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# Synthesis and Characterization of Silver Nanoparticles Against Two Stored Commodity Insect Pests

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**Abstract-** Micro sciences including nanotechnology are nm-scale investigations of extremely small objects. Specific and mixed age *Tribolium castaneum* and *Trogoderma granarium* have been reported from Faisalabad's grain market. The population had been acclimatized to the laboratory for each of the two species. Pupa of same age were obtained during insect rearing and in separately plastic containers for adult development (2 weeks) to increase diverse population. After isolation of plant products, biosynthesis of micro-particles was performed similarly to standard operating procedure. Toxicity Bioassays were performed through three amounts (5, 10 and 15 %) of the extracts (for each of the basic plant oils and silver -particles). Mortality results were reported after 24, 48 and 72 hours of medication. *Tribolium castaneum* had the highest mortality rate (15.10 %) and the lowest mortality rate (46.12 %). Silver nanoparticle gave highest mortality 57.91% against *Tribolium castaneum* and 39.39% against *Trogoderma granarium*. Repellency bioassay was conducted using a region choice approach followed by 75.39% (Silver nanoparticles), further results are confirmed by using Uv-visible and FTIR for their characterization. Under CRD statistical layout, data of all the bioassays is analyzed by factorial.

**Index Terms-** Micro sciences, nanotechnology, *Tribolium castaneum* and *Trogoderma granarium*, Mortality

## I. INTRODUCTION

Nanoscience is an evolving and increasingly evolved process that can accept the elements of the fundamental that can recognize and advance the emerging type of material production that has one aspect. Nano meter is very small, Nano is a Greek word, which means 'dwarf' but in the technical term, it means  $10^{-9}$ . It can take hydrogen side by side equal width and size of nanometers, thousands of nanometers equal to the typical bacterium, and their diameter is equal to the redwood tree and human hair would be equal to 1nm in diameter. At this similar dimension, they display some physical properties such as, insulating materials to become conductors, and materials that would be inert can cause the explosive in nature. They are prepared from many nanostructured materials and devices. It has one dimension which is less than 100 nm [1]. It also used as a biomedical, optical and electronic field. The nanoparticle has been work very successfully in the field of medicine, environmental sciences and food processing [2]. Recently Nanoparticles can be produced by the physical, chemical and green synthesis method for a long time but their major role nowadays is in microbes' biological system in the fabrication of metal Nanoparticles. Furthermore, the biosynthesis of nanoparticles is ecofriendly in nature because it can form without the use of harsh expensive chemicals. It also used as a highly conductor and semi-conductor, medical devices, sensor coating, catalytic agents and also used as a pesticide. Nanocarriers are aimed at reducing implementation quantity and slow pesticides transfer kinetics. [3]. Larvae and adults of this insect feed on damage grains [4] resulting up to 1-10% losses in different stored varieties of sorghum [5]. This insect pest has a presence in collected cereals can be contaminated the Grains as well as nutritional declines values [6]. *T. castaneum* attacks the Germ section of the grains and reduces germination potential [7]. Unluckily, these synthetic insecticides are to be get accumulated in the environment because it should not be degradable, resulting in polluted surroundings [8]. This alarming situation has prompted the researchers to explore biodegradable and eco-friendly insecticides [9] which are crucial needs of the contemporary scenario. Due to the potential insecticidal properties botanical is the possible alternative source of pest control [9]. In the past years, *T. castaneum* pest can be controlled by Polyethylen glycol and diatomaceous earth but garlic essential oil can be act as a reducing agent [10]. Noble metal nanoparticles such as silver are widely used in different fields due to its antibacterial and antioxidant properties. [11]. The efficacy of nano sized silver particles to control the pathogenic effect in plants [12].

## II. MATERIALS AND METHODOLOGY

Select and rear the insect for test culture

*T. castaneum* and *T. granarium* of various and varying age will be harvested through the grain market located in Faisalabad. The population for all two species is assimilated to the laboratory and has a supply potential of 1.5 kg in plastic containers (firstly decontaminate the store grains for *T. granarium* and store grain flour for *T. castaneum*; it can decontaminate through the oven for 30 minutes at 70 °C (Lab Line Instrument Inc. Model No.3512-1) and cover it with muslin cloths. All insects will be sieved out from adults in goods after three days. Goal insects should have nests that can be processed commodities, are stored in jars and can be put in an ideal position (65±5% a.l.H. and 30±2°C) and can be homogeneous to the F1 population as well (Hbib-ur-Rehman, 2018). After 3 days, bottles will be drained, then the bottles will be transferred into new boxes, the floor left behind will hold the eggs, the hatching time will be equivalent to 3 to 5 days [13].

### Preparation of silver Nano-particles

Firstly we can prepare the silver Nano particle like this way, Take the leaves powder from *R. communis*, *Jatropha curcus*, *Citrus paradise* purchased from the local market. Deionized water used in all experiments, I took 10g of *R. communis*, *Jatropha curcus* and *Citrus paradise* extracts by using weight balance, which can be boiled in 100ml distill water in 250ml conical flask. Then this extract were cooled at room temperature, filter through Whatmans No. 1 Paper Filter. This filtrate was just an act of decreasing and stabilizing Silver nanoparticles synthesis operative. [14] Ammonium solution will be added to AgNO<sub>3</sub> (solution accompanied by addition of 1-10ml extract of plant material) as described [14].

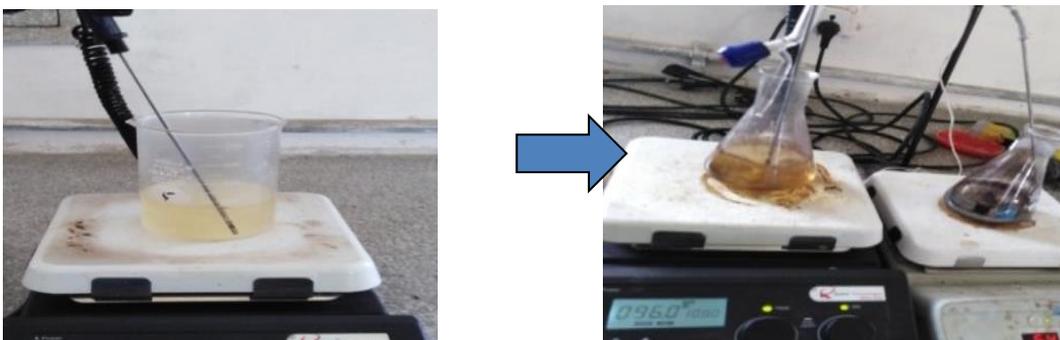


Figure 1.(Color changes after sometime)

### The Silver Nanoparticles Biosynthesis

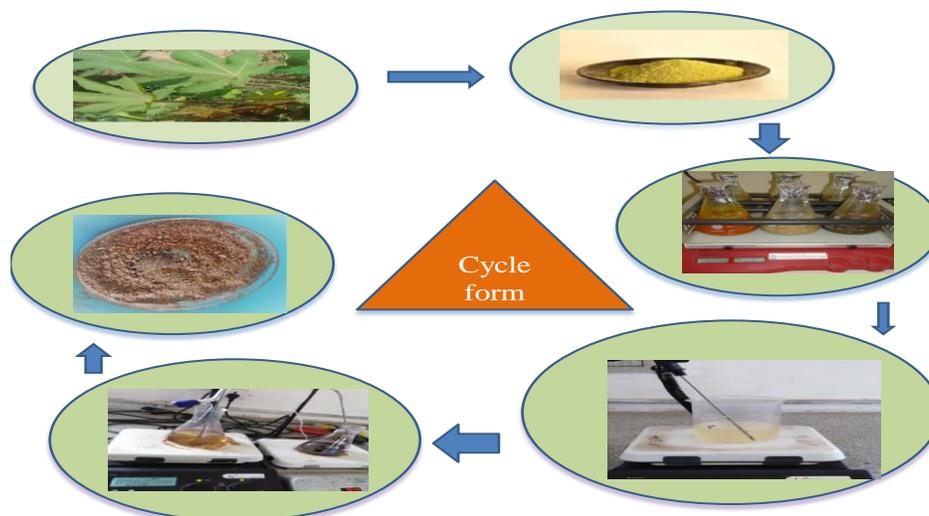
Using the green synthesis process, silver nanoparticles were synthesised. In this way silver nitrate were used as a precursor of silver metal cations which were reduced by ammonia solution (reducing agent). 1.6987mg (1mM) amount of silver nitrate was taken as a stock solution in 100 ml beaker, dissolve in 50ml deionized water. 5ml plant extract oil mixed in 50 ml distilled water and boiled at 100°C or 200rpm in hot plate for 1 hour. Add 10ml of plant extract (oil +Distill water) in silver nitrate solution drop wise in it. The total volume of the solution is 100ml by adding the deionized water. The solution was boiled at 80°C at 200rpm for 30 minutes and maintained the pH by adding the ammonia solution (0.5M), Different salt concentration (0.7-2 mM) were also be used. After adding ammonia solution Changed color of the solution. A Color transition from yellow to brown, was observed due to the reduction of Ag<sup>+</sup> ion into Ag<sup>0</sup> [14].



Figure 2.(Silver Dried nano-composits)

**Table 3.2: Change in color of solution during formation of Silver Nitrate nanoparticles by using *Jatropha curcus* ,*Citrus paradise* and *R. communis* plant extract**

Solution	Before Reduction	After Reduction	Color intensity	Time
<i>Jatropha curcus</i>	Dark Yellow			
1.6987mg (1mM) AgNO3	Lite grey	Pale Yellow	+	Immediately
		Lite brown	++	After 7 hours
		Brown	+++	After 24 hours
<i>Citrus paradise</i>	Lite Yellow			
1.6987mg (1mM) AgNO3	Lite grey	Dark Yellow	+	Immediately
		Brown	++	After 7 hours
		Dark brownish	+++	After 24 hours
<i>R. communis</i>				
1.6987mg (1mM) AgNO3	Lite grey	Yellow	+	Immediately
		Black brownish	++	After 7 hours
		Brown	+++	After 24 hours



**Figure 3 :Sketch representation**

**CHARACTERIZATION OF NANOPARTICLES**

We can determine the maximum production through absorption spectra of silver nanoparticle. We can observe the wavelength of SNP by using UV-visible spectrophotometer [15]; deionized Water continues to serve as a blank solution. Silver Nano particle optimum top point will be in air-dried form and it will be allowed to Characterized as described in Atomic-Force-Microscopy (Model-Nanosurf easyscan 2 AFM, Switzerland) [16].

**Toxicity Bio Assay**

Three plant extracts their concentration is (15, 10 and 5%) will be diluted in the stock solution by the use of four solvents. The concentration will be hands-on crushed grains, shaken for even distribution of concentration. It will allow to air dried and placed in small plastic jars. Both the insects, adults will be released in treated diet containing jars as described [17].

**Repellency**

Mean percent repellency was determining by using through a Favourable process. After the filter paper was cut in to the two halves, one half of each paper was treated with the extracts from the plants and acetone. After this som time passed the solution would be evaporated, then two halves were joined together and placed in a peteri dish. 20 Adults of *Tribolium castanium* and *Trogoderma granarium* were realeased in a center treated filter paper.The data was reported within 24, 48 and 72 hours, respectively [18].

$$\text{Percentage of repels} = \frac{N_c - N_t}{N_c + N_t} \times 100$$

**III. STATISTICAL ANALYSIS**

This Recorded data will be given through the Abbott’s formula, for the calculation of percent corrected values (i.e. mortality), and statistical analysis (ANOVA) will be performed by using statistica-8.1 software. Treatments means will be compared by using Tukey-HSD test at 5% signific The mortality (%) was corrected by Abbot’s (1925) formula:

$$\text{Corrected Mortality} = \frac{(\%)\text{Mc} - (\%)\text{Mo}}{100 - (\%)\text{Mc}} \times 100$$

Where, Mo = Mortality Watched; Mc = Control mortalityant level.

**IV. RESULTS**

**Determining The Mortality Of *Tribolium Castanium* Through Silver Nano-Particals Mortality Data After Exposure Of 24 Hrs**

To evaluate the mortality by *T. castaneum*, homogenous adults Was produced in small plastic jars on treated diet. Adults are encouraged to feed on treated diets and data regarding mortality was recorded. Wheat grains were used as diet and three Concentrations were used for each plant extract viz., 5, 10 and 15%. Data on mortality were recorded at 24, 48 and 72 h of exposure period. Insects were kept at 30±2oC and 60±5%RH in incubators for mortality assessment. There were three replicates of each treatment and control. Table 1. reveals the Variance Analysis (ANOVA) of T mean percent mortality data. Castaneum at different Jatropha curcus, Citrus paradise, and R concentrations. Common. Data Showed the key effects, plants (F=4.66; df=1: p<0.05) and concentration (F=11.10 df=:2 p<0.05) were significant regarding mortality values of *T. castaneum* after exposure period of 24 hours.

**Table 1. Variance analysis (ANOVA) of the % mortality data for *Tribolium castaneum* (Herbst)for Silver based nano-particals**

S.O.V	DF	SS	MSS	F value
Plant	2	1271.973	635.986	186.330 **
Concentration(Conc.)	2	926.744	463.372	135.757**
Plant*Concentration	4	292.456	73.114	21.421*
Error	18	61.438	3.413	
Total	26	2552.611	635.986	

**Table 2. Comparison of mean percentage morbidity of *Tribolium castaneum* after exposure to various crop extract concentrations after 24 hours**

Concentrations (%)	Mean percentage mortality $\pm$ SE
5	9.15 $\pm$ 1.19 c
10	17.08 $\pm$ 2.39 b
15	23.34 $\pm$ 3.62 a

Data in table 2. represents the insecticidal effect of different concentrations of 3 different oil against *Tribolium castaneum*. The experimental data revealed that maximum Mortality was recorded at 15 per cent (23.34 %). The mean mortality was 17.08 % at 10% concentration and 9.15 mortality rate was observed at 5 percent plant extract concentration. From this it is concluded that mortality only increased With increase in 3 different plant concentrations oil and also shows that concentration has major effect on average mortality percentage of *T. castaneum*.

### 3. Comparison of mean mortality percentage of *Tribolium castaneum* after exposure to different plant extracts after 24 hrs

Concentrations (%)	Mean percentage mortality $\pm$ SE
P1	8.32 $\pm$ 0.82 c
P2	17.11 $\pm$ 1.98 b
P3	25.76 $\pm$ 3.52 a

Table 3. for percent mean mortality values of different plant extracts at different concentration levels showed that extracts of *R. communis* and *Jatropha curcus* gave mortality values 25.76 and 17.11%, correspondly . While least mortality 8.32 % was given by extract of *Citrus paradise*.

### 4. Comparative mean percentage mortality of *Tribolium castaneum* after exposure to different plant extract concentrations following 24 hours

Plant extracts x Concentrations (%)	(%) Mean Mortality $\pm$ SE
<i>Citrus paradise</i> x 5	5.23 $\pm$ 1.83 g
<i>Citrus paradise</i> x 10	10.17 $\pm$ 2.56 efg
<i>Citrus paradise</i> x 15	12.02 $\pm$ 2.89 def
<i>Jatropha curcus</i> x 5	10.13 $\pm$ 1.61 fg
<i>Jatropha curcus</i> x 10	18.34 $\pm$ 1.57 cd
<i>Jatropha curcus</i> x 15	23.09 $\pm$ 2.45 bc
<i>Ricinus communis</i> x 5	13.10 $\pm$ 1.68 de

Plant extracts x Concentrations (%)	(%) Mean Mortality ± SE
<i>Ricinus communis</i> x 10	25.92±1.68 b
<i>Ricinus communis</i> x 15	37.07±0.89a

Table 4. showed the interaction between Various concentrations (5, 10 and 15 per cent) and different periods of exposure. Mean mortality of *T. castaneum* was given in percentage by the application of extract of *Ricinus communis*, *Jatropha curcus*, *Citrus paradise* oil along with standard error in table 4.

Mean contrast of mortality percentage values for T. At various concentrations of selected plant extract castaneum was the highest at maximum concentration. Extract of *Ricinus communis* gave the highest mean mortality revealed that maximum mortality (37.07 %) at 15% was recorded. The mean mortality was 25.92% at 10% concentration and 13.10% mortality The concentration of plant extracts was observed at 5 per cent. Extract of *Jatropha curcus* gave the mean mortality revealed that maximum mortality (23.09%) at 15% was recorded. The mean mortality was 18.34% at 10% concentration and 10.13% mortality was observed at 5% concentration of the plant extracts. Extract of *Citrus paradise* gave the mean mortality revealed that maximum mortality (12.02%) at 15% was recorded. The mean mortality was 10.17% at 10% concentration and 5.23% mortality Concentration of plant extracts was observed at 5%. The result given showed significant association between exposure time and concentration. We concluded from the results, that there was a gradually increase in mortality values with increased plant extract levels.

#### Mortality Data After Exposure Of 48 Hrs

**Table 5. Variance analysis (ANOVA) of data on percent mortality of *Tribolium castaneum* (Herbst) for Silver based nanoparticles**

S.O.V	DF	SS	MSS	F value
Plant	2	1536.53	768.27	189.142**
Concentration(Conc.)	2	1274.13	637.07	156.841**
Plant*Concentration	4	145.10	36.28	8.931*
Error	18	73.11	4.06	
Total	26	3028.88		

**Table 6. Contrast of mean percent fertility of *Tribolium castaneum* after exposure to various plant extract concentrations after 48 hours**

Concentrations (%)	Mean percentage mortality ± SE
5	11.39 ± 1.93 c
10	21.20 ± 2.60 b
15	28.13 ± 3.72 a

Data in table 6. represents the insecticidal effect of different concentrations of 3 different oil against *Tribolium castaneum*. The experimental data revealed that maximum mortality (28.13 %) at 15% was recorded. The mean mortality was 21.20 % at 10% concentration and 11.39% mortality The concentration of plant extracts was observed at 5%.From this it is concluded that mortality only increased with increasing concentrations of the three different plant oil and also shows that concentration has significant effect on % mean percent mortality of *T. castaneum*.

**7. Comparison of mean percentage mortality of *Tribolium castaneum* after exposure to different plant extracts after 48 hrs**

Concentrations (%)	Mean percentage mortality ± SE
P1	10.56 ± 0.82 c
P2	21.23± 2.60 b
P3	28.95 ± 3.40 a

Table 7. for percent mean mortality values of different plant extracts at different concentration levels showed that extracts of *R. communis* and *Jatropha curcus* gave mortality values 28.95 and 21.23%,correspondly . While least mortality 10.56 % was given by extract of *Citrus paradise*.

**8. Comparative mean percentage tribolium castaneum mortality following exposure to different plant extract concentrations after 48 hrs**

Plant extracts x Concentrations (%)	(%) Mean Mortality ± SE
<i>Citrus paradise</i> x 5	5.00±0.00 g
<i>Citrus paradise</i> x 10	11.67±1.67efg
<i>Citrus paradise</i> x 15	15.00±0.00 def
<i>Jatropha curcus</i> x 5	11.67±1.67 fg
<i>Jatropha curcus</i> x 10	23.34±1.67 cd
<i>Jatropha curcus</i> x 15	28.67±0.34 bc
<i>Ricinus communis</i> x 5	17.50±1.68 de
<i>Ricinus communis</i> x 10	28.61±0.67 b
<i>Ricinus communis</i> x 15	40.74±0.67a

Table 8. showed the interaction between Various concentrations (5, 10 % and 15 %)and different time period of exposure. Mean mortality of *T. castaneum* was given in percentage by the application of extract of *Ricinus communis*, *Jatropha curcus*, *Citrus paradise* oil along with standard error in table 8.

Mean comparison of percentage mortality values of *T. castaneum* at different concentrations of selected plant extract were highest at maximum concentration. Extract of *Ricinus communis* gave the highest mean mortality revealed that maximum mortality (40.74%) at 15% was recorded. The mean mortality was 28.61% at 10% concentration and 17.50% mortality was observed at 5 per cent plant

extract concentration. Extract of *Jatropha curcus* gave the mean mortality revealed that maximum mortality (28.67%) at 15% was recorded. The mean mortality was 23.34% at 10% concentration and 11.67% mortality was observed at 5% concentration of the plant extracts. Extract of *Citrus paradise* gave the mean mortality revealed that maximum mortality (15.00%) at 15% was recorded. The mean mortality was 11.67% at 10% concentration and 5.00% Mortality was observed at 5 per cent plant extract concentration. The result given showed significant association between exposure time and concentration. From the results we concluded that mortality values were increasing gradually with an increase in plant extract concentration.

### Mortality Data After Exposure Of 72 Hrs

**Table 9. Variance analysis (ANOVA) of the percent mortality data for Silver based nano-particals of *Tribolium castaneum* (Herbst).**

S.O.V	DF	SS	MSS	F value
Plant	2	1422.21	711.11	92.275**
Concentration(Conc.)	2	1998.33	999.16	129.655**
Plant*Concentration	4	399.07	99.77	12.946*
Error	18	138.71	7.71	
Total	26	3958.33		

**Table 10. Comparison of *Tribolium castaneum* mean percent mortality after exposure to various plant extract concentrations after 72 hrs.**

Concentrations (%)	Mean percentage mortality $\pm$ SE
5	9.70 $\pm$ 1.08 c
10	22.56 $\pm$ 2.92 b
15	30.59 $\pm$ 4.18 a

Data in table 10. represents the insecticidal effect of different concentrations of 3 different oil against *Tribolium castaneum*. The experimental data revealed that maximum mortality (30.59 %) at 15% was recorded. The mean mortality was 22.55 % at 10% concentration and 9.70% mortality was observed at 5 per cent plant extract concentration. From this it is concluded that mortality only increased With increased concentrations of the 3 different plant oil and shows also that concentration has a positive effect on the mean percent morbidity of T. Castañea.

### 11. Comparison of mean percentage mortality of *Tribolium castaneum* after exposure to different plant extracts after 72 hrs

Concentrations (%)	Mean percentage mortality $\pm$ SE
P1	12.78 $\pm$ 1.88 c
P2	19.67 $\pm$ 2.60 b

Concentrations (%)	Mean percentage mortality ± SE
P3	30.41 ± 4.98 a

Table 11. for percent mean mortality values of different plant extracts at different concentration levels showed that extracts of *R. communis* and *Jatropha curcus* gave mortality values 30.41 and 19.67%, correspondly . While least mortality 12.78 % was given by extract of *Citrus paradise*.

**12. Comparative mean percentage mortality of *Tribolium castaneum* after exposure to different plant extract concentrations following 72 hours**

Plant extracts x Concentrations (%)	(%) Mean Mortality ± SE
<i>Citrus paradise</i> x 5	6.67±1.67 g
<i>Citrus paradise</i> x 10	13.34±1.67efg
<i>Citrus paradise</i> x 15	18.34±1.67 def
<i>Jatropha curcus</i> x 5	10.00±0.00 fg
<i>Jatropha curcus</i> x 10	21.67±1.67 cd
<i>Jatropha curcus</i> x 15	27.34±0.67 bc
<i>Ricinus communis</i> x 5	12.45±1.68 de
<i>Ricinus communis</i> x 10	32.65±1.68 b
<i>Ricinus communis</i> x 15	46.12±2.42a

Table 12. showed the interaction between various concentrations (5, 10 and 15 per cent) and different time periods of exposure. Mean mortality of *T. castaneum* was given in percentage by the application of extract of *Ricinus communis*, *Jatropha curcus*, *Citrus paradise* oil along with standard error in table 12.

Mean comparison of percentage mortality values of *T. castaneum* at different concentrations of selected plant extract were highest at maximum concentration. Extract of *Ricinus communis* gave the highest mean mortality revealed that maximum mortality (46.12%) at 15% was recorded. The mean mortality was 32.65% at 10% concentration and 12.45% mortality was observed at 5% concentration of the plant extracts. Extract of *Jatropha curcus* gave the mean mortality revealed that maximum mortality (27.34%) at 15% was recorded. The mean mortality was 21.67% at 10% concentration and 10.00% mortality was observed at 5% concentration of the plant extracts. Extract of *Citrus paradise* gave the mean mortality revealed that maximum mortality (18.34%) at 15% was recorded. The mean mortality was 13.34% at 10% concentration and 6.67% mortality was observed at 5% concentration of the plant extracts. The given outcome showed that interaction of exposure time and concentration was significant. We concluded from the results, that there was a gradually increase in mortality values with increase in concentration of plant extracts.

**Determining The Mortality Of *Trogoderma Granarium* Through Silver Nano-Particals Mortality Data After Exposure Of 24 Hrs**

To evaluate the mortality of *T. granarium*, homogenous adults were released on treated diet in small plastic jars. Adults were allowed to feed on treated diet and data regarding mortality was recorded. Wheat grains were used as diet and three Concentrations viz. 5, 10 and 15 % of each plant extract were used. Mortality data was recorded for 24, 48 and 72 h of exposure period. For mortality assessment insects incubators were kept at 30±2 oC and 60±5 per cent RH. They replicated each treatment and control three times.

Table 13 Reveals the variance analysis (ANOVA) of data on the mean mortality percentage of *T. granarium* at different concentrations of *Jatropha curcus*, *Citrus paradise* and *R. communis*. Data showed that main effects, plants (F=4.66; df=1: p<0.05) and concentration (F=11.10 df=;2 p<0.05) were significant regarding mortality values of *T. castaneum* after exposure period of 24 hours.

**Table 13. Variance analysis (ANOVA) of data on percent mortality of *T. granarium* (Herbst) for silver based nanoparticles**

S.O.V	DF	SS	MSS	F value
Plant	2	555.807	277.904	38.4000**
Concentration	2	480.691	240.345	33.2103**
Plant*Concentration	4	65.422	16.355	2.2600*
Error	18	130.267	7.237	
Total	26	1232.187		

**Table 14. Comparison of mean percent mortality of *Trogoderma granarium* after exposure to various plant extract concentrations after 24 hours**

Concentrations (%)	Mean percentage mortality ± SE
5	4.13±1.19
10	10.28±2.15
15	14.40±2.08

Data in table 14. represents the insecticidal effect of different concentrations of 3 different oil against *Trogoderma granarium*. The experimental data revealed that maximum mortality (14.40%) at 15% was recorded. The mean mortality was 4.13% at 5% concentration and 10.28% mortality was found at a concentration of 10 per cent of plant extracts. From this it is concluded that mortality only increased with increasing concentrations of the three different plant oil and also shows that concentration has significant effect on Mean mortality % of *T. granarium*.

**Table 15. Comparison of mean percentage mortality of *Trogoderma granarium* after exposure to different plant extracts after 24 hrs**

Concentrations (%)	Mean percentage mortality ± SE
P1	4.44±1.30
P2	8.89±1.61
P3	15.48±2.25

Table 15. for percent mean mortality values of different plant extracts at different concentration levels showed that extracts of *R. communis* and *Jatropha curcus* gave mortality values 15.48 and 8.89%, correspondly . While least mortality 4.45% was given by extract of *Citrus paradise*.

**Table 16. Comparative mean percentage mortality of *Trogoderma granarium* after exposure to different concentrations of plant extracts after 24 hrs**

Plant extracts x Concentrations (%)	(%) Mean Mortality ± SE
<i>Citrus paradise</i> x 5	1.67±1.67g
<i>Citrus paradise</i> x 10	3.34±1.67efg
<i>Citrus paradise</i> x 15	8.34±1.67def
<i>Jatropha curcus</i> x 5	3.34±1.67fg
<i>Jatropha curcus</i> x 10	10.00±0.00cd
<i>Jatropha curcus</i> x 15	13.34±1.67bc
<i>Ricinus communis</i> x 5	7.40±1.68de
<i>Ricinus communis</i> x 10	17.50±1.68b
<i>Ricinus communis</i> x 15	21.54±1.46a

Table 16. showed the interaction between different concentrations (5, 10 and 15%) and different exposure time period. Mean mortality of *T. granarium* was given in percentage by the application of extract of *Ricinus communis*, *Jatropha curcus*, *Citrus paradise* oil along with standard error in table 16.

Mean comparison of percentage mortality values of *T. granarium* at different concentrations of selected plant extract were highest at maximum concentration. Extract of *Ricinus communis* gave the highest mean mortality revealed that maximum mortality (21.54%) at 15% was recorded. The mean mortality was 17.50% at 10% concentration and 7.40% mortality was observed at 5% concentration of the plant extracts. Extract of *Jatropha curcus* gave the mean mortality revealed that maximum mortality (13.34%) at 15% was recorded. The mean mortality was 10.00% at 10% concentration and 3.34% mortality was observed at 5 per cent plant extract concentration. Extract of *Citrus paradise* gave the mean mortality revealed that maximum mortality (8.34%) at 15% was recorded. The mean mortality was 3.34% at 10% concentration and 1.67% Mortality was observed at 5 per cent plant extract concentration. The result given showed significant association between exposure time and concentration. From the results we concluded that mortality values were increasing gradually with such an increase in plant extract concentration.

#### Mortality Data After Exposure Of 48 Hrs

**Table 17. Variance of analysis (ANOVA) of the data concerning % mortality of *T. granarium* (Herbst) for silver based nanoparticles**

S.O.V	DF	SS	MSS	F value
<b>Plant</b>	2	1608.555	804.278	123.0181**
<b>Concentration</b>	2	1265.198	632.599	96.7590**
<b>Plant*Concentration</b>	4	457.108	114.277	17.4792*
<b>Error</b>	18	117.682	6.538	
<b>Total</b>	26	3448.543		

**Table 18. Comparison of *Trogoderma granarium* mean percent mortality after 48 hrs of exposure to various plant extract concentrations.**

Concentrations (%)	Mean percentage mortality ± SE
<b>5</b>	5.81±1.49
<b>10</b>	14.18±2.30
<b>15</b>	22.58±4.77

Data in table 18. represents the insecticidal effect of different concentrations of 3 different oil against *Trogoderma granarium*. The experimental data revealed that maximum mortality (22.58%) at 15% was recorded. The mean mortality was 5.81% at 5% concentration and 14.18% mortality was observed at 10% concentration of the plant extracts. From this it is concluded that mortality only increased with increase in concentrations of the 3 different plant oil and also shows that concentration has significant effect on percent mean percent mortality of *T. granarium*.

**Table 19. Comparison of the mean percentage mortality of *Trogoderma granarium* after exposure to different plant extracts after 48 hrs**

Concentrations (%)	Mean percentage mortality ± SE
<b>P1</b>	6.67±1.44
<b>P2</b>	11.12±1.82
<b>P3</b>	24.80±4.48

Table 19. for percent mean mortality values of different plant extracts at different concentration levels showed that extracts of *R. communis* and *Jatropha curcus* gave mortality values 24.80 and 11.12%, correspondly . While least mortality 6.67% was given by extract of *Citrus paradise*.

**Table 20. Comparative mean percentage mortality of *Trogoderma granarium* after exposure to different concentrations of plant extracts after 48 hrs**

Plant extracts x Concentrations (%)	(%) Mean Mortality ± SE
<i>Citrus paradise</i> x 5	1.67 ±1.67 g
<i>Citrus paradise</i> x 10	8.34±1.67efg
<i>Citrus paradise</i> x 15	10.00±0.00def
<i>Jatropha curcus</i> x 5	5.00±0.00fg
<i>Jatropha curcus</i> x 10	11.67±1.67cd
<i>Jatropha curcus</i> x 15	16.67±1.67 bc
<i>Ricinus communis</i> x 5	10.77±1.68 de
<i>Ricinus communis</i> x 10	22.56±1.68 b
<i>Ricinus communis</i> x 15	41.07±1.68 a

Table 20. showed the interaction between Various concentrations (5, 10 and 15 per cent) and different time periods of exposure. Mean mortality of *T. granarium* was given in percentage by the application of extract of *Ricinus communis*, *Jatropha curcus*, *Citrus paradise* oil along with standard error in table 20.

Mean comparison of percentage mortality values of *T. granarium* at different concentrations of selected plant extract were highest at maximum concentration. Extract of *Ricinus communis* gave the highest mean mortality revealed that maximum mortality (41.07%) at 15% was recorded. The mean mortality was 22.56% at 10% concentration and 10.77% mortality was observed at 5% concentration of the plant extracts. Extract of *Jatropha curcus* gave the mean mortality revealed that maximum mortality (16.67 %) at 15% was recorded. The mean mortality was 11.67% at 10% concentration and 5.00% mortality was observed at 5% concentration of the plant extracts. Extract of *Citrus paradise* gave the mean mortality revealed that maximum mortality (10.00%) at 15% was recorded. The mean mortality was 8.34% at 10% concentration and 1.67 % mortality was observed at 5% concentration of the plant extracts. The result given showed significant association between exposure time and ability to concentrate. From results we concluded that there was a gradually increase in mortality values with increase in concentration of plant extracts.

#### Mortality Data After Exposure Of 72 Hrs

**Table 21. Variance of analysis (ANOVA) of the data concerning % mortality of *T. granarium* (Herbst) for Titanium dioxide based nanoparticles**

S.O.V	DF	SS	MSS	F value
<b>Plant</b>	2	1141.490	570.745	95.396**
<b>Concentration</b>	2	1497.094	748.547	125.115**
<b>Plant*Concentration</b>	4	278.498	69.625	11.637*
<b>Errorr</b>	18	107.692	5.983	

S.O.V	DF	SS	MSS	F value
Total	26	3024.774		

**Table 22. Comparison of mean percent mortality of *Trogoderma granarium* after visibility to various plant extract concentrations after 72 hours**

Concentrations (%)	Mean percentage mortality ± SE
5	8.59±1.02
10	18.64±2.63
15	26.79±3.63

Data in table 22. represents the insecticidal effect of different concentrations of 3 different oil against *Trogoderma granarium*. The experimental data revealed that maximum mortality (26.79%) at 15% was recorded. The mean mortality was 8.59% at 5% concentration and 18.64% Mortality was found at a concentration of 10 per cent of plant extracts. From this it is concluded that mortality only increased with increase in concentrations of the 3 different plant oil and also shows that concentration has significant effect on average mortality by percent of *T. granarium*.

**Table 23. Comparison of the mean percentage mortality of *Trogoderma granarium* after exposure to different plant extracts after 72 hrs**

Concentrations (%)	Mean percentage mortality ± SE
P1	10.00±1.44
P2	18.12±2.37
P3	25.92±4.29

Table 23. for percent mean mortality values of different plant extracts at different concentration levels showed that extracts of *R. communis* and *Jatropha curcus* gave mortality values 25.92 and 18.12%, correspondly . While least mortality 10.00% was given by extract of *Citrus paradise*.

**Table 24. Comparative mean percentage mortality of *Trogoderma granarium* after exposure to Variable concentrations of plant extracts after 72 hrs**

Plant extracts x Concentrations (%)	(%) Mean Mortality ± SE
<i>Citrus paradise</i> x 5	5.00±0.00g
<i>Citrus paradise</i> x 10	10.00±0.00efg

Plant extracts x Concentrations (%)	(%) Mean Mortality ± SE
<i>Citrus paradise</i> x 15	15.00±0.00def
<i>Jatropha curcus</i> x 5	10.00±0.00fg
<i>Jatropha curcus</i> x 10	18.34±1.67 cd
<i>Jatropha curcus</i> x 15	26.00±1.00bc
<i>Ricinus communis</i> x 5	10.77±1.68de
<i>Ricinus communis</i> x 10	27.60±1.68b
<i>Ricinus communis</i> x 15	39.39±2.91a

Table 24. showed the interaction between Various concentrations (5, 10 and 15 per cent) and different time periods of exposure. Mean mortality of *T. granarium* was given in percentage by the application of extract of *Ricinus communis*, *Jatropha curcus*, *Citrus paradise* oil along with standard error in table 24.

Mean comparison of percentage mortality values of *T. granarium* at different concentrations of selected plant extract were highest at maximum concentration. Extract of *Ricinus communis* gave the highest mean mortality revealed that maximum mortality (39.39%) at 15% was recorded. The mean mortality was 27.60% at 10% concentration and 10.77% mortality was observed at 5 per cent plant extract concentration. Extract of *Jatropha curcus* gave the mean mortality revealed that maximum mortality (26.00%) at 15% was recorded. The mean mortality was 18.34% at 10% concentration and 10.00% mortality was observed at 5% concentration of the plant extracts. Extract of *Citrus paradise* gave the mean mortality revealed that maximum mortality (15.00%) at 15% was recorded. The mean mortality was 10.00% at 10% concentration and 5.00% mortality was observed at 5 per cent plant extract concentration..The given outcome showed that the exposure time and concentration interactions were significant. From the results we concluded that mortality values were increasing gradually with an increase in plant extract concentration..

## V. CHARACTERIZATION OF NANOPARTICLES

### Silver Nano-composits

UV-Visible spectroscopy is one of the techniques most widely used for structural characterisation of silver nanoparticles (green synthesized AgNPs of *Ricinus communis*). Typical for silver nanoparticles.c is the absorption band in the region 350 nm to 450 nm. Therefore we can conclude that the nanoparticles recommended for farming leveal are against pest control because of their cheap quality, supply, eco-friendly nature and good alternative type.which is shown in [19].

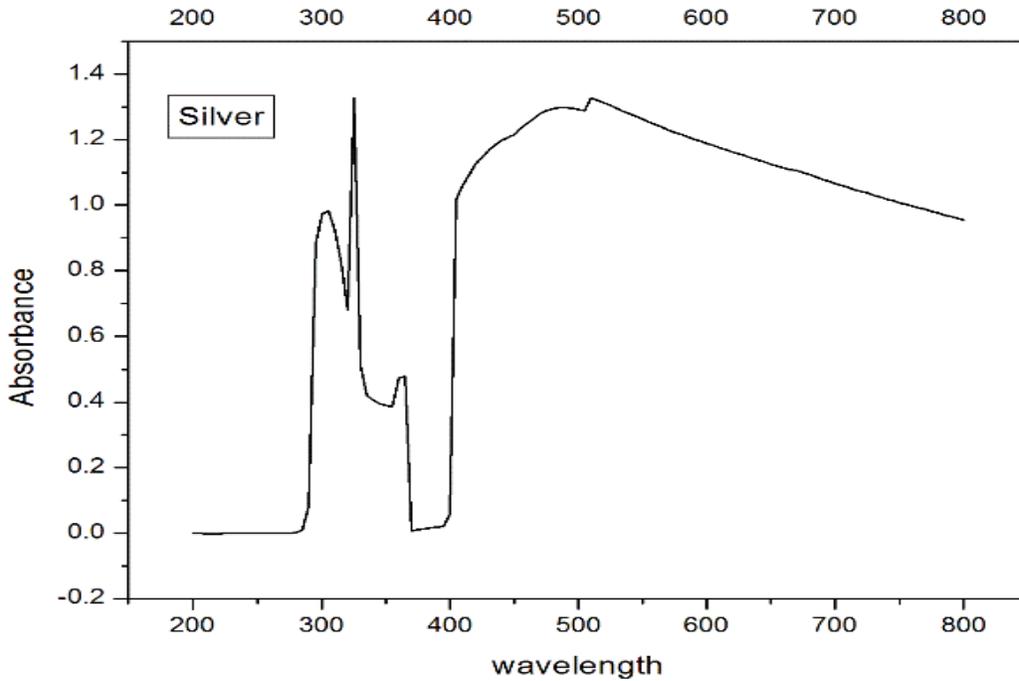


Figure 4 :Spectra of absorption of UV-Vis from synthesized silver nanoparticles

#### FTIR

FTIR observations were conducted to classify the potential biomolecules liable for both the capping and effective stabilization of metal nanoparticles synthesized with leaf broth. The peak IR bands (Fig. 4.2) observed in the dried *Ricinus communis* leaf at 3409 and 1733  $\text{cm}^{-1}$  are characteristic of the O – H and C,O stretching modes for the OH and C,O groups, possibly of oleuropein, apigenin-7-glucoside and/or luteolin-7-glucoside present in the *Ricinus communis* leaf[20]. The medium band of 1624  $\text{cm}^{-1}$  refers to amide I, the result of carbonyl stretching in proteins[20]. The strong peak at 1077  $\text{cm}^{-1}$  is equivalent to the amine stretching vibration of C – N. CH is assigned the peak near 651  $\text{cm}^{-1}$  from plane bending vibrations of the substituted ethylene systems –CH,CH. In the case of nanoparticles, a large shift in the absorbance peak with decreased band intensity from 3436 to 3395  $\text{cm}^{-1}$  and 1420 to 1454  $\text{cm}^{-1}$  was observed, implying binding of the extract's silver ions with hydroxyl and carboxylate groups[20].

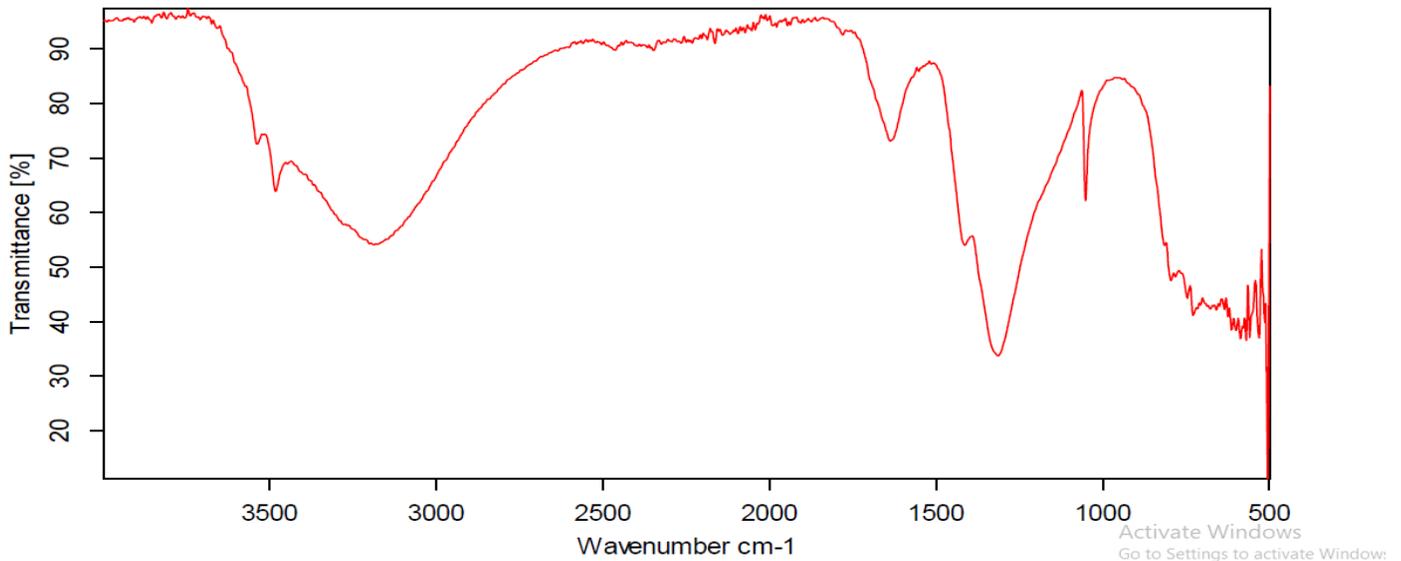


Figure 5: FTIR Spectra of silver Nano Particles

## VI. CONCLUSION

The current study was directed to investigate the insecticidal and growth-inhibiting vegetable extracts and new chemistry insecticide formulation of different nano-composites, against *Tribolium castaneum*. Two bioassays were carried in study including mortality and growth inhibition. The big impact on soil fertility or growth was produced by the tribolium castanum and *Trigoderma granarium* pests. Different plant extract oil has been used in the past years to control these effects, but it does not work properly. The big impact on soil fertility or growth was produced by the tribolium castanum and *Trigoderma granarium* pests. Different plant extract oil has been used in the past years to control these effects, but it does not work properly. Therefore we can conclude that the nanoparticles recommended for farming level are against pest control because of their cheap quality, supply, eco-friendly nature and good alternative type.

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# Awareness of Occupational Safety and Health Issues in Liquefied Petroleum Gas Business in Kiambu County, Kenya.

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**Abstract-** Liquefied petroleum gas cylinder accidents are catastrophic; thus, safety enhancement in this trade is indispensable. The aim of this research was to ascertain the level of awareness of occupational safety and health issues in Lpg retail business among retailers in Kiambu County. Interview schedules were administered to 292 Lpg retailers during the data collection period. Subsequently, the data collected was analysed using SPSS ver.25. Descriptive and inferential statistical analyses were effectuated and presented in form of charts, bar graphs, and tables. The targeted outcome of this study was that the results will provide important information that is the first step necessary to ensure that safety and health -which is a legal requirement- in the Lpg retail business is implemented for the well-being of all stakeholders. The study established that 77% of the respondents were not aware of the occupational safety and health issues in the Lpg cylinder retail business. The association of awareness of how to use a fire extinguisher and gender of the respondents was statistically significant at 95% confidence level with  $X^2$  (df=1) =4.999, since  $p=0.025$ . The association of awareness of the health and safety policy and respondents' experience was statistically significant at 95% confidence level with  $X^2$  (df=4) =32.204, since  $p<0.001$ . The study recommends that Lpg suppliers in partnership with EPRA and the county governments should raise public awareness about Lpg cylinder safety; through safety tailored campaigns on local television/radio stations, print media, and social media platforms.

**Index Terms-** Liquefied petroleum gas cylinders, Retailers, OSH Awareness, Safety culture.

## I. INTRODUCTION

Occupational safety and health is the science of the anticipation, recognition, evaluation and control of hazards arising in or from the workplace, which could compromise the health and well-being of employees and the occupier, considering the possible impact on the surrounding neighbourhoods and the prevailing environment. (Alli, 2008).

Liquefied petroleum gas (Lpg) is produced as a by-product of the oil and gas refinery process or obtained during the natural gas production process. In Kenya, Lpg is sold to consumers in pressurized cylinders. Lpg is predominantly used as a thermal fuel; burns cleanly, posing no water or ground pollution hazards and releases few Sulphur emissions. The normal ingredients of Lpg are propane and butane. (Competition Commission of South Africa, 2017).

Lpg cylinder accidents are catastrophic. Lpg is conceivably hazardous if mishandled, and therefore promotion of good safety practices in its retail is key. (Beheshti, et al., 2018). There's therefore need for simple practical advice on eliminating or reducing the risks associated with Lpg cylinder retailing in Kiambu County.

This research aimed at finding out the level of awareness of occupational safety and health issues in Lpg retail business in Kiambu County. This will provide important information that is the first step necessary to ensure that safety and health, in the Lpg retail business, which is a legal requirement is implemented for the well-being of all stakeholders.

## II. MATERIALS AND METHODS

### 2.1. Study design

The study utilized descriptive research design. Descriptive research is suitable when studying things or variables as they are in the field without manipulating them, and gives views and feelings from the respondents (Babbie, 2002.). The study design was employed in the interest of the researcher's aim of providing a picture of the situation on the ground as it naturally happened viz. Lpg cylinder retailing.

## *2.2. Study area and population*

The study area was Kiambu County, which is one of the 47 counties in the Republic of Kenya. It is in the central region and covers a total area of 2,543.5 Km<sup>2</sup> with 476.3 Km<sup>2</sup> under forest cover. (County Government Of Kiambu, 2015). The county has various urban centres: Thika town being the largest. Other urban centres include: Kiambu, Juja, Kikuyu, Karuri, Limuru, Gatundu, and Ruiru. (Kiambu County annual development plan, 2017). The study population comprised of 400 Lpg cylinder retailers undertaking the Lpg cylinder retail business, sampled from the selected study sites during the data collection period. (November, 2018 to February, 2019).

## *2.3 Sampling method*

Stratified purposive sampling was employed. Stratified purposive sampling focuses on characteristics of subgroups of interest. (Kothari & Garg, 2014; Patton, 2002.). In line with Kothari, (2004)., the overall population was first divided into subgroups that were individually more homogenous than the overall population. The strata classification was by virtue of urban centres in the region. Then; Thika, Limuru and Kiambu towns were purposively selected from the population strata. A known characteristic about the selected study sites is that they are among the biggest and highly urbanized regions in Kiambu County (Kiambu County annual development plan, 2018 & County Integrated Development Plan, 2018).

## *2.4 Sample size determination*

The sample of the Lpg cylinder retailers was a well-rounded representation selected from all over the study sites. From the population in 2.2 above, the sample size was determined by use of the sample size determination table, (Bartlett et. Al, 2001). With the data being categorical, a selected margin of error of 0.05, a standard variate value of 1.96 at 95% confidence level and a recommended population proportion of 0.50; the sample size determination table gives the sample size to use for the given population of 200 retailers in Thika town, 100 retailers in Kiambu town and 100 retailers in Limuru town to be 132, 80 and 80 respectively.

## *2.5. Research instruments*

The measurement tools designed to obtain data from the research subjects were observation and interview schedules. Response options in the interview schedule were weighted as follows: 1 =don't know, 2 =disagree, 3 =Neutral, and 4 =Agree. Data collected from the respondents was on socio-demographic characteristics and OSH awareness.

## *2.6. Pilot testing*

A pre-test was carried out in Kenyatta Road, to measure the validity and reliability of the research instruments. The pilot study targeted a sample size of 5 respondents in which all of them responded to the interview schedules.

## *2.7. Data processing and analysis*

Data from the study sites were coded, classified, checked for errors, omissions, and then summarised. The data were then analysed using the Statistical Package for Social Sciences (SPSS version 25.0) software and excel (version 2019). The results were organized and presented in form of tables, bar graphs, pie charts.

## *2.8 Ethical consideration*

Permission to carry out the study was sought from the Institution (Jomo Kenyatta University of Agriculture and Technology), and the Lpg cylinder retailers. Confidentiality of the respondents was protected in that no names or personal information was required in the interview schedules, and measures were taken to ensure no undue influence or coercion was exercised.

### III. RESULTS AND DISCUSSION

#### *3.1. Response rate*

The study targeted a sample size of 292 respondents in which the response rate was 100%. Interview schedules, typically have a high response rate, though expensive and time consuming (Rubin & Babbie, 2012).

### 3.2. Demographic characteristics of respondents

#### 3.2.1 Gender distribution of respondents

A large proportion of the respondents, 81%, were male whereas the remaining 19% were female. For this reason, it is deduced that Lpg cylinder retail business in Kiambu County is male dominated. This agrees with OSH (2007) that more men than women work in jobs that expose them to high risks.

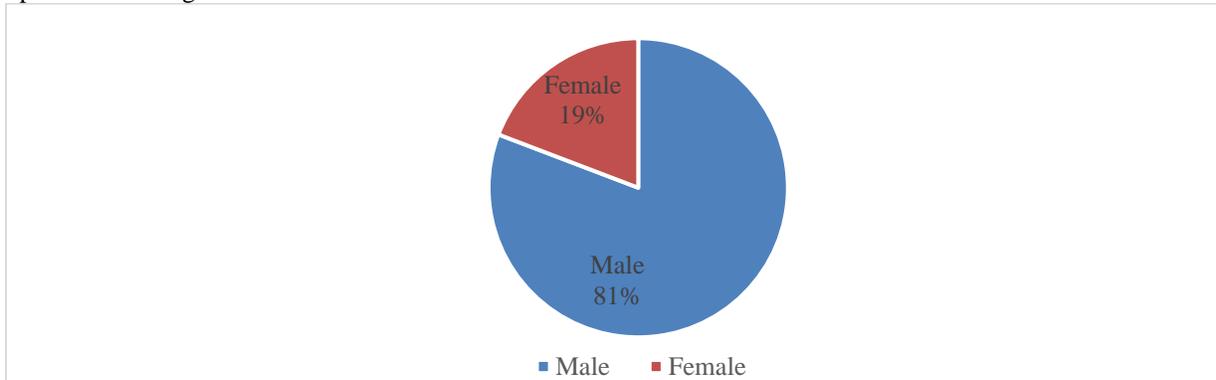


Figure 1: Gender distribution of respondents

#### 3.2.2 Age distribution of respondents

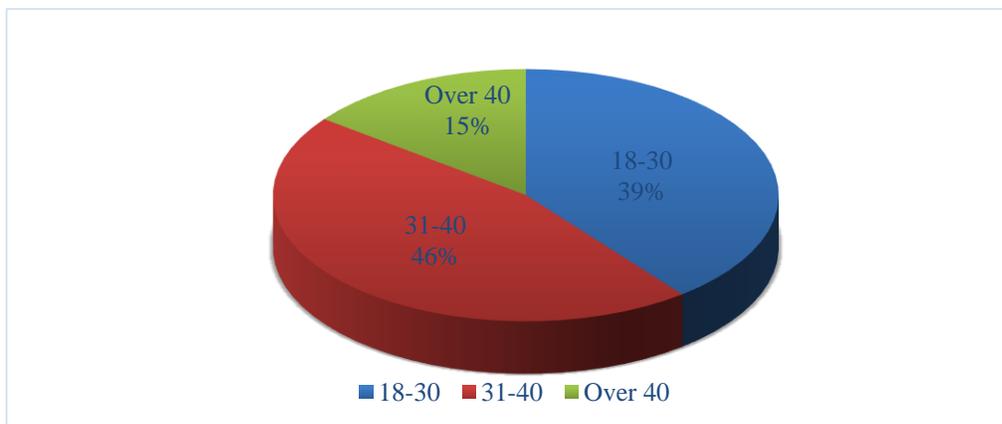


Figure 2: Age distribution of respondents

A greater part of the respondents, 46%, were aged between 31 and 40 years. 39% of the respondents were aged between 18 and 30 years. The least represented were respondents aged above 40 years who only made up 15%.

#### 3.2.3 Education levels distribution of respondents

27.1% of the respondents had attained up to primary education. A greater number of the respondents, 49.3%, had attained up to secondary education, while 23.6% had attained up to tertiary education. The variation in education level ensured varied responses which richly contributed to getting valuable information for the study. (Schultz et al., 2006).

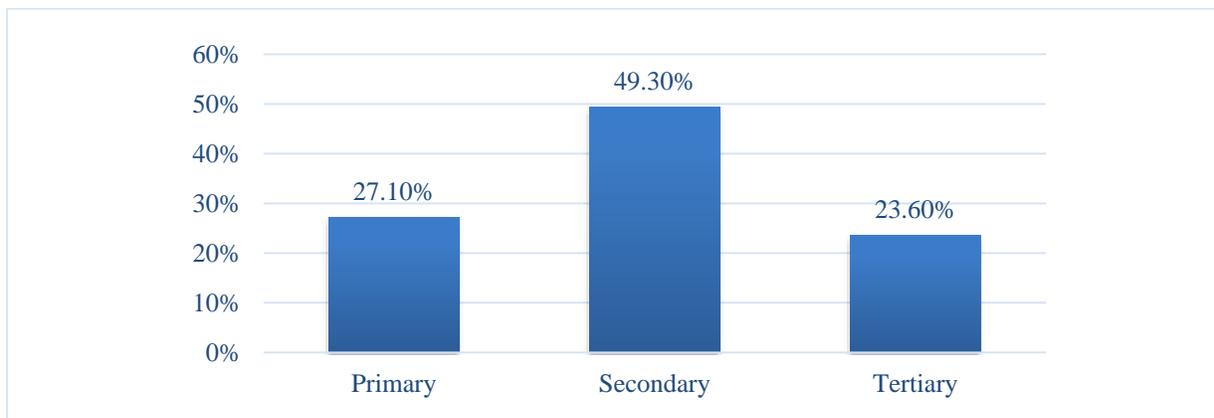


Figure 3: Education levels distribution of respondents

3.2.4 Distribution of respondents by Lpg retailing experience

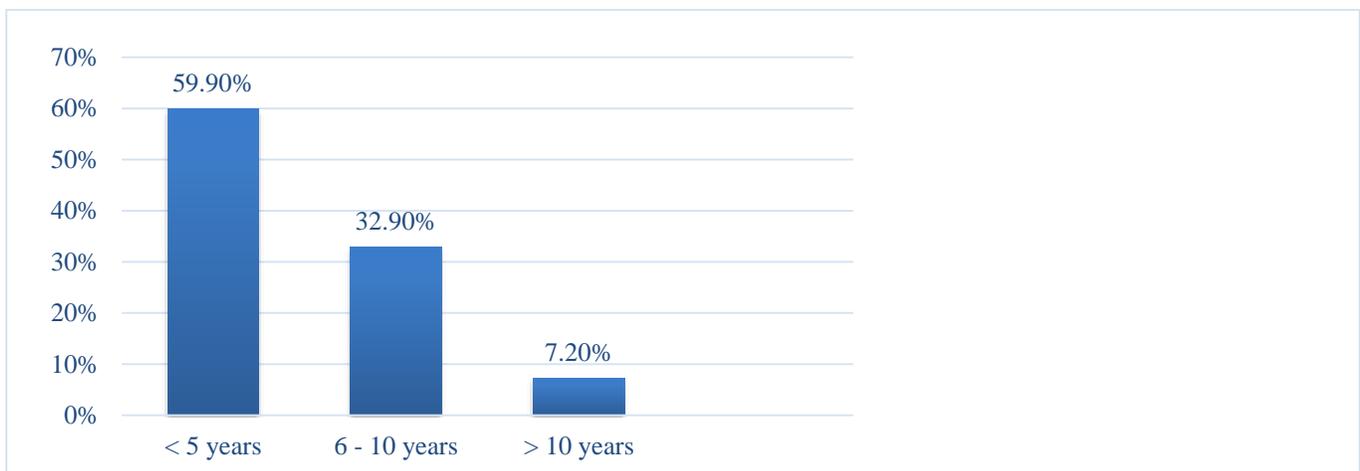


Figure 4: Lpg retailing experience of respondents

More than half of the respondents (59.9%), had an experience of between 1 and 5 years in the Lpg cylinder retail business. A good number (32.9%) had an experience of between 6 and 10 years. Only 7.2% of the respondents had over 10 years’ experience in the Lpg cylinder retail business.

3.3 Level of awareness on occupational safety and health issues

The study sought to assess the level of awareness of occupational safety and health issues in Lpg cylinder retail business. Respondents were presented with a predetermined set of questions, from an already prepared interview schedule, and their answers recorded. The findings are presented below.

Table 1: Respondents’ awareness of occupational safety and health issues.

OSH Awareness Aspect	Agree	Neutral	Disagree	Don’t know	Mean	Standard Deviation
I always wear safety shoes at my workplace.	22.3%	-	77.7%	-	2.45	0.833
I always wear safety gloves when handling gas cylinders at my workplace.	18.5%	-	81.5%	-	2.37	0.778
I always wear safety glasses when handling gas cylinders at my workplace.	-	-	99.7%	0.3%	2.00	0.059

OSH Awareness Aspect	Agree	Neutral	Disagree	Don't know	Mean	Standard Deviation
I'm aware that safety signs and warning notices should be clearly shown at my workplace.	40.4%	-	43.2%	16.4%	2.64	1.171
A First aid kit is available at my workplace	23.6%	-	76.4%	-	2.47	0.851
There is a fire extinguisher at my workplace.	29.8%	-	69.9%	0.3%	2.59	0.920
I have a health and safety (HSE) policy at my workplace.	8.6%	-	59.6%	31.8%	1.85	0.801
I have been trained on handling gas cylinders.	11.3%	-	88.0%	0.7%	2.22	0.642
I have been trained on fire safety	15.4%	-	81.2%	3.4%	2.27	0.760
There is a Fire safety management Plan at my workplace.	8.6%	-	67.8%	25.7%	1.85	0.720
I know how to use a fire extinguisher	32.2%	-	67.8%	-	2.64	0.936
I have undergone first aid training	26.0%	-	73.3%	0.7%	2.51	0.887
Cylinders should not be transported upright and in a secure position	45.9%	-	38.7%	15.4%	2.32	1.384
I'm aware that gas cylinders can explode when exposed to high temperatures	61.0%	-	16.4%	22.6%	2.99	1.298
Liquefied petroleum gas can cause cold burns when it comes into contact with skin	0.7%	-	72.6%	26.7%	1.75	0.481
In case of a gas leak, switching on lights can cause an explosion/fire	11.6%	4.8%	43.8%	39.7%	1.88	0.949
All injuries and accidents however minor should be reported and recorded	10.6%	-	65.4%	24%	1.97	0.816

Table 2. Association between respondents' demographics and first aid training.

Variable	Category	Undergone first aid training		
		No	Yes	Chi-Square
Gender	Male	73%	27%	$X^2=1.302, df=2, p=0.522$
	Female	79%	21%	

Age	18-30 years	80%	20%	$X^2=6.664$ , $df=4$ , $p=0.155$
	31-40 years	69%	31%	
	> 40 years	74%	26%	
Education level	primary	91%	9%	$X^2=19.389$ , $df=4$ , $p=0.001$
	Secondary	65%	35%	
	Tertiary	74%	26%	
Lpg retailing experience	< 5 years	77%	23%	$X^2=4.084$ , $df=4$ , $p=0.395$
	6-10 years	73%	27%	
	> 10 years	57%	43%	

Table 3. Association between respondents' demographics and awareness of fire suppression

Variable	Category	Know how to use a fire extinguisher		
		No	Yes	Chi-Square
Gender	Male	65%	35%	$X^2=4.999$ , $df=1$ , $p=0.025$
	Female	80%	20%	
Age	18-30 years	71%	29%	$X^2=4.331$ , $df=2$ , $p=0.115$
	31-40 years	70%	30%	
	> 40 years	77%	23%	
Education level	primary	82%	18%	

	Secondary	55%	45%	$X^2=22.090, df=2, p<0.001$
	Tertiary	78%	22%	
Lpg retailing experience	< 5 years	73%	27%	
	6-10 years	61%	39%	$X^2=6.344, df=2, p=0.042$
	> 10 years	52%	48%	

Table 4. Association between respondents' demographics and awareness of health and safety policy.

Variable	Category	Health and safety policy available at workplace		
		No	Yes	Chi-Square
Gender	Male	91%	9%	$X^2=8.671, df=2, p=0.013$
	Female	95%	5%	
Age	18-30 years	91%	9%	$X^2=7.469, df=4, p=0.113$
	31-40 years	89%	11%	
	> 40 years	100%	0%	
Education level	primary	96%	4%	$X^2=15.478, df=4, p=0.004$
	secondary	85%	15%	
	Tertiary	99%	1%	
Lpg retailing experience	< 5 years	98%	2%	

6-10 years	83%	17%	$X^2=37.204, df=4, p<0.001$
> 10 years	71%	29%	

Table 5. Association between respondents' demographics and awareness of cylinder handling

Variable	Category	Trained on cylinder handling		
		No	Yes	Chi-Square
Gender	Male	89%	11%	$X^2=1.249, df=2, p=0.536$
	Female	89%	11%	
Age	18-30 years	90%	10%	$X^2=2.954, df=4, p=0.566$
	31-40 years	87%	13%	
	> 40 years	91%	9%	
Education level	primary	97%	3%	$X^2=18.54, df=4, p=0.001$
	Secondary	81%	19%	
	Tertiary	95%	5%	
Lpg retailing experience	< 5 years	96%	4%	$X^2=30.702, df=4, p<0.001$
	6-10 years	81%	19%	
	> 10 years	62%	38%	

Table 6. Association between respondents' demographics and awareness of Lpg cold burns

Variable	Category	Lpg can cause cold burns to skin		
		No	Yes	Chi-Square
Gender	Male	99%	1%	$X^2=1.454$ , $df=2$ , $p=0.483$
	Female	100%	0%	
Age	18-30 years	99%	1%	$X^2=5.208$ , $df=4$ , $p=0.267$
	31-40 years	100%	0%	
	> 40 years	99%	1%	
Education level	primary	100%	0%	$X^2=35.487$ , $df=4$ , $p<0.001$
	Secondary	99%	1%	
	Tertiary	100%	0%	
Lpg retailing experience	< 5 years	100%	0%	$X^2=5.636$ , $df=4$ , $p=0.228$
	6-10 years	98%	2%	
	> 10 years	100%	0%	

Table 7. Association between respondents' demographics and awareness of fire safety.

Variable	Category	Trained on fire safety.		
		No	Yes	Chi-Square
Gender	Male	85%	15%	$X^2=2.458$ , $df=2$ , $p=0.293$
	Female	84%	16%	
Age	18-30 years	90%	10%	$X^2=17.002$ , $df=4$ , $p=0.002$
	31-40 years	78%	22%	
	> 40 years	88%	12%	
Education level	primary	95%	5%	$X^2=30.633$ , $df=4$ , $p<0.001$
	Secondary	76%	24%	
	Tertiary	91%	9%	
Lpg retailing experience	< 5 years	95%	5%	$X^2=44.745$ , $df=4$ , $p<0.001$
	6-10 years	70%	30%	
	> 10 years	62%	38%	

Table 8. Association between respondents' demographics and awareness of accident/incident reporting.

Variable	Category	All injuries/accidents/incidents should be reported		
		No	Yes	Chi-Square
Gender	Male	88%	12%	$X^2=7.410$ , $df=2$ , $p=0.025$
	Female	96%	4%	
Age	18-30 years	90%	10%	$X^2=3.711$ , $df=4$ , $p=0.447$
	31-40 years	87%	13%	
	> 40 years	95%	5%	
Education level	primary	95%	5%	$X^2=5.884$ , $df=4$ , $p=0.208$
	Secondary	86%	14%	
	Tertiary	90%	10%	
Lpg retailing experience	< 5 years	94%	6%	$X^2=14.288$ , $df=4$ , $p=0.006$
	6-10 years	82%	18%	
	> 10 years	86%	14%	

Table 9: Association between respondents' demographics and awareness of cylinder explosion

Variable	Category	cylinders can explode at high temperatures		
		No	Yes	Chi-Square
Gender	Male	38%	62%	$X^2=1.454$ , $df=2$ , $p=0.483$
	Female	45%	55%	
Age	18-30 years	39%	61%	$X^2=8.851$ , $df=4$ , $p=0.065$
	31-40 years	35%	65%	
	> 40 years	51%	49%	
Education level	primary	37%	63%	$X^2=20.235$ , $df=4$ , $p<0.001$
	Secondary	31%	69%	
	Tertiary	59%	41%	
Lpg retailing experience	< 5 years	47%	53%	$X^2=17.457$ , $df=4$ , $p=0.002$
	6-10 years	30%	70%	
	> 10 years	10%	90%	

#### IV. DISCUSSION AND CONCLUSION

It can be confirmed from this study that the application of safety command becomes more and more taxing as Lpg cylinders are moved away from the direct control of the wholesaler/supplier. A very important consideration is that all cylinder retail shops should have sufficient signage to give warnings and safety information on the hazardous products (Lpg cylinders) being stored. The employer must make sure that his/her employees are adequately trained, on Lpg safety, and should establish competency. Training records should be preserved and available upon request.

Majority of the Lpg retailers are not aware of the hazards they are exposed to, therefore unable to prevent and control this hazards. The study established that 77% of the retailers were not aware of the occupational safety and health issues in the Lpg retail business. The author concludes that the level of OSH awareness among Lpg retailers is inadequate.

The study further recommends that Lpg suppliers, in partnership with EPRA and the county governments should raise public awareness about Lpg cylinder safety; through safety tailored campaigns on local television/radio stations, print media, and social media platforms. Technological breakthroughs should also be embraced in Lpg cylinder safety enhancement in Kenya.

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# A Retrospective Study of Dental Caries Prevalence in 3-6 Years Old Children

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## ABSTRACT

Dental caries has been examined by multiple dental specialists by registering tooth surfaces with untreated caries lesions, extracted teeth and obturated teeth. Our research aims to conduct a clinical study of the prevalence of tooth decay in primary teeth. A retrospective study was performed analysis, using medical cards of 300 children from 3 to 6-years-old in Varna, Bulgaria. Children were divided into (1-4) groups depending on age of first visit: 3-year-olds (n=50), 4-year-olds (n=50), 5-year-olds (n=100), 6-year-olds (n=100). Registration of all dental caries lesions was performed in clinical conditions, with implementation of the International Caries Detection and Assessment System (ICDAS) and DIAGNOdent Pen. The epidemiological index of decay missing filling (dmft/s) was calculated. The results were performed by processing the data with a STATISTICA Manual, Version 10.0, 2010. By application of the descriptive analysis we determine that the average value of carious lesions into the total group of participants from 3 to 6 years old (equals to: dmft =  $4.40 \pm 0.21$ , dmfs =  $6.35 \pm 0.65$ ). Patients are characterized with dmft  $x \pm Sx$ : ( $2.80 \pm 0.25$  in group 1), ( $3.00 \pm 0.21$  in group 2), ( $4.30 \pm 0.29$  in group 3), and group 4 with higher caries prevalence ( $5.10 \pm 0.32$ ). There is a strong proportional relationship between the number of carious primary teeth and surfaces.

**Keywords:** dental caries, dmf index, primary teeth

## INTRODUCTION

Dental caries has been examined by multiple dental specialists by registering tooth surfaces with untreated caries lesions, extracted teeth and obturated teeth. This ensures three important results: ft (filled teeth) – this is the number of treated carious teeth, which shows access to dental treatment; dt (decayed teeth) – this is the amount of decayed teeth, which haven't been treated; dft (decayed and filled teeth) – this is the summation of ft and dt and it aims to determine the child's caries predisposition. In addition to the whole amount of decayed and filled teeth, the same information can be collected regarding affected tooth surfaces. Since every tooth has multiple surfaces, counting the decayed or filled surfaces is more accurate to the severity of the caries lesion development.

After conducting a study in Brasil in 2016, Correa-Faria et al. establish that the frequency of tooth decay is high and most of the children haven't received treatment. Having had a caries lesion in the near or distant past is a risk factor for developing new caries lesions. The decay frequency, established by the authors is 46,6%. The highest amount of dental caries was established in the group of children with previous caries lesions (61,1%). In 36,7% of children without a caries lesion registered in the first check up, there has been a caries lesion detected in the second epidemiological check up (Correa-Faria et al., 2016, 1).

Saravanan S. and co-authors have done a survey to evaluate the distribution of tooth decay in primary dentition in 5-year-old children. The area of their study is Pondicherry, and the amount of examined patients consists of 1009 students from both genders (527 boys and 482 girls). The dental caries was evaluated based on the status of the teeth and the need of treatment (WHO 1997). The prevalence of tooth decay in this year was 44.4% among the examined population and higher in boys. The authors concluded that primary second molars showed a higher frequency of tooth decay for both genders in the upper and lower jaw, (Saravanan et al, 2005, 2).

According to a study from China in 2011 from W. Keung Leung and C.H. Chu, the distribution of dental caries in children from Han was significantly lower than that of muslim children and tibetian children, living in the province of Qinghai. The need for treatment of tooth decay in children from Han and Qinghai was low, but their health status was unsatisfactory. The authors discovered that there was a need for basic oral and dental health care for maintaining profilactic methods in this part of China. In

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this study the examiners established the value of DMFT for the children from Han (DMFT=0,12) and the children of Qinghai DMFT=0,23. Most of the children from Han didn't have tooth decay (94%) (DMFT=0), compared to the muslim and tibetian children (82%), ( $p<0.01$ ) (Keung Leung et al., 2011, 3).

Other authors such as ElSalhy M. and co-authors, 2017 consider that the International Caries Detection and Assessment System (ICDAS) should be used in order to establish the potential summation, which shows the tooth decay level in children. In the conducted study the target group included 2808 children 1-15 years old from Kuwait, Brasil and Spain. The primary teeth were examined with ICDAS. The general ICDAS and the average ICDAS show a correlation based on the amount of caries lesions in the different severity of tooth decay in primary, mixed and permanent dentition. From the general ICDAS results, received from 10 selectively examined surfaces in primary teeth and 12 surfaces in permanent teeth, a summarized value for the general level of caries lesion distribution has been established. ICDAS shows a correlation between the amount of carious teeth, carious enamel surfaces, carious dentin surfaces, DMFT /dmft and DMFS/ dmfs in children with mixed dentition. In the 2017 study from ElSalhy M. and co-authors the index has similar tendencies in all tooth stages. These tendencies exist only in children with high caries lesion distribution, and the population of children, included in the study is a target group with high caries risk (ElSalhy M et al., 2017, 4).

The concept of minimal intervention in dental medicine was developed from scientists, researching the development of contemporary, adhesive restorative materials. There are studies that demineralized, but not cavitated enamel and dentin can be "cured". The operative method of treating caries lesions as well as the principle of "extension for prevention", suggested by G.V. Black, is no longer acceptable and doesn't find use in the operative technique (Tyas et al., 2011, 5).

A group of scientists, such as Ana Luiza de Souza et al. in 2014 develop a new instrument for more precise assessment of dental caries – Caries Assessment Spectrum and Treatment (CAST). The team of researchers determine the reproducibility of CAST in primary and permanent dentition, which conducts two epidemiological studies in Brasil, including two age groups of children 2-6 years and 6-9 years. Based on the study they proved that the reproducibility of CAST in primary teeth in 2-6 year olds is substantial. In mixed dentition 6-9 year-olds the CAST instrument is nearly perfect. In conclusion the researchers proved that the CAST instrument can be used in epidemiological studies, including these age groups of children (de Souza et al., 2014, 6).

Dental caries still has a high prevalence among children. Scientists, researching dental caries advise that if the process is diagnosed in an early stage, it can be treated with preventive, non-operative and minimally invasive methods. There is a variety of methods for early diagnostics. One of these methods is diagnostics with DIAGNOdent Pen. Panov VI. et al., 2014. Based on the conducted study, the conclusion is that the changes in the mineralization of the enamel of primary teeth can be diagnosed with DIAGNOdent (Panov et al., 2014, 7).

## AIM

Our research aims to conduct a clinical study of the prevalence of tooth decay in primary teeth.

## MATERIALS AND METHODS

### *Materials*

Subject of the study are 300 children ( $n=300$ ) from Varna, age 3-6 years old, distributed evenly in standartised age groups with equal amount of boys and girls. The criteria for inclusion are 3-4 year old, 5-6 year old healthy children, accompanied by their parents, without systematic, gingival and oral mucous diseases, with frequent visits to the dental office. A retrospective study was performed analysis, using medical cards of 300 children from 3 to 6-years-old in Varna, Bulgaria. Children were divided into (1-4) groups depending on age of first visit: 3-year-olds ( $n=50$ ), 4-year-olds ( $n=50$ ), 5-year-olds ( $n=100$ ), 6-year-olds ( $n=100$ ). Registration of all dental caries lesions was performed in clinical conditions, with implementation of the International Caries Detection and Assessment System (ICDAS) and DIAGNOdent Pen. The aim is to determine the amount of active and reversible caries lesions.

### *Methods*

Visually-diagnostic method, with dental mirror, light, water and air. Dental caries was determined at 2 thresholds: 1) all lesions (ICDAS 1-6) and cavitated lesions (ICDAS 3-6). The values of the initial caries were determined with DIAGNOdent Pen using laser fluorescence. The results were measured by teeth and surfaces. The children have detailed anamnesis and clinical status, with registered plaque index *OHI-S (Simplified) - J. C. Greene and J. R. Vermillion, 1964*. After detailed registration in the ambulatory cards, each of the smooth surfaces was polished and dried. Each smooth surface is examined- vestibular and oral-with visual, clinical methods, DIAGNOdent Pen, x-rays (intraoral-aproximal), Bite Wing x-rays. The values of each tooth and surface are registered. The data is achieved with clinical check ups. Each decayed (d), missing (m) and filled (f) tooth was registered with ICDAS 1-3. Non-cavitated lesions and enamel caries lesions (ICDAS 1-3) and dentin lesions (ICDAS 4-6) are examined. When determining dmft, non-cavitated lesions are included. For the registration of the oral status in children, an epidemiological card was used to evaluate the oral health status. It includes a short passport part, intraoral status, registration of the oral hygiene, evaluation of the caries risk, characteristics of the existing caries lesions (primary teeth and surfaces with/without caries lesions).

*Means of observation* - decayed, filled or extracted due to caries primary teeth/surfaces. The presence of one caries lesion – cavitated or non-cavitated

Observers: Doctors, specialists in pediatric dentistry

Tooth decay status: Tooth decay status of the children was diagnosed and registered according to teeth and surfaces with diagnostic threshold d1b.

*Diagnostic criteria*

Criteria for active caries lesions – d1a, d1b caries lesions under plaque, in predilection places, със with loss of shine and smoothness, loss of sharp borders; Criteria for stationary caries lesions - d1-2, lesions – with smooth surface, shine and sharp edges. Diagnostic scale: d1 – white enamel lesion, visible after drying; d2 – white enamel lesion, visible without drying; d3 – white enamel cavitated lesion; d4, d5 – dentin caries; d6 – dentin caries, that has reached the pulp. A – active (d1-3); NA – non-active (d1-3). Reversible caries lesions - (d1-3); Irreversible caries lesions- d4-6.

Differential diagnosis is carried out with non-carious lesions or: fluorosis, dysplasia hypomineralisata of the primary teeth, amelogenesis imperfecta hereditaria, enamel erosions of the enamel of primary teeth.

*Time and place of execution of the study*

The study is retrospective. Time of the study – 2015-2017.

Place of the study: The study is performed in:

- Faculty of Dental Medicine – Clinical dental office for Pediatric dentistry department, Varna
- University Medical dental center, Faculty of Dental Medicine – Varna.
- The study has a permission from the Ethics committee for scientific researches in Medical University Varna since 2015 and a written declaration of informed consent has been signed by the parents of every patient.

*Registration of the data*

Clinical cards, based on the World Health Organisation cards, are created for the registration of the data from the clinical research and oral-hygiene status. The registering of the values of the initial caries lesions is carried out with DIAGNOdent Pen, in order for the experiment to be precise. The three groups are standardized before the study. All children maintain oral hygiene two times a day – morning and evening. The children have three main meals and two intermediate meals with a snack and a fruit. The parents are given instructions to maintain oral hygiene two times a day and keep a dietary food regime without intermediate carbohydrate intakes. The check ups for the study are done by pediatric dentists. The results are measured by teeth and surfaces. Laser fluorescence diagnostics was applied and the results were measured with DIAGNOdent Pen.

*Activity and reversibility of the caries lesions*

Subject of observation: Dental caries.

Objects of observation: Children with high caries risk. The data was gathered after each check up and was registered in a specially devised Statistic card for people with dental caries, which is registered in an electronic table afterwards.

*Data Analysis*

Statistical methods: For a statistical analysis of the data a specialized packet STATISTICA 10.0. (StatSoft, Inc., STATISTICA Manual (Data analysis software system), Version 10.0, 2010) was used.

**RESULTS**

After a descriptive analysis we have gathered that the average frequency of dental caries in the age group 3-6 years-old is , It = 4,40 ± 0,21. The average frequency of dental caries in the different age groups shows, that the highest prevalence of dental caries is in 6 year olds (dmft = 5,10±0,32). For 3 year olds dmft = 2,80±0,25, for 4 year olds dmft = 3,00±0,21, for 5 year olds dmft = 4,30±0,29 (Table 1). The comparative analysis of the caries activity in the dentition shows that there is a significant difference between the caries activity in children with different tooth count (F = 27,48, p < 0,001). With biggest caries activity are children with 19 primary teeth (4,21), and with lowest – children with 20 primary teeth (1,74), (Figure 1, Table 2).

Table. 1. Dental caries lesions prevalence in primary teeth, dmft in 3-6 year-old children

Age in years	Persons	dmft $\bar{x} \pm S_x$	u	P
3	50	2,80±0,25	1,02	> 0,05
4	50	3,00±0,21	1,01	> 0,05
5	100	4,30±0,29	1,03	> 0,05
6	100	5,10±0,32	1,09	> 0,05
Total	300	4,40±0,21	1,15	> 0,05

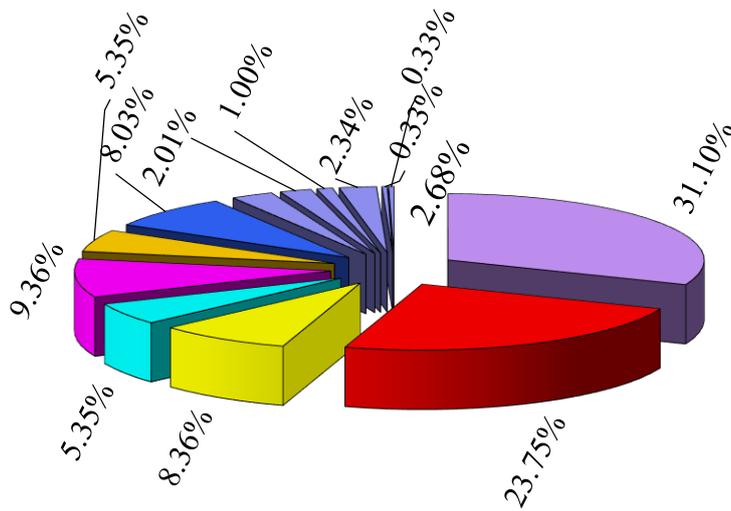


Fig. 1. Age dynamics of the dmft index with different diagnostic threshold – (d1-3). Count and relative share of dental caries by teeth

Table. 2. Age dynamics of the dmft index with different diagnostic threshold – (d1-3). Count and relative share of dental caries by teeth. Total count of caries lesions and dmft index

Total count of children	Intact teeth	1 decayed tooth	2 decayed teeth	3 decayed teeth	4 decayed teeth	5 decayed teeth	6 decayed teeth	7 decayed teeth	8 decayed teeth	9 decayed teeth	10 decayed teeth	11 decayed teeth	12 decayed teeth
Number of children	93	71	25	16	28	16	24	8	6	3	7	1	1
Percent %	31.10 %	23.75 %	8.36%	5.35%	9.36%	5.35%	8.03%	2.68%	2.01%	1.00%	2.34%	0.33%	0.33%

The dmft index shows the average count of teeth, affected by caries for one child. The hystogram shows the average count of teeth, affected by caries for different age groups. The total count of registered children is 300. With highest frequency are children with one caries lesion (n=71). There are children with more caries lesions, the sum of which is (10,11 and 12 decayed teeth), (Table 1). The different extent of diagnostics shows presence of reversible stages of caries process. There is sufficient potential for applying non-operative and preventive treatment in primary teeth. Diagnostics also shows the presence of cavitated and irreversible caries lesions, that require operative and invasive treatment with restorative techniques and materials. With the statistical analysis we have determined that the strong proportional relation between the number of decayed teeth and decayed surfaces ( $r=0,836$ ,  $p<0,001$ ), (Table 1 and 3).

Table. 3. Dental caries lesions prevalence in primary teeth based on surfaces, dfs for 3-6 year-old children

Age in years	Persons	dfs $\pm Sx$	u	P
3	50	3,80±0,98	1,02	> 0,05
4	50	4,40±0,61	0,51	> 0,05
5	100	6,58±0,79	0,83	> 0,05
6	100	8,08±0,55	0,79	> 0,05
Total	300	6,35±0,65	1,15	> 0,05

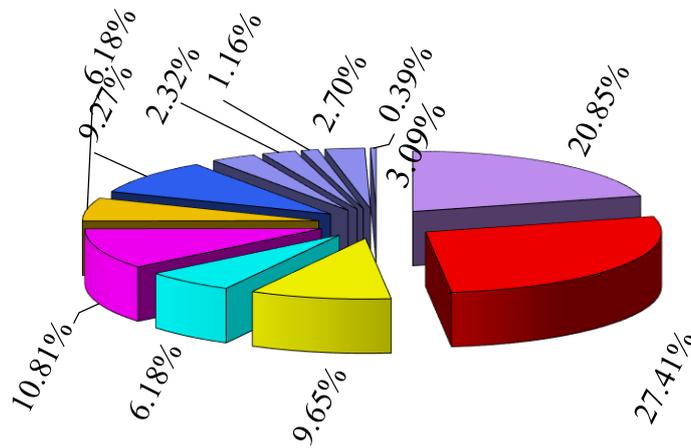


Fig. 2. Number and relative share of dental caries based on surfaces in 3-6 year-old children

Table. 4. Number and relative share of caries lesions based on surfaces. Total count of caries lesions and dfs index

Total number of children 300	Intact surfaces	[1-2] surfaces	[3-4] surfaces	[5-6] surfaces	[7-8] surfaces	[9-10] surfaces	[11-12] surfaces	[13-14] surfaces	[15-16] surfaces
Number of children	54	71	25	16	28	16	24	8	6
Percent%	18.06 %	23.75 %	8.36 %	5.35 %	9.36 %	5.35 %	8.03 %	2.68 %	2.01 %

Table 4 and Fig. 2 determines the average count of decayed surfaces in different age groups, as well as the percent of affected surfaces. The ratio doesn't vary significantly in the previous figure 1, (Table 2). The percent ratio of lesions is also determined. The results from the study of caries lesions on surfaces show, that caries lesions involving one or two surfaces prevail (23,75%). With highest frequency are caries lesions on several surfaces in primary teeth – 7,8 surfaces (9,36%), 11-12 surfaces (8,03%).

### DISCUSSION

In our study the results show, that with increase in age in children, there is an increase in the number of caries lesions. Every diagnostic threshold reveals a larger count of affected surfaces. The descriptive analysis shows, that the average frequency of caries lesions in the age group 3-6 year-olds is  $It = 4,40 \pm 0,21$ . The average frequency of dental caries for different age groups, shows that the highest prevalence is observed in 6 year-olds ( $dmft=5,10 \pm 0,32$ ). In primary teeth we can observe reversible stages of the caries process. All reversible lesions d1a, d1b, d2 can regress or become stationary, by lowering the accumulated pathology and maintaining exogenous fluoride prophylaxis, remineralizing therapy, dietary food regime and excellent oral hygiene with fluoride toothpaste, suitable for the age group.

In our study we have established a strong direct ratio relation between the number of decayed teeth and decayed surfaces ( $r = 0,836, p < 0,001$ ). The different degree of diagnostics shows the presence of reversible caries lesions d1a, d1b и d2. There is a sufficient potential for applying non-operative preventive treatment in primary teeth (Damyanova D et al., 2018, 2017, 2016, 8,9,10). Diagnostics show the presence of cavitated and irreversible caries lesions d3 and d4, which require operative treatment.

Doichinova L, Peneva M, achieve similar results in 2015 for the children in Sofia after doing a research. The authors conclude that the acquired results show the need for preventive treatment for improving the oral health of children in their researched region (Doichinova L et al., 2015, 11).

According to Klein H. and Palmer C. in 1938 the intensity of dental caries prevalence in children can be evaluated based on the index of the summation of the decayed, extracted (missing) and filled teeth and surfaces – DMF. Based on the results, a child can be placed in one of three risk groups – low caries risk, up to 2 DMFT (decayed, missing and filled teeth); medium caries risk, up to 4 DMFT and high caries risk – above 4 DMFT (Klein H, Palmer C, 1938, 12). The instrument of evaluation of the caries and parodontal disease risk is created in Bulgaria, in the department of Pediatric Dentistry, Faculty of Dental Medicine, Sofia by Rashkova M, Peneva M and Doychinova L, 2008. It is easy to use and a great help for pediatric

dentists, helping them improve early diagnostics and receive results in early treatment (Rashkova M, Peneva M, Doychinova L, 2008, 13).

In 2015 Doichinova L et al., conduct a study with patients 6-12 years old with carbohydrate intake as a risk factor. The research team from the Faculty of Dental Medicine, Sofia receive results that the children with high caries risk are highest percent  $n=54$  (54%) and prefer carbohydrate rich foods. They have the highest DMF(T+t)= 5,2. For the other children with medium caries risk  $n = 26$  (26%) и DMF(T+t) = 3,1 and for the children with low caries risk  $n = 20$  (20%) и DMF(T+t) = 1,8. The observed high levels of DMFT in 54% of the children is a logical result, based on the frequent intake of sweet foods and drinks for a long period of time, which increases the production of acids from the microorganisms in the plaque, which is a leading etiological factor for tooth decay development. Dentists use health promotion and education to control the intake of carbohydrates, as well as encourage non-cariogenic diets in order to improve the oral health status. (Doichinova L et al., 2015; Dimitrova-Haruel, 2004, 14, 15).

According to the World Health Organisation, the diet has a main role in the prevention of oral diseases, including caries lesions, tooth erosion, defects in development, oral mucosa pathology and periodontal diseases (Moynihan PJ, 2005, 16,17). Caries pathology is a combination of aesthetic and functional problems. The incidence and severity of the loss of height of the interdental papillae increases with age (Georgieva Ir et al, 2017, 18).

On the other hand, an effective method to prevent caries lesion development is consumption of water, containing fluoride, combined with lowering the intake of saccharose and lactose (Moynihan PJ, 2005,19). Nowadays the excessive intake of simple carbohydrates is a serious health issue, which has an unfavorable impact on the dental status (Moynihan P, Petersen PE, 2004, 20).

Dental caries is a painful, expensive to treat disease and it can have a harmful impact on the dentition (Dimova–Gabrovska M et al., 2016, Dimitrova D et al., 2018, 21, 22,23). Some of the authors, Belcheva A. and co-authors in 2014, use operative treatment for D<sub>3</sub> caries lesions in children 6-12 years old in Plovdiv, Bulgaria, creating cavity preparations with Er: YAG Laser and conventional burs (Belcheva A. et al, 2014, 24).

Granville-Garcia A.F. et al. in 2018 conduct a cross study, including 769 children in schools, located in northeastern Brasil. Among the parents and caregivers of the children, the low sense of coherence led to a worse way of life and oral health. For the children the psychological aspect didn't have an impact on their way of life and oral health. The researchers concluded that for both the parents and the children, toothache is an oral condition, which has a negative impact on the way of life and the oral health (Granville-Garcia A.F et al., 2018, 25).

Definitions of Terms Related to the Dental Caries Lesion- Caries Lesion (88%). Caries lesion is the clinical sign of caries. Caries lesions can be categorized according to their anatomical location on the tooth (coronal or root,cementum surface), their severity (non-cavitated, cavitated), depth of penetration into the tissue (in enamel, dentin, pulp), and their activity status (active, inactive), (26).

## CONCLUSION

There was a significant difference in the intensity of caries for children with different number of primary teeth in their dentition. There is a strong proportional relationship between the number of carious primary teeth and surfaces.

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# Anomalies In Teeth Development - Gemini Teeth And Fusion - Two Clinical Cases

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## ABSTRACT

Anomalies in tooth development are variations in the number, shape, size and structure of dental structures. First clinical case: A 6-year-old girl attends the Department of Pediatric Dental Medicine at the Faculty of Dental Medicine, Medical University of Varna for prophylactic examination. Intraoral examination revealed the presence of an unilaterally unusually large tooth in the region of the upper left central primary incisor of the upper jaw. A status localis intraoralis showed the presence of a twin primary tooth 61. Second clinical case: A 3-year-old girl attends a clinic at the Department of Pediatric Dental Medicine for a prophylactic examination, with complaints from parents that she has a larger and different primary tooth in her lower jaw to the right. The intraoral examination revealed the presence of an unilaterally unusually larger temporary tooth in the area of the lower right lateral incisor and the canine region. On clinical examination, the site strongly indicates a primary lateral incisor and canine fusion 82 and 83. Dental anomalies are a health and psychological problem for dental patients and parents. Fusion of teeth or fusions most often results in a reduced number of teeth in the tooth row. The fusion of teeth in our case is one-sided and affects the primary dentition.

**Keywords:** *gemini teeth, tooth fusion, anomalies*

## INTRODUCTION

Anomalies in tooth development are variations in the number, shape, size and structure of dental structures. The reasons may be entirely genetically predetermined, be the result of local or systemically acting environmental factors and ultimately a combination of these factors. Defects in shape are detected after the action of various etiological factors during the initiation, proliferation and morphodifferentiation of the dental embryo.

Twin teeth or dentes geminate are a defect that results from incomplete separation of the tooth bud, resulting in the formation of two partially or completely separated crowns with one common root. In cases where this separation is complete, this anomaly is called geminatio or double, which is the reason for the formation of supernumerary tooth. This supernumerary tooth is clinically seen as a smaller copy of its prototype.

The defects of the twin teeth and the fusion of the teeth (Fusio) occur with a lower incidence of primary tooth 0.5% - 1.6%, and at permanent 0.1% - 0.2%. It has been found that in 30-50% of cases of primary teeth the defect is also observed in permanent teeth. Upper and lower incisors are most commonly pathologically affected. Clinical dental gemination has the following options - minimal indentations on the cutting edge of apparently wide crowns to almost completely split into two parts clinical crowns. Similarly, the pulp chamber and the root canal of the tooth can be shared (inseparable) or separated and separate (1).

Knezevic A. et al. in 2002 published their research on twin and fusion teeth defects. The results of this study show that in a total of 3517 models studied, the incidence of twin teeth was 0.2%. Of these, 57.2% were fusion and 42.9% were diagnosed with dentes geminate or twin teeth (2).

Tooth fusion is defined as the fusion of two tooth buds, which results in the formation of a tooth with an irregular clinical crown shape. The defect is the result of persistence of the interdental lamina during the development of the dental germ. This is

caused by local factors or delayed disintegration of the interdental lamina. For fusion, genetic factors also have autosomal dominant inheritance with reduced penetration. Again, this pathology mainly affects the front teeth. When the fusion occurs at an early stage of development, it is found along the entire dental length of the crown and root. In these cases, a tooth of almost normal size is formed. However, if the fusion occurs later in histogenesis, the defect only affects the root, which has common dentin and cement. A single tooth is clinically established, but in average (statistically) calculated sizes, it is a larger tooth or is a tooth with a split crown.

According to Patil AA et al., 2014 (3), these types of anomalies, such as tooth fusion, can be one-sided or bilateral and may affect either of the two teeth, although primary dentition are more commonly affected. The incidence of this anomaly is 0.5% in the primary dentition and 0.1% in the permanent dentition (Kelly JR et al., 1978, 4).

Grafting of teeth or **dentes concreti** is a type of fusion for which it is different that the formed teeth only connect along the cement line. This defect could occur before or after a tooth eruption and is probably the result of local trauma, clumping of teeth or dislocation of dental germs during root formation. Dental pathology is rare in the clinic and it affects the upper second and third molars (1).

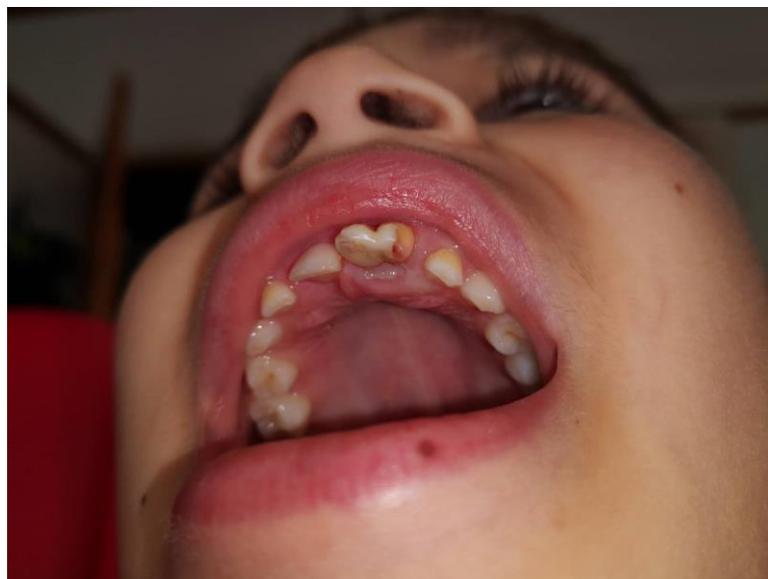
#### *Description of clinical cases*

##### *First clinical case*

A 6-year-old girl attends the Department of Pediatric Dental Medicine at the Faculty of Dental Medicine, Medical University of Varna for prophylactic examination. Parents' complaints are related to having a large tooth in their upper jaw. Her medical history concludes with clinical health. Intraoral examination revealed the presence of an unilaterally unusually large tooth in the region of the upper left central primary incisor of the upper jaw. A status localis intraoralis showed the presence of a twin primary tooth 61 (Fig. 1A and B). The deep labio-vestibular canal is related to the expanded medio-distal diameter of these teeth.



A



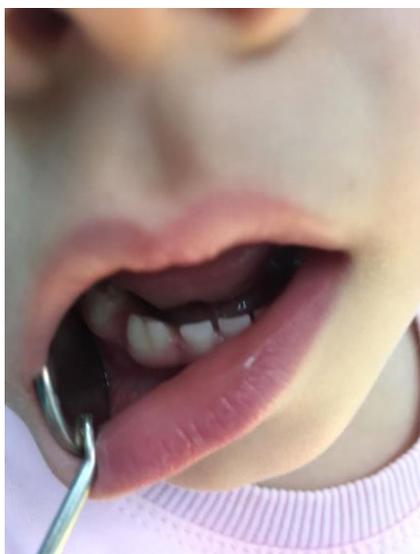
B

Fig. 1. *Dentes geminate of an upper central primary incisor - 61 tooth*

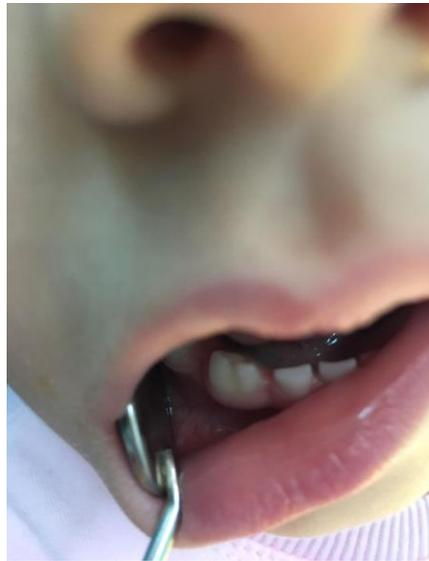
*Second clinical case*

A 3-year-old girl attends a clinic at the Department of Pediatric Dental Medicine for a prophylactic examination, with complaints from parents that she has a larger and different primary tooth in her lower jaw to the right. The patient's medical history was with the conclusion of clinical health. The intraoral examination revealed the presence of an unilaterally unusually larger temporary tooth in the area of the lower right lateral incisor and the canine region. On clinical examination, the site strongly indicates a primary lateral incisor and canine fusion 82 and 83 (Fig. 2. A and B).

The deep labio-lingual canal is connected to the enlarged teeth. Another pathology of tooth defects found by us is: Fusion of teeth or Fusio 82 and 83, (Fig. 2 A and B).



A



B

Fig. 2. Intraoral view showing lateral fusion of mandibular primary lateral incisor and canine - 82, 83 teeth

#### Discussion

Dental anomalies are a health and psychological problem for dental patients and parents. Changes in tooth shape and color lead to social isolation and low self-esteem for infants. Genetic research and the search for "defects" in genes can create a "comfort" for parents. Therefore, the dental specialist should theoretically and in clinical practice in these cases be well aware of the various defects in the construction of the teeth, delicately investigate and identify the causes of their occurrence and suggest clinical decisions for their treatment.

Dental geminations are found in both the primary and permanent dentition. They are the result of different degrees of invagination of the developing dental organ. The genetic factors that influence are likely to be similar to those affecting lamina dentis in patients diagnosed with hyperdontia.

According to Singh VP et al. (5) in a 2011 publication reports that fusion of teeth (fusio dentes, dentes confusi, dentes fusi, synodontia) is a rare developmental anomaly, which according to the Neville's classification of two dental anomalies (Neville BW et al., 2005, 6) is included in the tooth size anomalies. It is defined as the union of two separate tooth buds during odontogenesis, at a time when the crown is not yet mineralized and depending on the stage of development in which it occurs. Dental fusion may be complete or partial (Singh VP et al., 2011, 5). Dental fusion frequency also depends on race, gender, and location. According to the available literature, it ranges from 0.2 - 2.5% and is more common in primary dentition (7-13).

The fusion may occur between normal teeth or between normal and supernumerary teeth. In these cases, too, it is difficult to make a differential diagnosis between fusion and gemination. The fusion of permanent and supernumerary teeth occurs less frequently than the fusion between permanent teeth. Hachisuka, in his study, found that the incidence of fusion between permanent and supernumerary teeth was 0.1% and that this type of fusion usually included the anterior teeth of the upper jaw (Hachisuka Toshiya, Numerical analysis, 14,15).

The importance for the clinic is that a fusion in the primary dentition can lead to aplasia of the permanent tooth (1).

#### CONCLUSION / CLINICAL SIGNIFICANCE

1. Dental anomalies are a health and psychological problem for dental patients and parents.
2. Fusion of teeth or fusions most often results in a reduced number of teeth in the tooth row.
3. The fusion of teeth in our case is one-sided and affects the primary dentition.

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# Internet-Mediated Aids Denialism, Youth Exposure and Aids Beliefs: The Proselytizing Scenario

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**Abstract-** This paper deals with the problem of AIDS denialism mediated over the Internet in student communities in Nigeria. The Internet plays host to different shades of information and opinions. Since the suggestion of HIV as the cause of AIDS by Dr. Robert Gallo in the early 80s and the counter position by notable virologist, Dr Peter Duesberg, that HIV cannot cause AIDS, there have been issues around HIV & AIDS. One of such issues is AIDS denialism – the opinion held by some medical experts, professionals and organizations that HIV is not the cause of AIDS. Today, unlike years before, this opinion finds a free course on the Internet; with the potential for followership. This study, therefore, sought to determine whether Nigerian university students (classified in this study as youths) were exposed to Internet-mediated AIDS denialist arguments; and whether being exposed was a determinant influence on their AIDS beliefs. A survey was conducted among a sample of 398 university students drawn from five universities in southeast Nigeria. Findings show that exposure to AIDS denialism on the Internet was a major predictor of AIDS beliefs and response to HIV & AIDS communication among 30% (n=118) of the university students that were studied. Though no generalization, beyond the sample utilized, was intended, this figure was deemed significant enough to warrant broader studies along the line of the investigated theme, for wider generalizations.

**Index Terms-** AIDS Denialism, AIDS beliefs, denialist communications, AIDS Deniers, HIV & AIDS communication

## I. INTRODUCTION

The Internet medium offers the platform for the free course of information. Ideas and opinions that find their way on the Internet could be accessed by a little above 2.4 billion users worldwide. [1] A large percentage of these Internet users are youths. [2]

Nigeria has a population of over 160 million people, according to the 2006 national census, which is still extant data source. Youths below the age of 25 years, comprise one third of this population. Between year 2000 - 2012, Internet penetration in Nigeria grew from 0.06 percent to 34 percent. Presently, about 56 million Nigerians use the Internet, making Nigeria the largest market in Africa; and, the hope for the sustenance of this market lies in this large population of Internet users being youths. [3]

By implication, the foregoing statistics would suggest that the Nigerian youth is a prime market for the Internet. Youth exposure to the Internet could carry with it the potential consequence of these youths coming under the influence of negative materials like pornography, hate messages, doctrinaire messages or even the AIDS denialist ideas, which Smith and Novella [4] tell us are largely propagated through the Internet rather than scientific literature.

The consensus opinion held by the scientific community is that the Human Immuno-deficiency Virus (HIV) causes Acquired Immune Deficiency Syndrome (AIDS). [5] But AIDS denialists or deniers reject this “conventional wisdom”. AIDS denialism is mainly anchored on the belief that HIV does not cause AIDS. [6][7] Dr. Peter Duesberg, a notable AIDS “denialist”, had hypothesized from the outset of the AIDS crisis in 1987, that drugs used for recreational purposes such as alkyl nitrates (“poppers”) were the cause of AIDS and not HIV as was being widely promoted. [8] Furthermore, AIDS denialists hold the views that: HIV has not been scientifically isolated [9]; test for HIV is highly inaccurate [10]; malnutrition, recreational drugs and antiretroviral drugs indeed cause AIDS [11]; and that, AIDS is international conspiracy. [12]

Although AIDS denialism seems to have plateaued in the 80s and 90s, there is the view among AIDS researchers that the shadow of AIDS denialism still looms large – and the denialist message is still making some impact. [8]

## II. AIMS OF THE STUDY

The main aim of this study was to ascertain whether the youth members (the youth meant here are university students, between 16-30-plus years) of the Nigerian society, who are Netizens (individuals who spend a lot of time on the Internet) are exposed to AIDS denialism published on the Internet; and, if such exposure exerts a proselytizing effect on their AIDS beliefs. The study therefore sought answers to the following questions:

1. How accessible is the Internet to university students in Nigeria?
  2. Who among these students is a Netizen?
3. What number among these students regards Internet communications as credible?
4. Who among these students has come across AIDS denialist communications on the Internet?
4. Have their beliefs regarding HIV & AIDS been influenced in any way by exposure to, and acceptance of AIDS denialists' position?

Also, three research hypotheses were formulated for the study. These are:

**Research Hypothesis 1:** The university students in southeast Nigeria who own or have access to Internet-enabled PCs, laptops and phones are more likely to be Netizens.

**Research Hypothesis 2:** The university students in southeast Nigeria, who are Netizens, are more likely to be exposed to AIDS denialist communications on the Internet more than their colleagues who are occasional visitors on the web or non users of the Internet.

**Research Hypothesis 3:** The university students in southeast Nigeria, who are Netizens, and who perceive Internet communications as credible, are more likely to subscribe to the AIDS denialist position.

### III. METHOD

Our study was designed as a survey. A pre-coded 50-item questionnaire was used as the data collection instrument. These 50 items addressed variables directly related to the research questions and hypotheses that have been developed for the study. The survey questions were in regard to the respondents' ownership/access to Internet-enabled PCs, laptops and mobile phones; their status as Netizens; their perception of Internet materials; their exposure to Internet AIDS denialist communications; and their beliefs regarding HIV & AIDS.

Nigeria comprises six geopolitical zones: The Southeast; South-south; Southwest; North central; Northeast and Northwest. The study was purposefully set in Nigeria's southeast. The idea was to explore a regional situation which could serve as a basis for further studies in the other regions and beyond.

The population for this study comprises all university undergraduate students, numbering about 134,919 in five randomly selected universities in southeast Nigeria: Nnamdi Azikiwe University, Awka [35,646]; Abia State University Uturu [20,389]; Federal University of Technology Owerri [20,246]; Ebonyi State University, Abakaliki [23,437] and University of Nigeria, Nsukka [35,201]. These undergraduates, age 16-34, are classified as youth, and were purposively chosen because of their inclination towards using the Internet. A sample of 398 was drawn from the study population of 134,919, using Taro Yamane's formula for determining sample size:  $n = N / (1 + N(e)^2)$ .

The multi-stage sampling procedure was used to select 398 respondents, proportionally, from the study population of 134,919.

### IV. RESULTS

Our study had five specific objectives: 1) to establish Internet access among university students in southeast Nigeria; 2) to establish these student's 'Netizenship'; 3) to establish how credible these students deem Internet materials; 4) to establish who among these students is exposed to AIDS denialist communications on the Internet; 5) to establish these student's beliefs about HIV & AIDS. The five research questions posed in this study revolved around these objectives.

The gender distribution in our sample was 51 percent male and 49 percent female. More than half (58%) of the students surveyed were within the 22-27 age bracket. The remaining 40 percent fell within the 28-33 age bracket, while two percent abstained from indicating their age bracket. The majority of the students (82%) live on campus, while 18 percent live off campus.

#### 4.1 Analysis of Research Questions

The first research question of this study sought to determine how many among the undergraduate students in Southeast Nigeria own or have access to Internet-enabled PCs, laptops and mobile phones. Our findings are provided in Table 1.

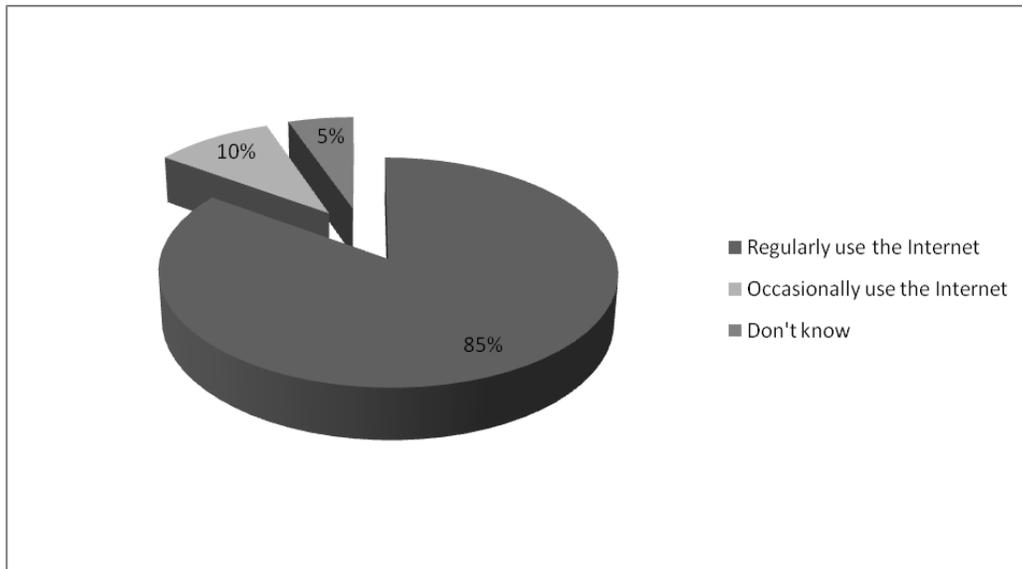
**Table 1: Respondents who own or have access to ICT devices**

Variables	Have access to PCs	Own/have access to laptops	Own mobile phones
Yes	92.1%	87.9%	99.2%

No	7.9%	12.1%	.8%
Total	100% (N=380)	100% (N=373)	100% (N=380)

On the average, over 90 percent of the respondents own ICT devices like PCs, Laptops and mobile phones. This led to the preliminary conclusion that a greater number among the undergraduate students studied own or have access to Internet-enabled PCs, laptops and mobile phones.

The second research question sought to know the Netizens among the respondents. The idea of establishing Netizenship was informed by the assumption that regular use of the Internet could predispose the students to chance upon volumes of information which might include denialist communications; than when they are occasional users or non users. Analysis of the respondents' use of the Internet, as shown in figure 1, indicates that over 85 percent regularly use the Internet; 10 percent occasionally while five percent were noncommittal.



**Figure 1: Respondents' frequency of Internet use**

Overall, our data suggest that more of the respondents regularly use the Internet. This is simply because they own or have access to Internet enabled devices. They could therefore be described as Netizens.

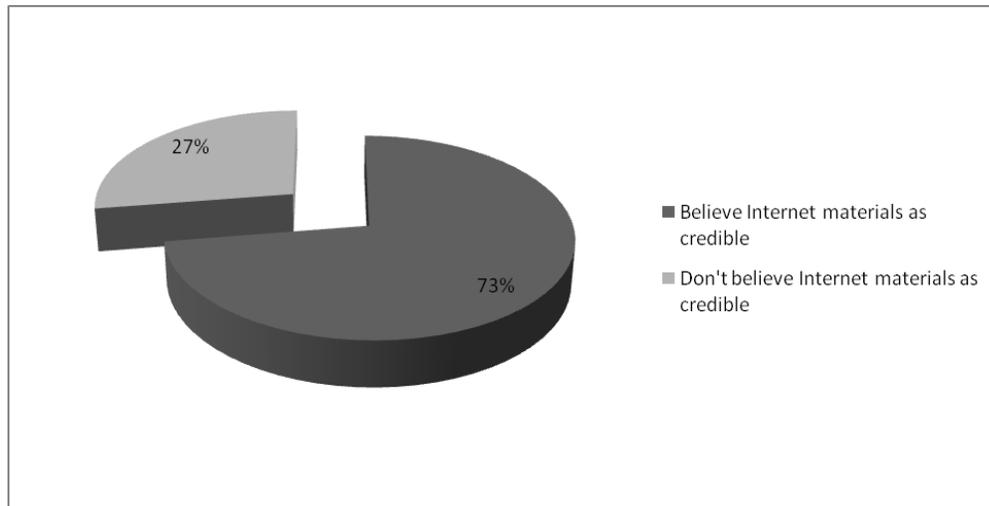
**Table 2: Respondents' main activities online**

S/N	Variab les	Send / receiv e e- mail via Intern et- enable d device s	Chat on <i>Yahoo Messen ger</i>	Chat on <i>Skyp e</i>	Communic ate on <i>Twitter</i>	Communic ate on <i>My Space</i>	Chat on <i>Face book</i>	Chat on <i>2Go</i>	Communic ate on <i>Yookos</i>	Engag e in bloggi ng	Own <i>YouTu be</i>	Comm ent on the Internet
1	Yes	90.8%	45.9%	28.9 %	58.4%	45.3%	86.8 %	83.2 %	9.5%	40.4%	35.8%	63%
2	No	8.9%	54.1%	71.1 %	41.6%	54.7%	12.9 %	16.8 %	90.5%	59.6%	64.2%	37%
Tot al	100%	100%	100%	100 %	100%	100%	100 %	100 %	100%	100%	100%	100%

	N=345	N=379	N=380									
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Table 2 shows the students’ main activities online. Our data reveal that a little above 90 percent of the respondents engaged mainly in the exchange of mails, whereas 80 percent and more dwelt on social networking via Face book and 2Go.

The third research question asked to know if Internet materials were perceived as credible by the respondents. The logic behind posing this question is to verify the value these students placed on materials from the Internet. Most times when people give the narrative of news events and the authenticity of their narrative are queried, usually, the frequent response is: “but I heard it on the radio” or “the ‘media’ carried it”. So, that’s what makes it authentic! It’s in this same spirit that we sought to establish the value students attached to Internet materials. If the perceive Internet materials generally as credible, then there is the likelihood that they could be influenced by denialist communications to question the HIV & AIDS conventions.



**Figure 2: Respondents’ perception of Internet materials**

Our findings, as shown in figure 2, show that 73 percent of the students perceive Internet materials as credible. These findings would suggest that, with this perception of Internet materials as credible, there is a veritable danger of these respondents being influenced by Internet materials such as denialist communications, which they could hold as credible.

The Fourth research question sought to ascertain if the respondents have come across denialist communications on the Internet.

**Table 3: Respondents’ exposure to AIDS denialist communication via the Internet**

S/N	Variables	Comments suggesting that HIV is not the cause of AIDS	Peter Duesberg’s comments	Review of the film <i>House of Numbers</i>	Review of the film <i>Dancing Naked on the Mindfield</i>	Visited <i>HealToronto.com</i> website	Visited <i>LewRockwell.com</i> website
1.	Yes	49.5%	37.5%	43.4%	48.4%	46.8%	40.3%
2.	No	50.5%	62.5%	56.6%	51.6%	52.2%	59.7%
Total		100% N=380	100% N=379	100% N=380	100% N=380	100% N=380	100% N=380

Findings from analysed data in Table 3 show that 40 percent of the respondents, on the average, were exposed to the various denialist communications. This suggests an appreciable level of exposure to AIDS denialism on the Internet. Also, findings reveal that about 40 percent of the respondents engage in blogging. This would suggest that exposure to AIDS denialism could occur during the process of blogging.

Research question five looked at the respondents’ beliefs vis-à-vis AIDS denialism.

**Table 4: Respondents' beliefs regarding HIV & AIDS**

S/N	Variables	HIV is not the cause of AIDS	HIV positive test is not reliable	AIDS is survivable	HIV is Western conspiracy to control Third World population	Antiretroviral drugs are poisonous and do more harm than good	AIDS is Western Conspiracy/ Profiteering
1.	True	27.1%	35.8%	25.5%	20.5%	40.9%	28.8%
2.	False	72.9%	64.2%	74.5%	79.5%	59.1%	71.2%
Total		100% N=380	100% N=380	100% N=380	100% N=380	100% N=379	100% N=378

Findings from analysed data in Table 4 show that, on the average, 30 percent of the respondents believe the various denialist communications. Since most of these respondents are exposed to AIDS denialist communication on the Internet, as established from analysed data, it could be said that this belief in AIDS denialist claims, might have been induced by exposure to such denialist claims. Implications abound for this development. One of such could be that HIV & AIDS campaigns against risky behaviour might not be taken seriously by individuals who subscribe to denialist claims, since the seriousness of the threat that the AIDS pandemic poses might seem a distant reality to them.

#### 4.2 Hypotheses Testing

The hypotheses developed for this study were statistically tested using Bivariate correlations and *Chi-square* tests. The aim was to establish if any relationship existed between the predictor variables and the dependent variables. The key hypothesis predicted that the university students in southeast Nigeria, who are Netizens, are more likely to be exposed to AIDS denialist communication on the Internet more than their colleagues who are occasional visitors or non users. The major premise of this study was anchored on this thesis.

The first hypothesis formulated for this study states that:

The university students in southeast Nigeria, who own or have access to Internet-enabled PCs, laptops and phones are more likely to be Netizens.

This hypothesis might appear a given, but the essence of posing it and subsequently subjecting it to test is to establish, in an empirical sense, Internet usage in the sample studied; rather than banking on assumptions based on the idea that it is a “given” that students use the Internet.

**Table 5: Bivariate correlation matrix for ownership of Internet-enabled devices and Netizenship variables**

Variables	Frequency of sending and receiving e-mails through Internet-enabled mobile phones	Frequency of chatting on Yahoo Messenger	Frequency of sending and receiving e-mails through Internet-enabled PCs
Ownership of Internet-enabled Mobile phones	.121*	-	-
Ownership of Internet-enabled Laptops	-	.171**	-
Ownership of Internet-enabled PC	-	-	.164**

Correlation is significant at the 0.05 level (2-tailed)

\*\* . Correlation is significant at the 0.01 level (2-tailed).

The results of Bivariate Correlations show a statistically significant correlation between the respondents who owned Internet-enabled mobile phones and their frequency of sending and receiving e-mails through such phones ( $r=.121$ ). This correlation is significant at 0.05 level. Also, there was a statistically significant correlation at 0.01 level, between respondents who owned Internet-enabled laptops and the frequency of their chats through yahoo messenger ( $r=.171$ ). Similarly, the correlation ( $r=.164$ ) between respondents who owned PCs and their frequency of sending and receiving e-mails through PCs was statistically significant at 0.01 level.

These statistically significant readings resonate with analysed data which revealed that 80 percent of the respondents own Internet-enabled devices, like PCs, and laptops while 90 percent owned mobile phones. Also, these readings are in accord with the findings from analysed data which suggest that a little lower than 50 percent regularly go online.

Overall, results of statistical analyses would suggest that the undergraduate respondents own Internet-enabled ICT devices and this appears to predispose them to ‘reside’ online, as Netizens. Therefore, the findings of this study support the first hypothesis. The second hypothesis of this study states that:

The university students in southeast Nigeria, who are Netizens, are more likely to be exposed to AIDS denialist communications on the Internet more than their colleagues who are occasional visitors on the web or non users of the Internet.

Results from the cross tabulation of frequency of Internet use (Netizenship) variables and exposure variables show significant relationships. These are depicted in contingency Tables 6-13.

**Table 6: Relationship between the tendency to post comments on the Internet and exposure to Internet-based reviews of the film, *House of Numbers***

Variables	Exposure to Internet-based reviews of the film, <i>House of Numbers</i>		Total
	No	Yes	
Tendency to post comments on the Internet			
Regularly	11.1%	9.7%	20.9%
Occasionally	22.6%	21.4%	44.0%
Don't Know	23.1%	12.0%	35.1%
Total	56.8%	43.2%	100.0% N=(359)

$\chi^2=6.567;df 2;p<.0.03$

**Table 7: Relationship between the tendency to post comments on the Internet and visit to the website *Healtoronto.com***

Variables		Visit to the website <i>Healtoronto.com</i>		Total
		No	Yes	
Tendency to post comments on the Internet	Regularly	9.7%	11.1%	20.9%
	Occasionally	21.2%	22.8%	44.0%
	Don't Know	22.6%	12.5%	35.1%
Total		53.5%	46.5%	100.0% N=(359)

$\chi^2=9.150;df 2;p<.0.01$

**Table 8: Relationship between the tendency to exchange communications on YouTube and exposure to Internet-based reviews of the film, *House of Numbers***

Variables		Exposure to Internet-based reviews of the film, <i>House of Numbers</i>		Total
		No	Yes	
Tendency to exchange communications on <i>YouTube</i>	Regularly	5.4%	4.5%	9.9%
	Occasionally	12.5%	14.7%	27.2%
	Don't Know	38.2%	24.6%	62.9%
Total		56.1%	43.9%	100.0% N=(353)

X=6.156;df 2;p<.0.04

**Table 9: Relationship between the tendency to exchange communications on My Space and exposure to comments suggesting that HIV is not the cause of AIDS**

Variables	Exposure to comments suggesting that HIV is not the cause of AIDS		Total	
	No	Yes		
Tendency to exchange communications on <i>My Space</i>	Regularly	6.5%	7.5%	14.0%
	Occasionally	17.4%	21.8%	39.3%
	Don't Know	28.0%	18.1%	46.1%
Total	52.3%	47.7%	100.0% N= (321)	

X=7.991;df 3;p<.0.04

**Table 10: Relationship between the tendency to exchange communications on Twitter and exposure to comments suggesting that HIV is not the cause of AIDS**

Variables	Exposure to comments suggesting that HIV is not the cause of AIDS		Total	
	No	Yes		
Tendency to exchange communications on <i>Twitter</i>	Regularly	7.3%	10.4%	17.7%
	Occasionally	14.3%	15.5%	29.9%
	Don't Know	30.5%	22.0%	52.4%
Total	52.1%	47.9%	100.0% N=(328)	

X=5.859; df 2;p<.0.05

**Table 11: Relationship between the tendency to exchange communications on Twitter and exposure to Internet-based reviews of the film, House of Numbers**

Variable	Exposure to Internet-based reviews of the film, <i>House of Numbers</i>		Total	
	No	Yes		
Tendency to exchange communications on <i>Twitter</i>	Regularly	9.5%	8.2%	17.7%
	Occasionally	13.7%	16.2%	29.9%
	Don't Know	33.5%	18.9%	52.4%
Total	56.7%	43.3%	100.0% N=(328)	

X=8.576;df 2; p<0.01

**Table 12: Relationship between the tendency to exchange communications on Twitter and exposure to the reviews of the film, *Dancing Naked on the Mindfield*.**

Variable	Exposure to Internet-based reviews of the film, <i>Dancing Naked on the Mindfield</i>		Total
	No	Yes	
Tendency to exchange communications on <i>Twitter</i>	Regularly	7.0%	10.7%
	Occasionally	12.8%	17.1%
	Don't Know	31.4%	21.0%
Total	168	160	100% (N=328)
	51.2%	48.8%	

X=11.015;df 2;p<.004

**Table 13: Relationship between the tendency to exchange communications on Twitter and visiting the website *HealToronto.com***

Variable	Visit to the Website <i>HealToronto.com</i>		Total
	No	Yes	
Tendency to exchange communications on <i>Twitter</i>	Regularly	6.7%	11.0%
	Occasionally	14.0%	15.9%
	Don't Know	32.6%	19.8%
Total	53.4%	46.6%	100% (N=328)

X=122.583;df 2; p<.002

There was a significant relationship at .03 level between the tendency to post comments on the Internet and the chance of exposure to the review of the film, *House of Numbers* (Table 6). The import of this relationship suggests that those respondents who post comments could be eager to read comments and therefore are predisposed to read reviews such as those on *House of Numbers*.

Table 7 shows that the relationship between the respondents' tendency to post comments on the Web and visiting the website *HealToronto.com* was significant at 0.01 level. The picture here is that posting comments has something to do with visiting websites. Since the respondents claim to post comments more or less regularly or occasionally, it appears a possibility that they could chance upon the denialist website, *HealToronto.com*.

The relationship between the respondents exchanging communications on *YouTube* and their chancing upon the review of the film, *House of Numbers* was significant at 0.04 level (Table 8). The reviews of *House of Numbers*, which is meant for the Cyber community, usually come in form of *YouTube* video communications. It would therefore not come as a surprise that those respondents who more often than not communicate on *YouTube*, could come across reviews of *House of Numbers*.

Table 9 presents data suggesting a significant relationship between the tendency to exchange communications on *My Space* and the possibility of stumbling on comments suggesting that HIV is not the cause of AIDS. This relationship is significant at 0.04 level. The implication of this significance could be that more about HIV and AIDS are usually discussed on *My Space* by participants. Therefore, those respondents logging on to *My Space*, almost always, stand the chance of coming in contact with some form of AIDS denialist communication.

There was a significant relationship, at 0.05 level, between the tendency to exchange communications on *Twitter* and the possibility of coming across comments suggesting that HIV is not the cause of AIDS (Table 10). A little above 45 percent of the respondents, who either regularly or occasionally twitted, found themselves exposed to comments suggesting that HIV is not the cause of AIDS. AIDS denialists could be using all available space in cyberspace to try to get their message through; this could be why denialist communications are on twitter, making those who twitted liable to being exposed to such communication.

Table 11 reveals a statistically significant relationship between exchanging communications on *Twitter* and coming in contact with the reviews of the film, *House of Numbers*. This significance is at 0.01 level. Here, tweets on the review of *House of Numbers* could be the reason why those respondents who exposed themselves to reviews of *House of Numbers* did so.

The relationship between the tendency to communicate through *Twitter* and the possibility of being exposed to the review of the film, *Dancing Naked on the Mindfield* was statistically significant at .004 level (Table 12). It could be that tweets of the reviews of the film, *Dancing Naked on the Mindfield* were largely responsible for the exposure of the respondents to this denialist communication. This appears a possibility, particularly, with those respondents who are Netizens.

statistically significant relationship at .002 level, between the tendency among the respondents to communicate via *Twitter* and their visiting *HealToronto.com* website, was established (Table 13). Here, again, tweets from the hosts of this denialist website could be responsible for the inclination of those respondents, who often communicated on twitter, visiting this website.

Overall, these chi-square tests show significant relationships between the Netizenship variables and exposure to Internet mediated AIDS denialist communications variables at  $p < 0.03$ ,  $p < 0.01$ ,  $p < 0.004$ ,  $p < 0.04$ ,  $p < 0.05$ ,  $p < 0.01$ ,  $p < 0.004$  and  $p < 0.002$ . Our findings, therefore, support the second hypothesis

third hypothesis sought to statistically test the likelihood that the Internet usage among the respondents and their perception of Internet sources as credible, could lead to their subscribing to the AIDS denialist position.

In line with the foregoing, the third hypothesis states that:

The university students in southeast Nigeria, who are Netizens, and who perceive Internet communications as credible, are more likely to subscribe to the AIDS denialist position.

**Table 14: Bivariate correlation matrix for respondents' perception of the credibility of Internet materials and beliefs about HIV and AIDS vis-à-vis AIDS denialism**

Variables	Respondents who would be readily opinionated based on exposure to "enlightening" materials on the Internet	Respondents who believe that HIV is not the cause of AIDS	Respondents who believe that HIV Positive test is not reliable	Respondents who believe that AIDS is survivable	Respondents who believe that HIV is conspiracy by Western Powers to control Third World population	Respondents who believe that antiretroviral drugs are poisonous and do more harm than good	Respondents who believe that AIDS is simply Western profiteering
Respondents who think Internet sources are credible	.211**	.043	-.033	-.100	.021	-.044	-.029

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Table 14 presents bivariate correlations suggesting a statistically significant correlation between the respondents' perception of Internet materials as credible and the inclination to be opinionated based on "enlightening" materials from the Internet ( $r = .211$ ). This correlation is statistically significant at 0.01 level.

Juxtaposing this result with earlier findings, it would appear that those respondents, who are Netizens, are more inclined to perceive Internet materials as credible. And, this inclination could predispose them to be readily opinionated in line with the AIDS denialist communications they are exposed to. In the light of this, the findings of our study support the third hypothesis.

## V. CONCLUSION

Data obtained from 398 university students spread across five universities in southeast, Nigeria, show that over 40 percent of the respondents are Netizens by virtue of the regularity of their online activities. Also, 40 percent of the respondents, on the average, are exposed to AIDS denialist communication on the Internet. About 30 percent of the respondents, on the average, believe the denialists' lines about HIV and AIDS. This leads to the conclusion that Netizenship could predispose individuals to being exposed to AIDS denialist communication. Also, exposure to such denialist lines could have a potential proselytizing effect on Netizens' beliefs about HIV & AIDS.

These generalizations are limited to the sample studied. It is our belief that further studies could lend a confirmatory weight to this study whereby wider generalizations would become applicable.

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# Analysis of heavy metals concentration in different media of Iwofe Creek, Niger Delta, Nigeria

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## ABSTRACT

This study investigated heavy metals concentration in *Penaeus monodon*, surface water and sediment for six months in Iwofe creek, in Niger Delta, Nigeria. Samples were collected from three stations and were analyzed for lead (Pb), chromium (Cr), cobalt (Co), Zinc (Zn), copper (Cu) and nickel (Ni) use of atomic absorption spectrophotometer. The results showed the level of heavy metal concentrations in *P. monodon*, surface water and sediment. From the results, lead, chromium and copper recorded the least concentrations across the three media (fish, sediment and surface water). Cobalt recorded the highest concentration for all test media followed by nickel and zinc. No significant difference ( $p > 0.05$ ) was observed across the test media (*P. monodon*, sediment and the surface water) for the six months of study. Monthly changes in surface water physico-chemical parameters were also analyzed during the study period; January 2018 to June 2018. Physico-chemical parameters analyzed for surface water were Temperature ( $^{\circ}\text{C}$ ), pH, Dissolved Oxygen (mg/l), Total Suspended Solid (ppt) and Salinity (ppt). The highest concentration of the physico-chemical parameters was observed in the dry season (January to March 2018) and lower concentrations were observed in the rainy season (April to June 2018). The fluctuating levels were found throughout the year. The Physico-chemical parameters of the water were compared with Department of Petroleum Resource (DPR, 2002) and Federal Environmental Protection Agency (FEPA, 2003) standards and all the values were within the permissible limit. To reduce and avoid aquatic biota loss, there is need to monitor and minimize heavy metals generation and discharge into the aquatic environment by applying relevant regulatory control measures. It is therefore recommended that the Federal Ministry of Environment and other relevant regulatory agencies in Nigeria ensure regular monitoring of the aquatic resources and provide a proper management control to indiscriminate discharge and effluence in to the aquatic environment.

**Keywords:** Heavy Metals, *Penaeus monodon*, Sediment, Surface Water and Iwofe Creek.

## INTRODUCTION

Water pollution is the introduction of contaminant by physical, chemical, disease causing microbial agents or radioactive agents to the natural water body (Ghosh and Singh, 2005). The introduction of these contaminant into the environment is called Pollution (Obasohan and Eguavoen, 2008). According Oluyemi *et al.* (2008) it has become more challenging to maintain the quality of the aquatic ecosystem. There are pollutants that naturally enter the River system e.g. natural fires, volcanoes and oil seeps etc (Hossain *et al.* 2012).

Clearly the preceding definitions and descriptions of water pollution is highly indicative of it is a common phenomenon, especially in areas where surface waters, such as rivers, streams, lake and brackish/coastal waters are exposed to anthropogenic activities. The coastal and brackish water environment is usually known by large industrial settlements and urban areas by impact of effluent discharge which causes accumulation of heavy metal (Ogbonna *et al.*, 2009). The brackish water environment is been endangered by discharges of untreated wastes and industrial effluents (Nenibarini, 2004). This eventually causes harm to the sustainability of the living resources and public health. The waste transports high level of toxicants, especially the heavy metals which have the ability to accumulate in the basic food chain and also move up to the higher trophic level Nagajyoti *et al.*, 2010). Heavy metals are important

environmental pollutants and their toxicity is a challenge because of the ecological, nutritional, environmental and evolutionary effects (Jaishankar *et al.*, 2014).

Water pollution affects rivers, oceans, lakes and drinking water for humans and some sources of water pollution include marine dumping, industrial waste, atmospheric deposition, underground storage leakages, eutrophication and global warming (Espinoza-Quiñones *et al.*, 2012). The direct contaminants that bring about pollution in water are pathogens, wide spectrum of chemicals and physical or sensory changes e.g. increased temperature and water discolouration (Maduka *et al.*, 2008).

Marine pollution is a principal problem in the world today (Useh *et al.*, 2015). Activities of human and industries have caused various discharge of pollutants into the marine environment endangering the health of the population and destroying the quality of the environment by making the water bodies unfit for human use (Abowei and Sikoki, 2005). Pollution in marine environment has a wide array of implications for human health. Most sea food, particularly fish can get contaminated and affected humans when they are consumed. Also, use of marine water resources for recreation could pose serious health hazards as a result of pollutants effects.

The main entry routes of toxic substances into the surface water are normally via point source, industrial discharges and run-offs (Aghoghovwia, 2008). Niger Delta is the key zone for the extraordinary biodiversity on the conservation in Western coast of Africa (Nenibarini, 2004). According to Ogamba *et al.*, (2015), heavy metals go into the Niger Delta environment through anthropogenic activities. Mgbakor *et al.* (2011) listed some of the anthropogenic activities as industrial waste, chemical waste, mining. Others includes battery manufacturing, soldering, painting, refining, gasoline, electrical wiring, stained glass production and ceramic glazing (Srivastav *et al.*, 2013). Mgbakor *et al.* (2011) stated that these substances cause serious effects on biological processes in production of the coastal ecosystems. The careless discharge of liquid wastes of organic and inorganic forms affects the physico-chemical properties of water and further causes danger to the flora and fauna of the marine ecosystem and man (Subhashini and Selvi, 2019). The quality of a particular environment determines the kind of organisms that will be found in that environment (Vidali, 2001). Environmental experts from the UK, USA and Nigeria has rated the Niger Delta area as the highest oil-impacted environment and polluted region in the world (Ikelegbe, 2005).

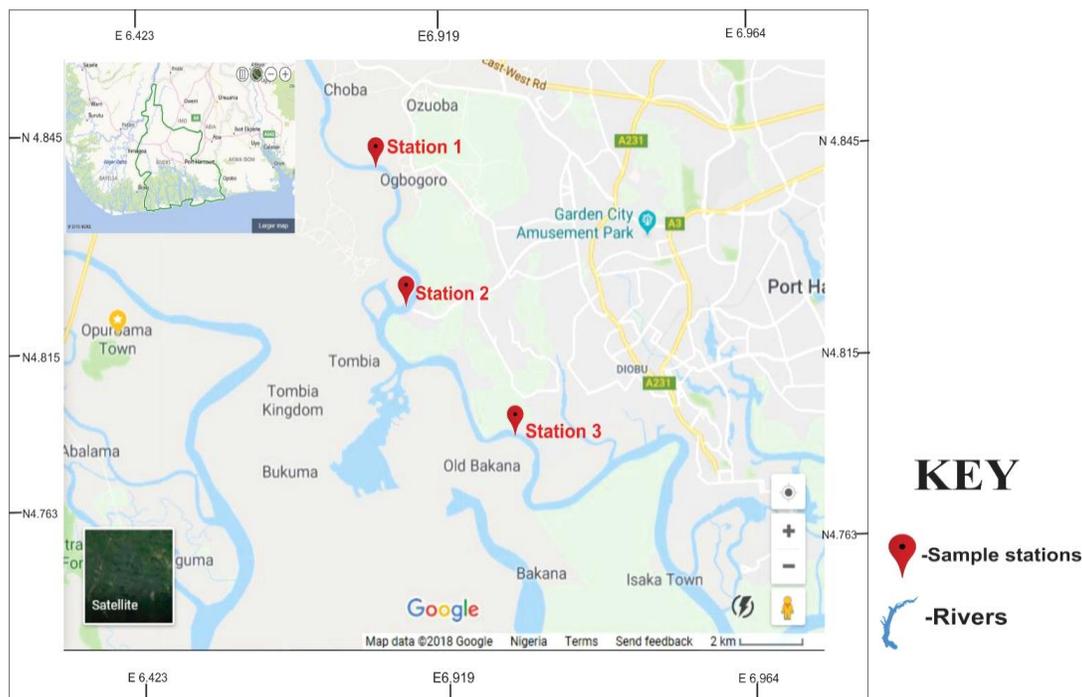
This status of the Niger Delta area as the highest oil impacted region in the world could be explained and justified by the high level of hydrocarbon activity exploration/exploitation and the very poor environmental control standards to control spills and other associated wastes released into the environment. Additionally, there are rampant acts of sabotage of oil installation facilities that leads to release of enormous amount of crude into the environment.

Similarly, as is typical of most oil producing areas of the Niger Delta region, the environment surrounding the study creek is highly urbanized and industrialized as part of the chain of water resources applied for the sprawling chain of crude oil and other natural resources facilities used for the exploitation in the region. The effluents discharge from human waste, pipeline leakage, accidental discharges, discharges from refineries and sabotage (illegal bunkering) loading activities may be detrimental to the quality of the creek. Therefore, this study shall help to provide scientific data/information on the current levels of heavy metals (Lead, Iron, Cadmium, Zinc and Copper) in *Penaeus monodon*, surface water and sediments of Iwofe Creek. Fishing is the major occupation of the populace of the area; recent interactions have resulted in complaints from the fishers of low catch due mainly to pollution of the aquatic body. It is expected therefore that through the results of this study, some of the effects on the aquatic environment, inhabitants of the community and the current level of pollution along Iwofe Creek and it's bio-resources in particular will be established and used as a basis to plan remediation and control policies and programmes.

## MATERIALS AND METHODS

### Study Area Description

The study was carried out in Rumuolumeni community area of Obio/Akpor Local Government Area, Rivers State, Nigeria. The study area is located between latitude  $4.8^{\circ}$  N and longitude  $6.9^{\circ}$  E and has a very busy human and automobile traffic in its surrounding neighborhoods. The creek connects Tombia waterside, another populated area in Rivers State. The major land mark intersections through which the creek could be accessed include Whimpey junction, Aker/Okocha Road, Eagle Cement Factory road and Ignatius Ajuru University of Education. Fishing has been the traditional occupation of the locals. The climate of the area is typically tropical, with a clearly distinct rainy period between April and October. This results in enormous fluctuation in the water levels and other physio-chemical parameters of the river. Contrary to the conventional trend and notion that there is always an increase in water levels in all water bodies during rainy season; Iwofe creek exhibit some contrary characteristics. It exhibits a reduction in its water level during rainy season. The reason for this trend is that the creek is located within a valley, so when the rainfalls, the runoffs that flows into the creek generates large quantities of sand and directly into the creek, thus reducing the water depth and volume during the rainy season. There are several anthropogenic activities in the area with several oil serving companies, open local markets where different produce are sold including firewood, banana, fish etc. Other uses that the water is put into direct use for include swimming, transportation and fishing depending on the time.



**Figure 1: Map Showing the study Area along the Iwofe Creek in Rivers state.**

### Sampling Techniques

Sampling was carried out once a month for six months (January-June 2018) according to the Bonny tide table for six months using a composite sampling technique. The sampling stations were at least 1,000 meters apart along the Iwofe creek in Rivers State. The sampling locations were geo-referenced and purposely selected to cover areas of the river receiving effluents and wastes from different anthropogenic activities of the area. Figure 1 shows the map of the study area.

A composite sampling technique was used in the three sample stations along the creek. The sediments were collected using an 'Ekman grab' sampler, while the surface water samples were collected in pre-cleaned high-density Schott glass bottles and the swimming crabs were collected from the local fishermen and stored in an ice pack to maintain the freshness and later transported to the <http://dx.doi.org/10.29322/IJSRP.10.04.2020.p10007> [www.ijssrp.org](http://www.ijssrp.org)

laboratory. The different sampled media of the Iwofe creek for which heavy metals (Lead (Pb), Chromium (Cr), Cobalt (Co), Zinc (Zn), Copper (Cu) and Nickel (Ni)) were analyzed using standard laboratory procedures include surface water, sediment and Giant tiger prawn (*Penaeus monodon*) (Plates 1 to 4).

The sampling stations are shown in figure 1 above. A total of three stations were chosen and were at least 1000 meters apart along the Iwofe creek. Based on the peculiarities and features observed around the study area of this creek, three sampling stations were selected within the creek to reflect different activities in the areas: Station I, Station II and Station III (Plate 1,2,3 and 4). Samples collected for analysis include water, sediment and biota. All sites were geo-referenced using a handheld global positioning system (GPS) receiver unit (Magellan GPS 315) to generate geographic coordinates (longitudes and latitudes) of the sampling area.

A comparative analysis of the levels of these three metals in water, sediment and tiger prawn was carried out to determine the extent of heavy metal concentrations in them using the Atomic Absorption Spectrophotometric Machine (API-RP 45).



Plates 1:

Showing station I (Midstream)

Plates 2: Showing station II (Downstream)



Plates 3: Showing station III: (Upstream)

Plates 4: Showing the giant tiger prawn (*Penaeus monodon*)

## RESULTS

### Physicochemical Parameters

The mean values of the physicochemical parameters are presented in table 1 to table 6 and Figure 2. The month of March ( $29.2 \pm 0.00^\circ\text{C}$ ) recorded the highest temperature and the least was observed in the month of June ( $26.9 \pm 0.00^\circ\text{C}$ ). Temperature across the stations showed little variation, ranging from  $26.9$ - $27.4^\circ\text{C}$  for the month of January. The result show that there was significant difference ( $P < 0.05$ ) between the stations and the months. The pH across the stations showed little variation and ranges from  $6.4$ - $7.2$  throughout the months. The result shows slight significant changes across the stations and the months. Although the pH values recorded ( $7.21 \pm 0.00$ ) were highest for the month of January and lowest ( $6.4 \pm 0.00$ ) for the month of June. The Dissolved Oxygen (mg/l) recorded for the stations showed little variation. The DO value recorded for the six months ranges between  $2.6$ - $5.3$ . The mean value for station 1 was  $4.90 \pm 0.00$ , station 2 was  $3.8 \pm 0.00$  and station 3 was  $4.3 \pm 0.00$ . There was significant difference ( $P < 0.05$ ) across the stations and the months. The salinity (ppt) recorded for the six months ranges between  $106$ - $197$  ppt. The result shows significant difference ( $P < 0.05$ ) between stations and months although station 1 ( $190.0 \pm 0.00$ ) recorded the highest value of salinity while station 2 ( $129.00 \pm 0.00$ ) recorded the least value across the months. Total Suspended Solid (TSS) varied across the stations and months. The TSS value ranges between  $107$ - $178$  ppt. The result shows significant difference ( $P < 0.05$ ) across the stations and months. Although March recorded ( $178.0 \pm 0.00$ ) the highest TSS while the least value ( $107 \pm 0.00$ ) was recorded in the month of January.

#### **Heavy Metal (mg/l) in Giant Tiger Prawn (*P. monodon*)**

Tables 7 shows the heavy metal concentrations in the Giant tiger prawn (*P. monodon*) sample from three stations along the Iwofe creek from January to June. The level of Lead was less than  $0.001 \pm 0.0$  mg/l across the three stations for the six months and there was no significant difference ( $p > 0.05$ ) observed between the stations and the months. The value for copper ranges between  $0.01$  mg/l to  $0.02$  mg/l across the three stations and months with no significant different ( $p > 0.05$ ) across the three stations and the month. Chromium value was  $0.01$  mg/l for all the stations and months and no significant different was observed ( $p > 0.05$ ) across the stations and months. Nickel ranges between  $0.105$  mg/l to  $0.210$  mg/l for the six months. With the highest value recorded in the months of January ( $0.156$  mg/l) and the least value in the month of May ( $0.81$  mg/l). There was significant difference ( $p < 0.05$ ) between the stations and across months. Cobalt showed variations between  $0.113$  mg/l to  $0.198$  mg/l. With the highest value of Cobalt recorded in the months of May ( $0.230$  mg/l) and the least value in the month of June ( $0.113$  mg/l). A significant difference ( $p < 0.05$ ) was observed between the stations and months. Zinc showed little significant difference ( $p < 0.05$ ) with values ranging between  $0.81$  to  $0.158$  mg/l for the stations across the months. The highest value ( $0.156$  mg/l) was observed in the month of January and the least ( $0.81$  mg/l) was in the month of May.

#### **Heavy Metal (mg/l) in the Sediment Sample**

Tables 8 shows the mean heavy metal concentrations in the Sediment sampled from three stations along the Iwofe creek from January to June. The mean value of lead recorded for the three station and six months were less than  $0.001 \pm 0.0$  mg/l and no significant difference ( $p > 0.05$ ) was observed between the stations and the months. Copper ranges from  $0.01$  mg/l to  $0.03$  mg/l across the three stations for the six months with no significant different ( $p > 0.05$ ) across the three stations for each month. Chromium value was  $0.01$  mg/l all through the stations for the six months and no significant different was observed ( $p > 0.05$ ). Nickel ranges between  $0.170$  mg/l to  $0.274$  mg/l for the six months. With the highest value recorded in the months of January ( $0.274$  mg/l) and the least value in the month of June ( $0.129$  mg/l). There was significant difference ( $p < 0.05$ ) between the stations and across months. Cobalt showed variations between  $0.121$  mg/l to  $0.256$  mg/l. With the highest value recorded in the months of March ( $0.256$  mg/l) and the least value in the month of February ( $0.121$  mg/l). A significant difference ( $p < 0.05$ ) was observed between the stations and the six months. The mean value of Zinc was significant difference ( $p < 0.05$ ) with the values ranging between  $0.001$  mg/l to  $0.288$  mg/l across the stations for the six months. The highest value ( $0.288$  mg/l) was observed in the month of January and the least ( $0.001$  mg/l) was observed across the other months.

### Heavy Metal (mg/l) in the Surface water Sample

The mean values of the heavy metal concentrations in the Surface water sampled from the three stations along the Iwofe creek from January to June can be seen in Table 9. Mean values recorded for lead in the three station for six months were less than  $0.001 \pm 0.0 \text{mg/l}$  and no significant difference ( $p > 0.05$ ) was observed between the stations and across the six months. The values recorded for Copper was  $0.001 \text{mg/l}$  across the three stations for the six months and no significant different ( $p > 0.05$ ) was observed across the three stations for all the months. Chromium values were  $0.001 \text{mg/l}$  across the stations for the six months and no significant different was also observed ( $p > 0.05$ ). the range of values for Nickel was between  $0.101 \text{mg/l}$  to  $0.249 \text{mg/l}$  for the six months. With the highest value recorded in the months of January ( $0.294 \text{mg/l}$ ) and the least value in the month of June ( $0.101 \text{mg/l}$ ). There was significant difference ( $p < 0.05$ ) between the stations and across the months. Cobalt values range from  $0.214 \text{mg/l}$  to  $0.292 \text{mg/l}$ . With the highest value recorded in the months of February ( $0.292 \text{mg/l}$ ) and the least value in the month of June ( $0.214 \text{mg/l}$ ). A significant difference ( $p < 0.05$ ) was observed between the stations and the six months. The values for Zinc across the stations for the six months were significant difference ( $p < 0.05$ ) with the values ranging between  $0.94 \text{mg/l}$  to  $0.170 \text{mg/l}$  across the stations for the six months. The highest value ( $0.170 \text{mg/l}$ ) was recorded in the month of January and the least ( $0.94 \text{mg/l}$ ) was observed in the months of April.

**Table 1. Variations in the Physico-Chemical Parameters of Iwofe Creek for January**

Parameter	Station 1	Station 2	Station 3	DPR (2002)	FEPA (2003)
Temp ( $^{\circ}\text{C}$ )	$27.20 \pm 0.00^a$	$26.9 \pm 0.00^b$	$27.4 \pm 0.01^a$	30	27.8/30
Ph	$7.21 \pm 0.02^a$	$6.81 \pm 0.00^a$	$6.83 \pm 0.00^a$	6-9	6.5-8.5
DO (mg/l)	$4.90 \pm 0.00^a$	$3.8 \pm 0.00^c$	$4.3 \pm 0.00^b$	20	-
TSS (ppt)	$139.3 \pm 0.01^b$	$107.4 \pm 0.00^a$	$162.0 \pm 0.00^c$	2000	1000/2000
Salinity (ppt)	$190.0 \pm 0.00^a$	$129.0 \pm 0.00^c$	$132.0 \pm 0.00^b$	-	-

\*At  $p > 0.05$

\*With same superscript there is no significant difference.

\*With different superscript there is a significant difference.

**Table 2. Variations in the Physico-Chemical Parameters of Iwofe Creek for February**

Parameter	Station 1	Station 2	Station 3	DPR (2002)	FEPA (2003)
Temp ( $^{\circ}\text{C}$ )	$28.1 \pm 0.00^a$	$27.6 \pm 0.00^b$	$27.1 \pm 0.01^b$	30	27.8/30
pH	$6.8 \pm 0.02^a$	$6.72 \pm 0.00^a$	$6.8 \pm 0.00^a$	6-9	6.5-8.5
DO (mg/l)	$5.3 \pm 0.00^a$	$4.7 \pm 0.00^b$	$4.8 \pm 0.00^b$	20	-
TSS (Ppt)	$168.7 \pm 0.01^a$	$159.5 \pm 0.00^b$	$122.4 \pm 0.00^c$	2000	1000/2000
Salinity (ppt)	$197.0 \pm 0.00^a$	$134.0 \pm 0.00^b$	$138.0 \pm 0.00^b$	-	-

\*At  $p > 0.05$

\*With same superscript there is no significant difference.

\*With different superscript there is a significant difference.

**Table 3. Variations in the Physico-Chemical Parameters of Iwofe Creek for March**

Parameter	Station 1	Station 2	Station 3	DPR (2002)	FEPA (2003)
Temp (°C)	29.2 ±0.00 <sup>a</sup>	28.7 ±0.00 <sup>a</sup>	28.1 ±0.00 <sup>b</sup>	30	27.8/30
pH	7.1±0.00 <sup>a</sup>	6.9 ±0.00 <sup>a</sup>	6.7 ± 0.00 <sup>a</sup>	6-9	6.5-8.5
DO (mg/l)	4.5 ±0.00 <sup>a</sup>	3.4 ±0.00 <sup>c</sup>	3.8 ±0.00 <sup>b</sup>	20	-
TSS (ppt)	178.5 ±0.00 <sup>a</sup>	127.4 ±0.00 <sup>c</sup>	162.0 ±0.0 <sup>b</sup>	2000	1000/2000
Salinity (ppt)	143.0 ±0.00 <sup>a</sup>	122.0 ±0.00 <sup>c</sup>	139.0 ±0.0 <sup>b</sup>	-	-

\*At p>0.05

\*With same superscript there is no significant difference.

\*With different superscript there is a significant difference.

**Table 4. Variations in the Physico-Chemical Parameters of Iwofe Creek for April**

Parameter	Station 1	Station 2	Station 3	DPR (2002)	FEPA (2003)
Temp (°C)	28.0 ±0.00 <sup>a</sup>	27.5 ±0.00 <sup>b</sup>	27.5 ±0.00 <sup>b</sup>	30	27.8/30
pH	6.6±0.00 <sup>a</sup>	6.8 ±0.00 <sup>b</sup>	6.6 ± 0.00 <sup>a</sup>	6-9	6.5-8.5
DO (mg/l)	3.1 ±0.00 <sup>b</sup>	4.1 ±0.00 <sup>a</sup>	3.2 ±0.00 <sup>b</sup>	20	-
TSS (ppt)	173.0 ±0.00 <sup>a</sup>	121.0 ±0.00 <sup>a</sup>	157.0±0.00 <sup>b</sup>	2000	1000/2000
Salinity (ppt)	113.0 ±0.00 <sup>b</sup>	132.0 ±0.00 <sup>a</sup>	138.0±0.00 <sup>a</sup>	-	-

\*At p>0.05

\*With same superscript there is no significant difference.

\*With different superscript there is a significant difference.

**Table 5. Variations in the Physico-Chemical Parameters of Iwofe Creek for May**

Parameter	Station 1	Station 2	Station 3	DPR (2002)	FEPA (2003)
Temp (°C)	27.0 ±0.00 <sup>a</sup>	26.5 ±0.00 <sup>b</sup>	26.8 ±0.00 <sup>b</sup>	30	27.8/30
pH	6.6±0.00 <sup>b</sup>	6.8 ±0.00 <sup>a</sup>	6.5 ± 0.00 <sup>b</sup>	6-9	6.5-8.5
DO (mg/l)	2.8 ±0.00 <sup>c</sup>	3.9 ±0.00 <sup>a</sup>	3.2 ±0.00 <sup>b</sup>	20	-
TSS (ppt)	169.0 ±0.00 <sup>a</sup>	119.0 ±0.00 <sup>c</sup>	152.0±0.00 <sup>b</sup>	2000	1000/2000
Salinity (ppt)	134.0 ±0.00 <sup>a</sup>	119.0 ±0.00 <sup>c</sup>	129.0±0.00 <sup>b</sup>	-	-

\*At p>0.05

\*With same superscript there is no significant difference.

\*With different superscript there is a significant difference

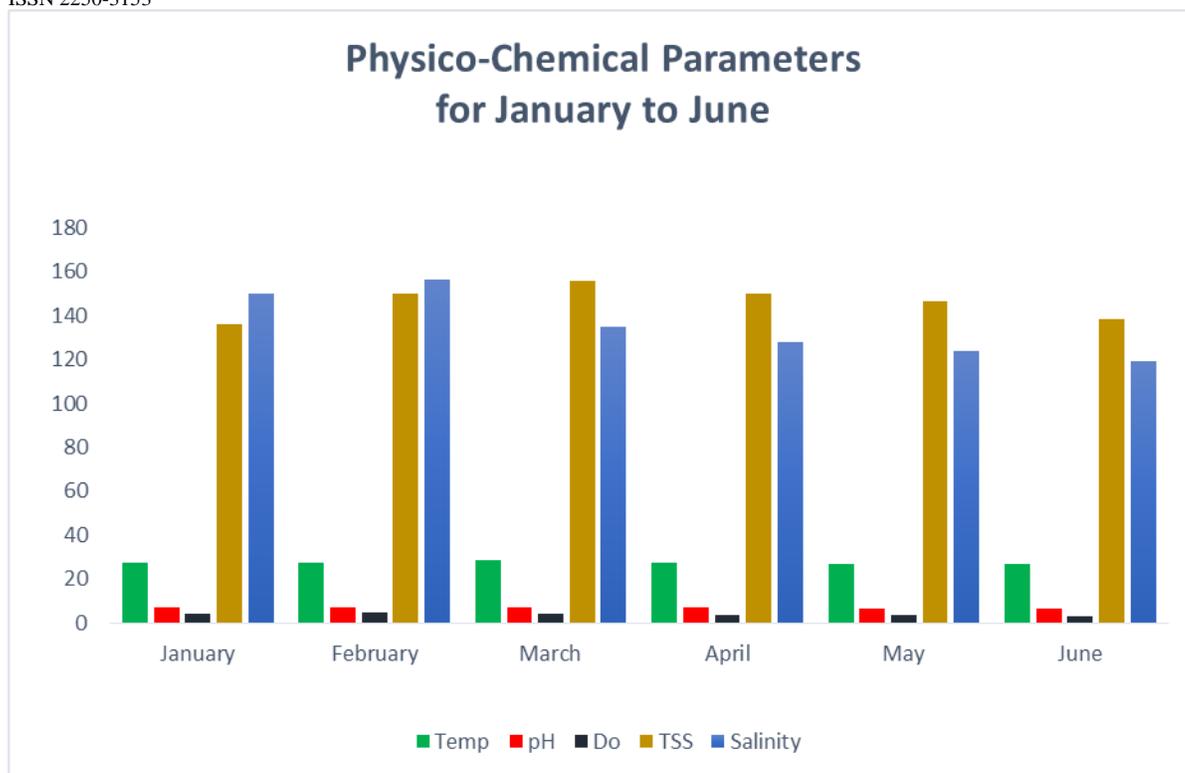
**Table 6. Variations in the Physico-Chemical Parameters of Iwofe Creek for June**

Parameter	Station 1	Station 2	Station 3	DPR (2002)	FEPA (2003)
Temp (°C)	27.4 ±0.00 <sup>a</sup>	26.3 ±0.00 <sup>b</sup>	26.5 ±0.00 <sup>b</sup>	30	27.8/30
pH	6.4±0.00 <sup>c</sup>	6.6 ±0.00 <sup>a</sup>	6.5 ± 0.00 <sup>b</sup>	6-9	6.5-8.5
DO (mg/l)	2.6 ±0.00 <sup>c</sup>	3.4 ±0.00 <sup>a</sup>	2.8 ±0.00 <sup>b</sup>	20	-
TSS (ppt)	156.0 ±0.00 <sup>a</sup>	114.0 ±0.00 <sup>c</sup>	145.0±0.00 <sup>b</sup>	2000	1000/2000
Salinity (ppt)	106.0 ±0.00 <sup>c</sup>	129.0 ±0.00 <sup>a</sup>	112.0±0.00 <sup>b</sup>	-	-

\*At p>0.05

\*With same superscript there is no significant difference.

\*With different superscript there is a significant difference



**Figure 2: The Physico-chemical parameters from January to June 2018**

**Table 7. Mean Concentrations of Heavy Metal (mg/l) in Giant Tiger Prawn (*P. monodon*) from Iwofe Creek from January to June 2018.**

Months	Metals	Station 1	Station 2	Station 3	SE	WHO (2011)	FEPA (2007)
January	Pb	0.001	0.001	0.001	0.00	0.01	Less than 1
	Cu	0.01	0.01	0.01	0.00	2.0	Less than 1
	Cr	0.001	0.001	0.001	0.00	0.05	Less than 1
	Ni	0.153	0.210	0.187	0.00	0.02	Less than 1
	Co	0.167	0.132	0.198	0.00	-	-
	Zn	0.156	0.102	0.114	0.00	3.0	Less than 1
February	Pb	0.001	0.001	0.001	0.00	0.01	Less than 1
	Cu	0.02	0.01	0.01	0.00	2.0	Less than 1
	Cr	0.001	0.001	0.001	0.00	0.05	Less than 1
	Ni	0.174	0.150	0.170	0.00	0.02	Less than 1
	Co	0.171	0.137	0.121	0.00	-	-
	Zn	0.134	0.92	0.106	0.00	3.0	Less than 1
March	Pb	0.001	0.01	0.001	0.00	0.01	Less than 1
	Cu	0.01	0.01	0.01	0.00	2.0	Less than 1
	Cr	0.001	0.001	0.001	0.00	0.05	Less than 1
	Ni	0.128	0.168	0.163	0.00	0.02	Less than 1
	Co	0.169	0.117	0.133	0.00	-	-
	Zn	0.171	0.102	0.132	0.00	3.0	Less than 1
April	Pb	0.001	0.001	0.001	0.00	0.01	Less than 1
	Cu	0.020	0.020	0.020	0.00	2.0	Less than 1
	Cr	0.001	0.001	0.001	0.00	0.05	Less than 1
	Ni	0.122	0.157	0.159	0.00	0.02	Less than 1
	Co	0.156	0.128	0.113	0.00	-	-
	Zn	0.128	0.84	0.098	0.00	3.0	Less than 1
May	Pb	0.001	0.001	0.001	0.00	0.01	Less than 1
	Cu	0.02	0.02	0.02	0.00	2.0	Less than 1
	Cr	0.001	0.001	0.001	0.00	0.05	Less than 1
	Ni	0.163	0.118	0.134	0.00	0.02	Less than 1
	Co	0.230	0.148	0.152	0.00	-	-
	Zn	0.142	0.081	0.123	0.00	3.0	Less than 1
June	Pb	0.001	0.001	0.001	0.00	0.01	Less than 1
	Cu	0.01	0.01	0.01	0.00	2.0	Less than 1
	Cr	0.001	0.001	0.001	0.00	0.05	Less than 1
	Ni	0.151	0.105	0.121	0.00	0.02	Less than 1
	Co	0.215	0.135	0.141	0.00	-	-
	Zn	0.131	0.069	0.109	0.00	3.0	Less than 1

**Table 8. Mean Concentrations of Heavy Metal (mg/l) in the Sediment from Iwofe Creek from January to June 2018.**

Months	Metals	Station 1	Station 2	Station 3	SE	WHO (2011)	FEPA (2007)
<b>January</b>	<b>Pb</b>	0.001	0.01	0.001	0.00	0.01	Less than 1
	<b>Cu</b>	0.030	0.030	0.030	0.00	2.0	Less than 1
	<b>Cr</b>	0.001	0.001	0.001	0.00	0.05	Less than 1
	<b>Ni</b>	0.170	0.235	0.274	0.00	0.02	Less than 1
	<b>Co</b>	0.160	0.243	0.238	0.00	-	-
	<b>Zn</b>	0.001	0.288	0.001	0.00	3.0	Less than 1
<b>February</b>	<b>Pb</b>	0.001	0.001	0.001	0.00	0.01	Less than 1
	<b>Cu</b>	0.02	0.01	0.01	0.00	2.0	Less than 1
	<b>Cr</b>	0.001	0.001	0.001	0.00	0.05	Less than 1
	<b>Ni</b>	0.174	0.150	0.170	0.00	0.02	Less than 1
	<b>Co</b>	0.171	0.137	0.121	0.00	-	-
	<b>Zn</b>	0.134	0.92	0.106	0.00	3.0	Less than 1
<b>March</b>	<b>Pb</b>	0.001	0.001	0.001	0.00	0.01	Less than 1
	<b>Cu</b>	0.050	0.030	0.040	0.00	2.0	Less than 1
	<b>Cr</b>	0.001	0.001	0.001	0.00	0.05	Less than 1
	<b>Ni</b>	0.141	0.191	0.210	0.00	0.02	Less than 1
	<b>Co</b>	0.238	0.156	0.230	0.00	-	-
	<b>Zn</b>	0.001	0.257	0.001	0.00	3.0	Less than 1
<b>April</b>	<b>Pb</b>	0.001	0.001	0.001	0.00	0.01	Less than 1
	<b>Cu</b>	0.040	0.030	0.030	0.00	2.0	Less than 1
	<b>Cr</b>	0.001	0.001	0.001	0.00	0.05	Less than 1
	<b>Ni</b>	0.190	0.138	0.187	0.00	0.02	Less than 1
	<b>Co</b>	0.232	0.152	0.200	0.00	-	-
	<b>Zn</b>	0.251	0.001	0.001	0.00	3.0	Less than 1
<b>May</b>	<b>Pb</b>	0.001	0.001	0.001	0.00	0.01	Less than 1
	<b>Cu</b>	0.04	0.040	0.040	0.00	2.0	Less than 1
	<b>Cr</b>	0.001	0.001	0.001	0.00	0.05	Less than 1
	<b>Ni</b>	0.183	0.132	0.184	0.00	0.02	Less than 1
	<b>Co</b>	0.228	0.148	0.196	0.00	-	-
	<b>Zn</b>	0.001	0.251	0.001	0.00	3.0	Less than 1
<b>June</b>	<b>Pb</b>	0.001	0.001	0.001	0.00	0.01	Less than 1
	<b>Cu</b>	0.02	0.020	0.020	0.00	2.0	Less than 1
	<b>Cr</b>	0.001	0.001	0.001	0.00	0.05	Less than 1
	<b>Ni</b>	0.169	0.126	0.171	0.00	0.02	Less than 1
	<b>Co</b>	0.215	0.135	0.174	0.00	-	-
	<b>Zn</b>	0.251	0.250	0.001	0.00	3.0	Less than 1

**Table 9. Mean Concentrations of Heavy Metal (mg/l) in Surface water from Iwofe Creek from January to June 2018.**

Months	Metals	Station 1	Station 2	Station 3	SE	WHO (2011)	FEPA (2007)
<b>January</b>	<b>Pb</b>	0.001	0.001	0.001	0.00	0.01	Less than 1
	<b>Cu</b>	0.001	0.001	0.001	0.00	2.0	Less than 1
	<b>Cr</b>	0.001	0.001	0.001	0.00	0.05	Less than 1
	<b>Ni</b>	0.172	0.249	0.191	0.00	0.02	Less than 1
	<b>Co</b>	0.286	0.220	0.237	0.00	-	-
	<b>Zn</b>	0.154	0.111	0.170	0.00	3.0	Less than 1
<b>February</b>	<b>Pb</b>	0.001	0.001	0.001	0.00	0.01	Less than 1
	<b>Cu</b>	0.001	0.001	0.001	0.00	2.0	Less than 1
	<b>Cr</b>	0.001	0.001	0.001	0.00	0.05	Less than 1
	<b>Ni</b>	0.176	0.230	0.160	0.00	0.02	Less than 1
	<b>Co</b>	0.242	0.270	0.292	0.00	-	-
	<b>Zn</b>	0.151	0.101	0.148	0.00	3.0	Less than 1
<b>March</b>	<b>Pb</b>	0.001	0.001	0.001	0.00	0.01	Less than 1
	<b>Cu</b>	0.001	0.001	0.001	0.00	2.0	Less than 1
	<b>Cr</b>	0.001	0.001	0.001	0.00	0.05	Less than 1
	<b>Ni</b>	0.172	0.121	0.140	0.00	0.02	Less than 1
	<b>Co</b>	0.264	0.239	0.289	0.00	-	-
	<b>Zn</b>	0.148	0.130	0.143	0.00	3.0	Less than 1
<b>April</b>	<b>Pb</b>	0.001	0.001	0.001	0.00	0.01	Less than 1
	<b>Cu</b>	0.001	0.001	0.001	0.00	2.0	Less than 1
	<b>Cr</b>	0.001	0.001	0.001	0.00	0.05	Less than 1
	<b>Ni</b>	0.169	0.112	0.118	0.00	0.02	Less than 1
	<b>Co</b>	0.282	0.233	0.259	0.00	-	-
	<b>Zn</b>	0.145	0.94	0.138	0.00	3.0	Less than 1
<b>May</b>	<b>Pb</b>	0.001	0.001	0.001	0.00	0.01	Less than 1
	<b>Cu</b>	0.001	0.001	0.001	0.00	2.0	Less than 1
	<b>Cr</b>	0.001	0.001	0.001	0.00	0.05	Less than 1
	<b>Ni</b>	0.163	0.113	0.116	0.00	0.02	Less than 1
	<b>Co</b>	0.278	0.229	0.253	0.00	-	-
	<b>Zn</b>	0.141	0.113	0.134	0.00	3.0	Less than 1
<b>June</b>	<b>Pb</b>	0.001	0.001	0.001	0.00	0.01	Less than 1
	<b>Cu</b>	0.001	0.001	0.001	0.00	2.0	Less than 1
	<b>Cr</b>	0.001	0.001	0.001	0.00	0.05	Less than 1
	<b>Ni</b>	0.152	0.101	0.108	0.00	0.02	Less than 1
	<b>Co</b>	0.265	0.214	0.252	0.00	-	-
	<b>Zn</b>	0.129	0.117	0.121	0.00	3.0	Less than 1

**DISCUSSIONS**

### **Physico-Chemical Parameters**

Samples collected from the different station from January to June 2019 are with the mean values and standard deviation of physico-chemical parameters of the Iwofe creek are represented in table 1 to 6 and figure 2 respectively. Physicochemical parameters of water are an indication of possible chemical reaction which determines the survival and growth of microorganisms in them varies according to the requirement of these organisms. The results of this study revealed that the mean values recorded for the different parameters across the stations for the six months were within stipulated standard limit of the Federal Environmental Protection Agency (FEPA) and Department of Resources (DPR) limits for substances discharge into water for domestic use in Nigeria (FEPA, 2003; DPR, 2002). A similar trend was reported by Usha (2015). High values were reported by Garg *et al.* (2006) and Nikam *et al.* (2011) in their study. The variation in the physico-chemical parameters of the water across the study duration could be due to decrease in water level or either due to increased number of carbonates and or photosynthetic activities by producers (Abubacker *et al.* 1996) or due to dilution of rain water. Similar result was also reported by Latha *et al.* (2010); Shinde *et al.* (2011).

### **Metals in The Different Media**

Heavy metals are environmental pollutants of major concern as they constitute hazardous substances, non-degradable and persistent with serious degradation on the aquatic ecosystem (Chinaiah and Digambar, 2011). The mean concentrations of Lead (Pb), Chromium (Cr), Cobalt (Co), Zinc (Zn), Copper (Cu) and Nickel (Ni) in the fish sample, sediment and surface water sampled from the different station from January to June 2019 of the Iwofe creek are represented in table 7, 8 and 9 respectively. From the results, lead, chromium and copper recorded the least concentrations across the three media (the fish, sediment and surface water). This could be attributed to report by Ogamba *et al.*, (2015) who said that different level of heavy metals go into the aquatic environment through different levels anthropogenic activities. Cobalt recorded the highest concentration for all test media followed by nickel and zinc. No significant different ( $p > 0.05$ ) was observed across the test media (*P. monodon*, sediment and the surface water) for the six months of study. This could be attributed to the interaction between the exposure time and the Physico-chemical parameters associated with the water body at that time (Odu *et al.*, 2013). The main entry routes of toxic substances into the surface water are normally via point source, and the concentration of cobalt could have been more from the industrial discharges and run-offs at that point (Aghoghovwia, 2008). Exposure to these environmental contaminants can lead to immunosuppression and increased susceptibility to disease in shell fish and other fin fish (Miller *et al.*, 2002). Although the level of these metal observed within the fish, sediment and surface water were within permissible limit for drinking purpose is 50 mg/l to 150 mg/l. Similar results were reported by Ajagekar *et al.* (2011) on upper reach of New Calabar River. However, the values were lower (20.8-62.60 mg/Kg (Fe), 0.15-5.70 (Pb), 0.03-0.24 mg/Kg (Cd)) than what was reported in Ikot Ada Udo with history of oil spilled (Vincent-Akpu *et al.*, 2015). Similar trend was also reported by Narayana *et al.* (2005) and the maximum values were found to be below the desirable limit. The present values were also similar to results reported by Sawant and Chavan (2013); Pradeep *et al.* (2012).

### **CONCLUSION**

Knowledge on the heavy metal concentrations of the aquatic environment is of utmost importance, as it helps in the management of the aquatic environment and human consumption of the aquatic biota. The effects of environmental pollution on aquatic ecosystem and its safety for human use are serious worldwide public issues. Although most of the metals that were found in the fish, sediment and surface water of Iwofe creek over the study period were generally of lower concentrations, with time it might bio-accumulate and affects humans after consumption and can cause some health challenges. Pollution of the aquatic environment from anthropogenic activities sources are the major cause of aquatic resources loss and this

can lead to an imbalance in the food chain. To reduce and avoid aquatic biota loss in Iwofe creek, there is need to monitor and minimize heavy metals generation and discharge into its environment by applying relevant regulatory and control measures. It is therefore recommended that the Federal Ministry of Environment and other relevant regulatory agencies in Nigeria ensure regular monitoring of the aquatic resources of the Niger Delta region in general cum that of Iwofe creek in particular and provide a proper management control to indiscriminate discharge and effluence into the aquatic environment.

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# Investigation on Impacts of contamination of Oil exploration and Production on Environment and its Implications on people's health.

## Case Study: NIGERIA

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**Abstract-** The contamination of fossil oil in the environment with inspection and production activities is a common thread of the surrounding oil producing countries, especially in a developing countries including Nigeria. This country has been suffered from civil terrorist attacks in which affected different countries in West Africa, like **Cameroon, Chad, Niger**, but especially in **Nigeria** where this paper focused on and this problem has affected the oil fields production, and oil amenities such as the pipeline, are removed by causing oil storage and spills; thus causing significant pollution of the entire environment (**biota, soil, water and air**), and human health effects. The infection occurs in the period of production of all rock oil production and explorations processes and negatively affects the environment which in turn reflect health risks through food chain such as apparition of heavy metals; Lead, and Barium in hair of some of Nigerians people. This review examines and checks some the environmental effects related to black gold discovered and produced in Nigeria and its implications to human health. It has further highlighted some recommendations that may help sustainable practices for the exploration and production of this resource which may yield in less negative effects for both environment and human health.

**Index Terms-** Fossil oil, Environment, Exploration, implications, human health, Boko Haram

## I. INTRODUCTION

Nigeria's fossil oil infection from boring processes creates issues that destroy the lives of people living nearby oil camps area, wells, bobbing stations, and pipelines. In addition, oil contamination creates unhealthy to the native environment. The population living on oil-rich sites around the world is subjected to contamination of drinking water, top soil, and livestock due to toxic pollution that can result from the oil extraction process. In some contaminated sites, serious illnesses resulting from exposure have been documented.

Before the establishment of petro-chemical industries, environments around the world that sat upon large black oil reserves supported healthy of human life and vibrant environment.

Petroleum infection from drilling processes, however, has adversely affected the population living in these different areas by environment polluting around them. Air, water, soil and have been severely tainted by oil pollutants. As a result, wildlife, livestock, and population have been sickened. Fossil Oil infection has adversely affected the lives of many people living in areas near oil discovered sites. With the crude oil and producing chemicals polluting water supplies, air, and surrounding plant and animal life, population health has suffered. Because a level of those affected by oil contamination lives of the land, local economy has also been impacted by the deterioration of environment in West-Africa.

In addition to physical impacts, economic stress affects the [subconscious](#) health of the persons living in contaminated areas. A range of total number of explorations have focused on specific diseases noted in particular contaminated. Many problems have arisen because of oil exploration and extraction and their associated pollution. This Paper focused on health problems affecting population living in areas contaminated by that kind of Oil. The prior investigation in orients that there is a significant lack of available information regarding health problems or issues from exposure to oil contamination. This report Studies conducted by researchers are scarce and tend to be the specific location. In kind, at the initiation of this project paper, I know that the short- and long-term effects resulting from oil contamination have not been thoroughly explored as well, and there is not sufficient understanding of the psychological and physical implications that kind of Oil exploration and its eradication present for human Social communities.

The paper project achievement is to create a clearinghouse for available research on oil contamination and its health effects on humans being.

The first step in investigating the real problematic breaks in this area of research was contacting people who have studied health issues arising from petrochemical exposure. I established sites that stores documents, audio files, and video files related to health-related effects of oil contamination exposure from several spill sites [all over the world](#).

I think many countries in West Africa have such as the issues like Niger and one country called South-Soudan etc. With this paper project we expect that this with different organizations in the way of Sustainable development like UN and EU will help in protection of human health in contaminated areas in Nigeria Country.

## II. BACKGROUND

In our days in the world environment recognizes the significance of environmental sustainability to the development of country. So, one of the cardinal objectives of the sustainable Development Goals is to ensure environmental sustainability. It then implies that they should be [decreased](#) in environmental degradation as well as pollution. Multinational and other industrial establishments are expected to play an important role in the development of the society and host communities (2009-2010).

The literature on the Nigeria highlights soil erosion, water pollution, oil spillage, soil erosion, and global warming as the consequences of oil exploration in the region

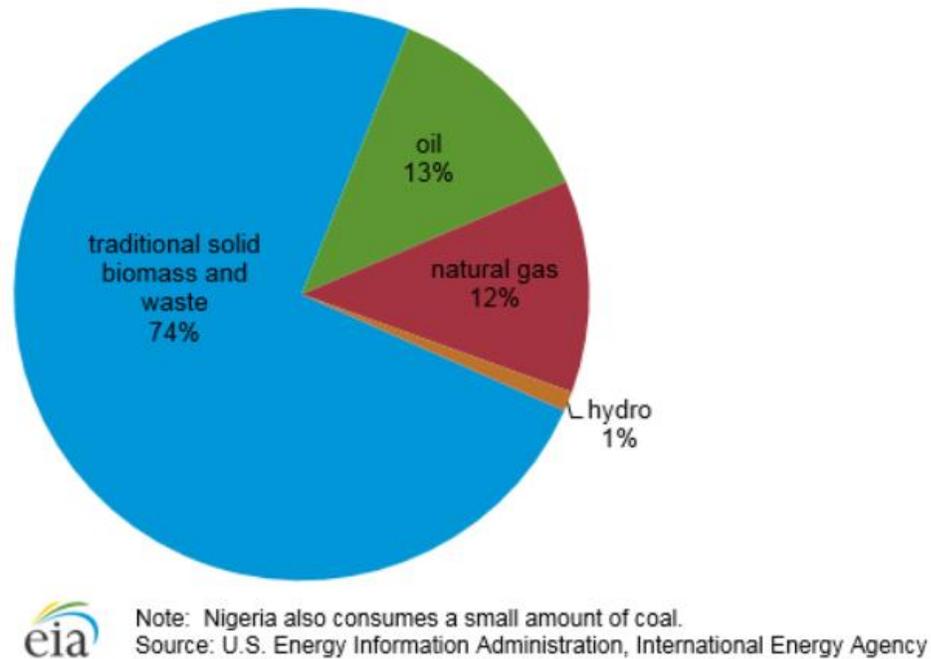
Nigeria is currently the biggest fossil oil producer in Africa and was the world's fourth-largest exporter of LNG in 2015. Nigeria's back oil production is hampered by instability and supply [disturbances](#), while its natural gas sector is restricted by the lack of infrastructure to commercialize natural gas that is currently flared. Nigeria is the largest oil producer in Africa, holds the largest natural gas reserves on the continent, and was the world's fourth-largest exporter of liquefied natural gas in 2015. Nigeria became a member of the Organization of the Oil Exporting Countries in 1971, more than a decade after oil production began in the oil-rich Bay Elsa State in the 1950s. Although Nigeria is the leading black oil producer in Africa, production is affected by sporadic supply disruptions, which have resulted in unplanned outages of up to 500,000 barrels per day.

Nigeria's black oil and native gas industry is mainly located in the south of Niger- Delta area, where it has been a source of issue. Local groups seeking a share of the wealth often attack the petroleum [facilities](#), forcing [enterprises](#) to declare force majeure on fossil oil shipments. At the same time, oil theft leads to pipeline damage that is often severe, causing loss of production, pollution, and forcing some companies to shut in production.

Aging infrastructure and poor repairing have also resulted in oil spills. Natural gas flaring has contributed to environmental pollution. Protests from local groups over environmental damages from oil spills and natural gas flaring have exacerbated tensions between some local communities and international oil companies [IOCs]. The industry has been blamed for different kind of pollutions that has damaged air, soil, and water, leading to losses in arable land and decreases in fish stocks. Nigeria's oil and natural gas resource is the mainstay of the country's economy. According to the International Monetary Fund [IMF], oil and natural gas export revenue, which was almost 87 billion dollars in 2014, accounted for 58percent of Nigeria's total government revenue in that year. Black Oil and natural gas revenue is the country's main source of foreign exchange, making up more than 95percent of Nigeria's total exports to the world in 2014. Because Nigeria heavily depends on oil revenue, its economy is noticeably affected by crude oil price changes. The International Monetary Fund projects that Nigeria's oil and natural gas exports earned 52 billion dollars in 2015, 35 billion dollars less than in 2014, which is mostly attributed to the fall in oil prices. Nigeria's fiscal buffers the Excess Crude Account and the Sovereign Wealth Fund include savings generated when oil revenues exceed budgeted revenues. However, those funds have declined from 11 billion dollars at the end of 2012 to 2 billion dollars at the end of 2014. Nigeria also held 34.25 billion dollars in gross international reserves at the end of 2014.

### 1.1 Primary energy consumption in Nigeria

The United State Energy Information Administration estimates that in 2013 total primary energy consumption in Nigeria was about 4.8 quadrillion British thermal units of this amount, traditional biomass and waste accounted for 74percent. This high share represents the use of biomass to meet off-grid heating and cooking needs, mainly in rural areas. It's important to note that estimates of traditional biomass consumption are imprecise because biomass sources are not typically traded in easily observable commercial markets. The electrification rate in Nigeria is estimated at 45percent leaving approximately 93 million people in Nigeria without access to electricity. The International Energy Agency estimated that 115 million of population in Nigeria rely on traditional biomass and waste as their main sources of energy in their country.



**Figure 1: Nigeria's total primary energy consumption in 2013**

What we call a Crude oil typically means **unrefined oil**. Petroleum is a fossil fuel found underground formed different millions of years ago as a result of the decomposition and pressurization from the remains of small animals and plants. The remains which is covered by mud begins to pile up forming more and more sediment thus leading to its change into rock due to increase in the temperature variability and pressure which in turns makes the plants and animals remain get heated up turning it into that crude oil which is a mixture of hydrocarbons these hydrocarbons in the rock strata can be conveniently extracted and refined to produce fuels like diesel oil including paraffin, gasoline and petrol. Crude oil Extraction begins with the boring of wells into the underground reservoir and with the use of a drill bit breaks through the ground driving the particles to the area using boring fluid, a perforated casing is added in the production zone for the oil to flow into the well. The boring rig is removed and pumps installed once the well is complete. The machine pump then removes the oil and distributes it to a network for transportation to the refinery. The improving process is carried out using fractional purification, the issue is subjected to heat at about 700°F making the crude oil explode into various components or fractions at a certain piping point range.

Below is the table of crude oil components and their different boiling range

Component	Boiling point
Fuel Gas, LPG, refinery gas	< 25°C
Gasoline - petrol	25°C – 75°C
Naphtha	75°C – 190°C
Paraffin, kerosene	190°C – 250°C
Diesel oil, gas oil	250°C – 350°C
RESIDUE (fuel oil, lubricating oils, waxes)	>350°C
Bitumen	500°C – 700°C

## 1.2 Important Main locations of crude oil in Nigeria

The past years Petroleum was discovered in Nigeria in 1956 in Oloibiri. This discovery was made by shell D'Arcy Petroleum Development Company of Nigeria, as a consortium of Shell. And British oil then had known as Anglo-Iranian. This post, it shows the location of a known place of oil in Nigeria as well as the Oil enterprises that have been involved in its oil production. When we briefly talk about the history of this, the prior to this discovery in Oloibiri, Shell has commenced drilling work in 1951, with the first test well drilled in **Owerri** area and Oil was discovered in non-commercial quantities at **Akata**, near **Eket** in 1953. The Company was unrelenting despite the fact that it had spent 6million pounds but was yet to find Oil in commercial quantities. The current, Nigeria produces an average of 2.5million barrels of crude oil per day which makes the country the largest producer of crude oil in Africa. The production of petroleum in Nigeria plays a very important as over 90percent of the country's gross earnings comes from the place of black oil production. *The location of Crude oil in Nigeria* let first take look at the oil states in the Country. The oil producing states include **Abia, Akwa Ibom, Bayelsa, Delta, Edo, Lagos, Imo and Rivers.**

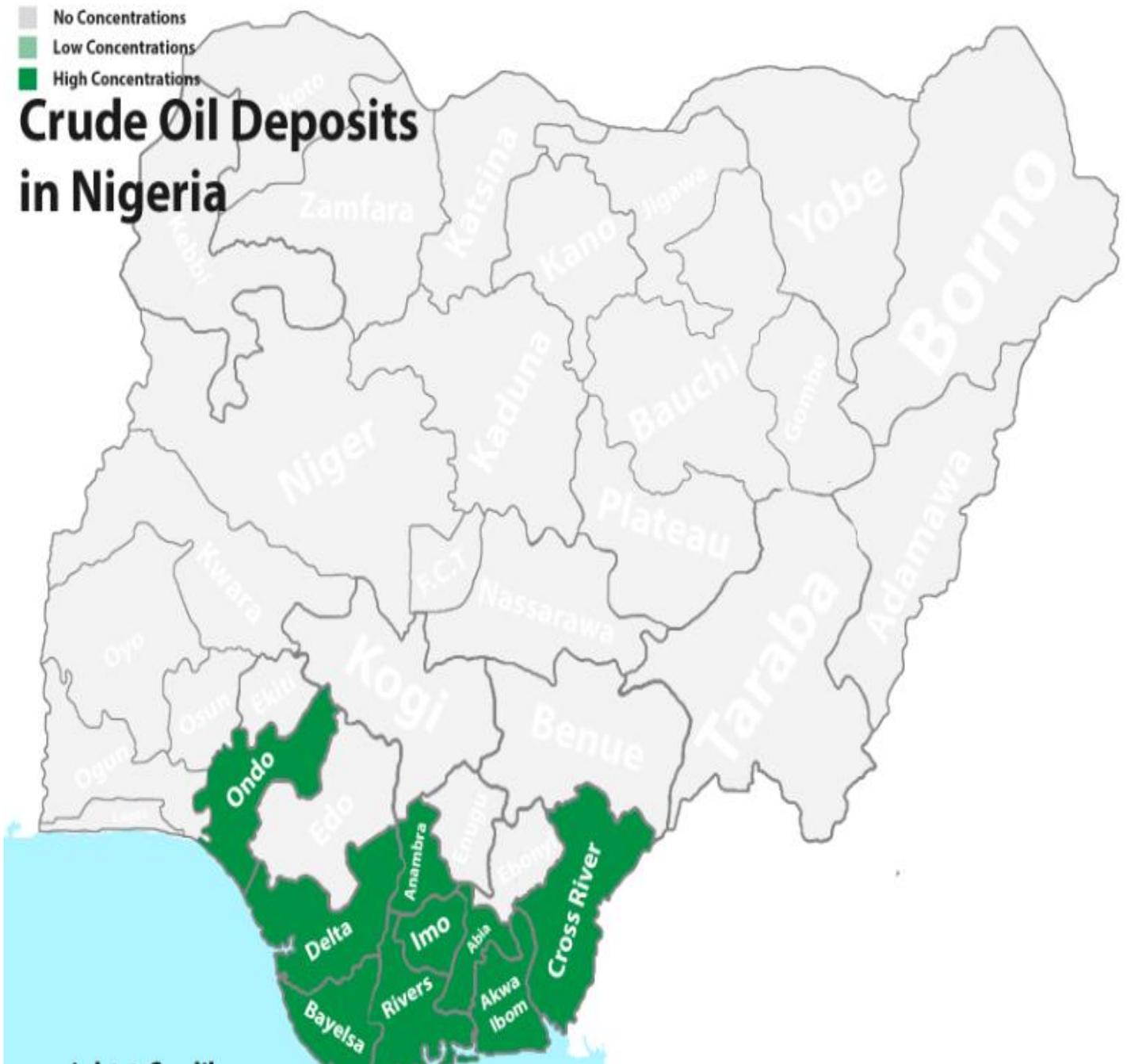


Figure 2: This shows the locations of Crude Oil in Nigeria/ Picture from: <https://community.oilprice.com/topic/4752-nigerian-crude-oil/>

**Abia Atate** has over one hundred oil wells and three installed flow stations in Abia State. In 2012, the boundary commission revealed that it returns forty two oil wells from neighboring Rivers State to **Abia** which made Abia the fourth largest oil production. And Shell holds the most of the licenses for the wells in Africa with a focus on 50 wells that it has considered high-yield. Abia produces “36000” barrels of crude oil per day. A breakdown of this reveals that Imo that Imo produces “23000 barrels” per day while the Ismail flow station produces over “8000 barrels” of crude oil per day. **Akwa Ibom**, is the highest oil and gas producing State in Country with over “500000 barrels” and **Bayelsa State**, which is one of the biggest crude oil and natural gas deposits in the country. Despite the crude oil found in this state, the majority of Baselessness live in poverty which is a big issue in that Area in Nigeria. We have **Delta State** which is also the second major provider of black oil and gas in the country with a daily production of “346000 barrels”. Also, the state has one of the biggest deposits of place of oil production and natural gas in the country. Apart from that deposits place, Delta is also rich in natural resources like limestone, decorative rocks, tar sand, Kaolin, limonite, silica and Industrial clay.

We have **Edo State** which is the seventh largest producer of oil and gas in the country with a daily output of “33000 barrels” and this state produces mining resources like Limestone and quarry. The last is Imo State which has over 163 oil wells at over twelve different locations in the state. The biggest petroleum companies in this state include **Addax petroleum, Chevron Corporation, Royal Dutch Shell and Agip**. After this Nigeria has the ten top best restaurants in Abuja to distribute the black oils which cause many issues of pollutants from oil to population health in Nigeria, these restaurants are the following: **Ohaji-Egbema, Oguta, Oru-East, Iho, Oru -West, Obowo and Ngor-Okpala**.

### 2.3 The Impact of oil Exploration and Production on the Environment.

The Oil pollution has affected on the black oil producing community-based under study in several ways. The present situation of the **Akwa Ibom** State environment especially the black oil producing areas is appalling. Though natural phenomena like erosion, flood and climate change are major factors which adversely the environment, consequences of people activities like gas flaring and black oil spillage have threatened an imminent collapse of the ecosystem. Black Oil spillage that occurred in the host- communities of **Akwa Ibom** State are the cost or the attendant issues the people are facing and suffering from since the advent of black oil discover in the area. In fact, it could be seen as the major cause of environmental degradation, black oil conflict within the state. The situation is worsened by the lack of commitment in rectifying the abnormality.

This laissez fair the manner has pursued unabated despite outcry by the victims as well as relevant environment protection laws. While the stakeholder especially the transnational petroleum companies, have exhibited zero concern for the wellbeing of their operational domain and its inhabitants, the victims of this acts of destruction are left to their fate. This has led to countless litigation against the black oil companies.

The effects of the negative activities of the black gold companies include air, soil pollution, soil degradation, health risk among others. In most of the black oil producing Communities of **Akwa Ibom** State under study, despite being the highest place of black oil producer in Niger-Delta, they are perhaps the most underdeveloped place in the State. They play host to oil firms including Exxon Mobil, Shell petroleum development company amongst others. In this section, the research work will look more specifically at various environmental and socioeconomic problems that have been identified as a result of the intensive extraction of native oil resources in the Del, Lagos communities- based on the productive area in Nigeria.

**These impacts are grouped into three interrelated impacts and the proposed way of solution;**

- Socio-Economic effect, Physical-Health effects, Socio-Culture Impacts,
- Socio-Economic effects and destruction of traditional means of livelihood.

From the paper  
Of  
The Impact  
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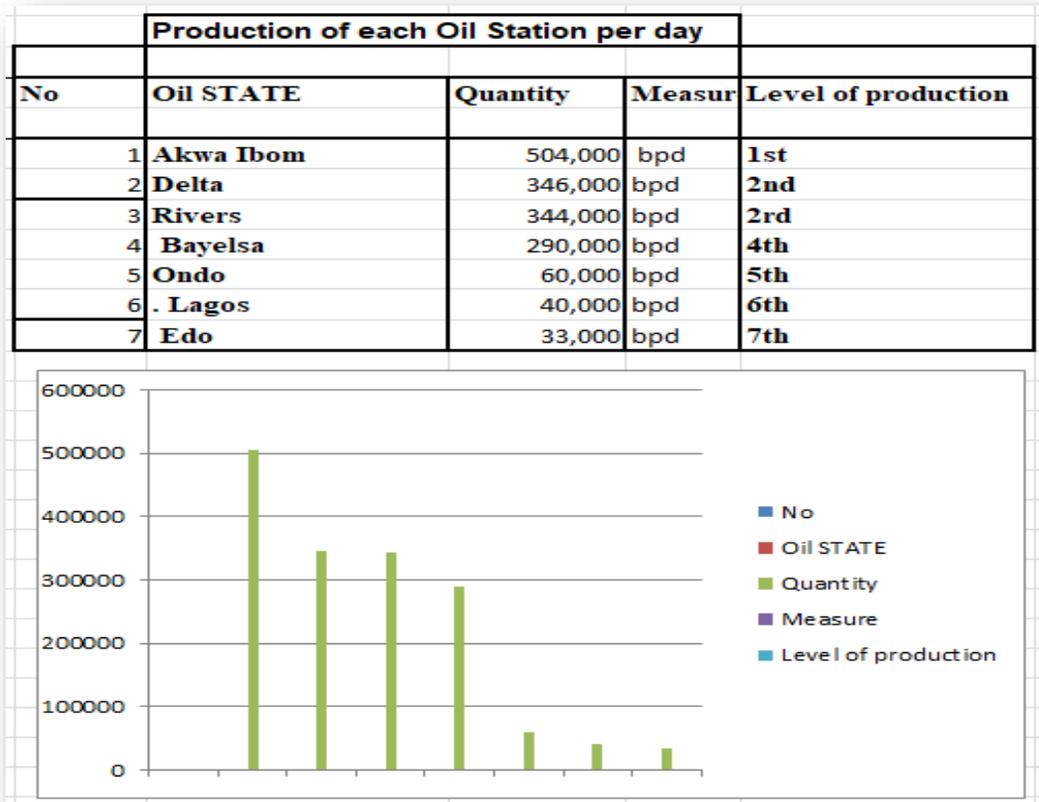


Figure 3: Table shows the production of each Oil state in Nigeria per day in 2019/ Own drawing in Microsoft excel

### 1.3 The uses of petroleum

- It is used as a transportation fuel, heating, and electricity generation like gas, petrol, and diesel.
- [coal oil](#) is used in aircraft and due to its same to diesel fuel can be used in either compaction ignition engines and It is used as a burning fuel such as kerosene oil.
- The bitumen or asphalt is used to pave or tar road as a binder for gravel to form asphalt concrete.
- Naive gas is also used in steam crackers and reformers as a major feed stock to produce hydrogen gas, ethylene and other Olefins.
- Paraffin wax is a by-product of the refining of lubricating oil and is used as a lubricant and for other applications such as cosmetics. It is used to produce **Sulphur** since some crude oil has a little **Sulphur** content.
- It's also used in the production carbon and hydrogen.

#### Aim and Objective

- About objective of this paper project is to make orientation of researchers to know what about the place of production Oil (crude oil) in Nigeria and this can be very important to the country of Nigeria because if the big countries participate in sustainability of Nigeria, it will be good to the life of Nigerian's people to be in a known country and it's a profit to the Organization like **EU, UN, UA**, to create a partnership with this Country.

- Motivation, of people how to manage this place of production of Oil of Nigeria for protecting environment and call other companies to work with Nigeria for avoiding Jobless in that country through the Oil production.

-The broad objective of the study is to determine the impact of over-dependence on oil on Nigeria's economy.

-Determine the impact of over dependence on oil on Nigeria economic growth.

-Evaluate the long-run relationship between economic growth and oil revenue in Niger.

### 1.4 General Interests

- About the interest of a place of Oil production in Nigeria, it's is an orientation and encouragement of make effort of continue to explore and developing this country and create relationship between different country around world.
- The place of oil production is a very important source of foreign exchange and has become major influence to the Nigeria economy.
- Here we take a look at the history of this black gold as well as the economic importance of The place of oil production in the country with the focus of partnerships with other countries and International oil companies.

- It is very important in Africa to have big country like Nigeria because not only development of this Country, also other country in Africa develops through the crude oil of Nigeria.
- The place of oil production is one of the most actively traded commodities in the world. Petroleum still remains the primary energy source for transportation and manufacturing industries. For this reason, oil price movements may impose significant influence on economic situation in different countries.
- Here the Organization of the Petroleum Exporting Countries, OPEC and non-OPEC agreed to cut world supply by “1.8 million barrels” of oil per day, bopd in November 2016; with the cuts extended to last through 2018. OPEC’s intent was to limit output to 32.5 million bopd to shore up prices.

## 1.5 Social Interest

- About, the Social interest of place of production oil in Nigeria. In general, it’s very interesting to see Nigerian population work or have job in all activities of producing Oil in Nigeria.
- During activities in the place of oil production (Crude oil) in Nigeria a percentage shows us that the unemployment decrease, different students on this field they can get job easily this means no jobless of the engineer of this field and the distributor Companies recruit many people for the job, this can be one of goal in social economy of Nigeria.

### 1.5.1 Scope

About the limit of this paper was to show the level of oil production par day and percentage of population affected by production of Oil in Nigeria, the quantity of production of oil per month, and then how Nigeria developed through the crude oil since 2014 - 2018. This can determine how the next 4 years how the situation will be, if they will continue to improve their activities in Producing Oil and making partnership with other countries.

### 1.5.2 Conclusion and Recommendation

In conclusion, as we have mentioned the history of Oil in Nigeria, development through the oil production, different activities, exchange with different countries around world, importance and different impacts from the crude oil, I have seen that with partnership of Nigeria and other countries in the future this country will grow in development through the crude oil. Like a big country in production of Oil, it is better to make enough security of this country because at this time we can call it mother of Oil in Africa, and this security will make stability of all activities of this Country. After review, checking this paper and seeing the mistakes that I have made in this paper agree to correct and insert some updates on it. And this will help me to be oriented in constructing this good paper project through the comments from the reviewers. Because of the short time we did not achieved one of our objectives to show the percentage of population affected by production of black Oil in Nigeria, but I am preparing ring to do a deeply research on another paper I will try to maximize my effort to work on that one of the objectives was planned.

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# Conflicting Concerns Of Mobility And Health Rights In Emergencies- Where An Ethical Blueprint Fit?

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**Abstract:** In times of health emergencies, such as the outbreak of a communicable disease, there are issues in law and ethics that are raised. This include, the need to maintain the dignity of those affected, ramping up measures to ensure the protection of health rights, and whether there is a justification for restricting movement given the risk of infection but taking cognisance of the economic implication. Policymakers and health professionals will be faced with the decision of how to maintain conduct so as not to undermine these rights, but also ensure safety.

**Index Terms:** Ethics, Human Rights, Emergencies and Health Crisis, Public Safety, Mobility

There is an economic question to be raised on the issue of health rights, via referencing the arguments in law.<sup>1</sup> It's hardly simply whether there ought to be treatment, but whether the background of the limited nature of the State's financial resources enthrone the conversation of how much of allocation for treatment is to be envisaged, and to who, in terms of prioritisation. This extends beyond health resource allocation and the balancing act of redirection of funds to more vulnerable areas of need, to analysis of the external impact of pandemics on the financial markets, and economic prospects within societies.<sup>2</sup> With consideration of Brexit developments, a period of deliberation which showed a great deal of political will to respect the right of the people to choose representatively, the framework of engagement with Europe and control of access to opportunities in a globalised world, these issues are still less thorny because they spring from the vicissitudes of life. Effectiveness in curbing the attendant risks may stem from a globalised and concerted response. People are constantly moving, and the nature of business require the movement of goods and services.<sup>3</sup>

The scope of rightful access to beneficial treatment and positive obligation to treat patients with dignity and professional care remains. Recent health emergencies across several parts of Europe and beyond, in other continents, leading to shutting of travel arrangements and closing of public institutions and spaces, makes the dilemma of extent of protection of these health rights more dire.<sup>4</sup> Should huge

<sup>1</sup> A.R. Maclean, "The Human Rights Act 1998 and the Individual's Right to Treatment" (2000) 4 *Medical Law International* 245-276. Maclean considers this scenario in common law and the Human Rights Act 1998 in relation to the legal obligations entrenched in the several Conventions- especially how resource allocation can be scrutinised vis a vis the duty to care for patients and their right to insist on medical treatment. This argument extends to the role of the convergence of law and ethical consideration- Amy L. McGuire, Mary A. Majumder, and J. Richard Cheney, "The Ethical Health Lawyer: The Ethics of Lawyer- Ethicists"(2005) 33(3) *Journal of Law, Medicine & Ethics* 603.

<sup>2</sup> Fred Imbert, Thomas Franck "Dow Plunges 10% amid Coronavirus Fears for its Worst Day Since the 1987 Market Crash" March 12, 2020 <<https://www.cnbc.com/2020/03/11/futures-are-steady-wednesday-night-after-dow-closes-in-bear-market-traders-await-trump.html>> accessed March 14, 2020; M. El-Erian, "How This Market Crash is Different from 2008, and the Same: The Global Economy's Banking Nerve Centre is not under Threat" *Financial Times* March 9, 2020 <https://www.ft.com/content/c789f080-6203-11ea-a6cd-df28cc3c6a68> accessed March 14, 2020-

"...the actual and feared impact of the coronavirus is destroying supply and demand simultaneously. This has undermined the momentum of global economic growth."<sup>3</sup> Travel has been affected severely, leading to restrictions on movement of several people across countries. Alex Leary, Xie Yu and Jennifer Calfas, "Trump Administration Expands Europe Travel Ban to U.K. and Ireland as Spain Goes Under Lockdown: Nations world-wide step up border controls and restrictions on movement, seeking to slow pandemic" *Wall Street Journal* March 14, 2020 <https://www.wsj.com/articles/coronavirus-closes-national-borders-apple-stores-11584183924>

<sup>4</sup> On the Covid-19 situation World Health Organisation's report show "On 31 December 2019, WHO was informed of a cluster of cases of pneumonia of unknown cause detected in Wuhan City, Hubei Province of China. The coronavirus disease (COVID-2019) was identified as the causative virus by Chinese authorities on 7 January. As part of WHO's response to the outbreak, the R&D Blueprint has been activated to accelerate diagnostics, vaccines and therapeutics for this novel coronavirus." By January 30, 2020 it was declared a Public Health Emergency of International Concern (PHEIC) and Scientists across the world would meet in Geneva by 11-12 February 2020 to assess the virus and work on strategy to curtail it; WHO, Coronavirus disease (COVID-2019) R&D <<https://www.who.int/blueprint/priority-diseases/key-action/novel-coronavirus/en/>> accessed on March 14, 2020. "The R&D roadmap for COVID-19 outlines research priorities in 9 key areas. These include the natural history of the virus, epidemiology, diagnostics, clinical management, ethical considerations and social sciences, as well as longer-term goals for therapeutics and vaccines" WHO, "WHO publishes draft R&D blueprint draft for COVID-19" 6 March 2020 <<https://www.who.int/emergencies/diseases/novel-coronavirus-2019/events-as-they-happen>> accessed on March 13, 2020. From monitoring of the situation in Wuhan from January 4, 2020 when there was no recorded death, by March 11, 2020 the update indicate the virus has spread to 118,000 cases in 114 countries, and 4,291 <http://dx.doi.org/10.29322/IJSRP.10.04.2020.p10009> [www.ijsrp.org](http://www.ijsrp.org)

cost and lack of practical preparedness erode these daily privileges? Where governments were to take actions to temporary curtail movements, clearly breaching the right of movement of her citizens within communities and their travel to other countries, it is doubtful it would be an unnecessary infringement<sup>5</sup> even if not in a war emergency but a health crisis of which the magnitude was still unravelling, given the highly disruptive nature to public safety and flourishing, albeit for a short time. The other right to live safely by ensuring a protected communal space, though subtle, has to also be guaranteed. Whilst health is given its due, there is also the undertones for financial stability, and perhaps more significantly a respect for and preservation of human lives. Both Bioethicists and Christian theological ethicists would be concerned with treating patients with dignity even in times of emergencies, which could mean respect for their belief system such as belief in God and the potency of prayer, not just as an afterthought but a pre-emptive response; then chaplaincy and institutional structures needs to exist to affirm that.<sup>6</sup> Proactive measures such as these then, which involves the acknowledgment of personal preference, autonomy, and human conditioning, can be viewed with less scepticism. Its' been argued a minute level of scepticism might be helpful in some cases,<sup>7</sup> but sound value based ethics could form the basis of a review whether response has been appropriate and efficient in light of capacity to deliver healthcare, human dignity upheld, recommended and approved medications used, and especially whether respect for engrained rights has been observed. And where rights have been limited as a matter of consensus and professional opinion, access to the right to treatment must have been void of tribal inclinations, societal class prejudices, and individual complacency as a result of lack of training.

Again, one may think the right of movement entirely sacrosanct, well that remains to be so in war-like emergencies- as they ponder and shudder at the thought of been hurled off their favourite tea or coffee sweet spot, by security and enforcement agents, where there is the slightest indication of a flu-like symptom.<sup>8</sup> Apprehension may mellow where it to be revealed their health was of utmost concern. But, is the State to be paternalistic in approach or rather trust the instinct of the individual to seek their own healthcare, even if it means veering to the edgy cliff, and could drop? However, of note is, the denial of the individual's right to movement in a health emergency do not equate to a guarantee of access to treatment where fund is not infinite. The patient soon discovers the sudden and real possibility of a loss of rights at both ends of the stick. Maclean, puts it this way, "It may be, that to do justice to the individual's human rights the courts will have to look beyond the immediate resource allocation decision and consider the overall funding question."<sup>9</sup> He however conceded, "the right to life creates a powerful claim that resources should be diverted towards life-preserving and life-saving treatment and away from other therapies", whether the patient has the right to choose what manner of life-saving therapy is another issue.<sup>10</sup>

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people have lost their lives; WHO, "WHO Director-General's opening remarks at the media briefing on COVID-19", 11 March 2020 <<https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020> > accessed on March 13, 2020.

<sup>5</sup> Article 13, 20 and 27, has to be read in conjunction with Article 29 and 30 UDHR- both the right to freedom of movement within and without a country, and the right to gather in community peacefully and to share of her culture and arts, is however "subject only to such limitations as are determined by law solely for the purpose of securing due recognition and respect for the rights and freedoms of others and of meeting the just requirements of morality, public order and the general welfare in a democratic society." UDHR, <https://www.un.org/en/universal-declaration-human-rights/> accessed March 12, 2020. Similarly, Article 3,8 Human Rights Act 1998 UK allows for adjustments or amendments by legislation to "Convention Rights" and freedoms, as well as for the Courts to make judicial pronouncement as it may find appropriate in society. With Brexit deliberation and frequent health emergencies as Covid-19, it is feasible to anticipate legislative steps to balance protection of rights movement and societal integration and guarantee public safety. For EU States, *Protocol No. 4 to the Convention for the Protection of Human Rights and Fundamental Freedoms securing certain rights and freedoms other than those already included in the Convention and in the First Protocol thereto Strasbourg, 16.IX.1963*: Article 2 (1)-(2) provides for the rights to movement in residence and outside the country, but subsection 3 and 4, introduces the caveat for emergencies that allows the government to act in interest of public safety, for the protection of health- "No restrictions shall be placed on the exercise of these rights other than such as are in accordance with law and are necessary in a democratic society in the interests of national security or public safety, for the maintenance of order public, for the prevention of crime, for the protection of health or morals, or for the protection of the rights and freedoms of others." This is not a destruction of right but a logical step to protect and enhance the right, because an individual's freedom has to be viewed in the context of lack of intrusion by another. *Convention for the Protection of Human Rights and Fundamental Freedoms Rome, 4.XI.1950* < [https://www.echr.coe.int/Documents/Convention\\_ENG.pdf](https://www.echr.coe.int/Documents/Convention_ENG.pdf)>: Articles 11(2), 15(1),17,18 the combined effect forbids the destruction of these convention rights but envisages a situation the exigencies require the life of a nation, safety, peaceful co-existence for the State to act in her best interest to restrict the prescribed rights.

<sup>6</sup> Jim Q. Ho, Christopher D. Nguyen, Richard Lopes, Stephen C. Ezeji-Okoye, and Ware G. Kuschner "Spiritual Care in the Intensive Care Unit: A Narrative Review" (2018) 33(5) *Journal of Intensive Care Medicine* 279-287.

<sup>7</sup> Cynthia L. Rigby, "Stepping into the Madness: On Being Sceptical, Doing Justice, and Hoping Against Hope" (2015) 28(2) *Studies in Christian Ethics* 175 –186; Jim Q. Ho, and others, *Spiritual Care in the Intensive Care Unit* Ibid.

<sup>8</sup> *Cynthia Rigby*, takes the view Christian values (Reformed) should allow for scepticism of belief in its traditional ethics- for disbelief and unknowing. In my opinion, Christian ethics present a concrete value stance, based on belief in God and of His goodness, and a respect for human life and need for dignity, as well as the protection of the rights of the vulnerable, else such a person stands the risk of spiritual judgement from God. This view also filters into the insistence, as a matter of taking human responsibility, for doctors to exercise due care to their patients. *Jim Q. Ho and others*, write spiritual care has a positive role in healthcare delivery, they caution those responsible- "Rather than emphasizing biomedical facts or manipulating spiritual beliefs to reinforce their argument, which may provoke distrust and are often futile, physicians could instead try to explore and understand their spiritual views. Once the patient's or family's views have been clarified, the physician could then find common ground to align with the view and share hope" p.284. I have argued in another place natural rights are God-given to a human, and inalienable, which should be protected [Israel Okunwaye, "A Jurisprudential Quagmire on Definition of 'Rights'- Human or Legal, Both or Neither? To What Divine and Constructive Purpose in Society?" (2017) 4(2) *IJLLS* 23].

<sup>9</sup> "Conflating health and safety is not just a post-9/11 phenomenon, but the events of 9/11 have made this conflation more apparent and more dangerous to human rights", P.335- George J. Annas, "Ebola and Human Rights: Post-9/11 Public Health and Safety in Epidemics" (2016) 42 *American Journal of Law & Medicine* 333-355. Furthermore, Annas suggests "With the Ebola epidemic, there is an ethical obligation to treat people who have the disease, and to try to halt its spread" P.353.

<sup>10</sup> Maclean, *Individual's Right to Treatment* P.263.

<sup>10</sup> Maclean Ibid 263.

Mobility concerns may have to be relegated in the hierarchy of needs to meet in emergencies, to prioritize health- it's not a case of a denial of rights but rather a scrutinising of best outcomes; how for instance out of two rights one has to take precedence, mobility right may have to give way to a medical privilege to professional treatment, even it means being confined for a short period of time. The right to treatment has to be considered in the broader spectrum,<sup>11</sup> of whether the State has granted taking legislative steps to preserve that opportunity and the extent to which, and also in the context of the financial power for allocation for health services, or the individual's capacity and freedom to secure their privilege through self-funding. Also, in terms of the duty to care with the acceptable professional standard and enabling access to treatment without discrimination. In such circumstances of strategic disease control, it is argued human rights is not restrained but enhanced through protection and access to treatment. This is because there may be a credible reason for containment of many in a community at a particular time of crisis, and towards professional care, but to also ensure there is not a freedom expressed to also affect others' right to life and well-being. It becomes a contextualisation of communal rights, an individual's rights enabling another individual's rights- creating a situation that helps deal with the spread of infection that threatens life. When there is a virus which by nature is communicable, the apprehension comes from the need to maintain public safety as well as provide standard treatment as required to a patient in the same breadth, whilst it may be rightly perceived in some quarters as the patient being locked up, the broad consensus is one of curtailment of the disease from spreading, and if need be for as long as necessary to restrain movement.<sup>12</sup> If the vulnerable in the population is to survive in a health crisis, they must not be left only to their self-help measures, but access to treatment would need to be readily accessible, and that includes providing accurate health information and counselling, medical testing opportunities, approved medication, and a comprehensive monitoring strategy; to secure their rights in a democratic society and others, so together as the global community can be empowered to flourish and enjoy the benefits of migration.

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<sup>11</sup> George J. Annas, *Ebola and Human Rights* P. 353-354- "The Ebola experience suggests four principles that should guide a public health/human rights response to future epidemics: 1. Prevention should remain the primary goal so that research and other non-treatment interventions should not be pursued if they make prevention efforts less effective; 2. Government has the primary responsibility for the health of the people, and therefore must follow basic human rights, including non-discrimination, the right to health, and special protections for women and children; 3. Interventions should be sustainable and contribute to building a healthcare system and healthcare infrastructure, not increasing silos. 4. There are no disaster exceptions to informed consent for research."

<sup>12</sup> Peter Moszynski, "Doctors Disagree over Detention of Patients with Extensively Drug Resistant Tuberculosis" (2007) 334(7587) *British Medical Journal* 228.

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# A Study on Financial performance of Selected Foreign Sector Banks in India

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## Abstract

Bank is one of the most important part of national economy. Scheduled Commercial Banks divided into sector Public sector Banks, Private Sector Banks and Foreign Sector Banks. Foreign Banks operating in India form 19<sup>th</sup> century. Researcher studied with the object to analyze the financial performance of foreign bank during the period of 2010-11 to 2018-19. For the purpose of the study researcher selected 5 foreign banks (Citi Bank, Standard Chartered Bank, HSBC Bank, Deutsche Bank and AEBC bank) with the help of convenient sampling method. This study used secondary data which was collected from the annual report of the selected foreign Banks, RBI published bulletin and official website. Ratio technique has been used for analytical study and Single Factor ANOVA has been applied for hypothesis testing. The study conclude that Standard Chartered Bank and Deutsche Bank shows good performance compare to another selected Foreign Banks. Financial performance of selected Foreign Banks was significantly different.

## Key Words

Foreign Bank, Bank, Financial Performance, Ratio, ANOVA

## 1. Introduction

Banks are central pillar of economy and play important role in development of the nation. Bank word derived from the Italian word “Banca” from French word banque which means a bench or money exchange table. According to Indian banking regulation Act “A banking is the business of accepting for the purpose of lending or investment of deposits of money from the public repayable on demand or otherwise and withdraw able by cheque, draft and order.”

Indian Scheduled Commercial Bank are divided into three part Public sector banks, Private sector Banks and Foreign sector Banks. Foreign Banks operating form 19<sup>th</sup> century in India. Over a period the foreign bank have become an important internal module of Indian financial and banking system. A foreign banks branch is type of foreign bank that is obligated to follow the regulations of both the home and host countries. Because the foreign bank branch has loan limits based on the total bank capital, they can provide more loans than subsidiary banks. Standard Chartered bank is oldest foreign bank that came to India.

Last few decade so many changes in Indian Banking Sector. So this research paper study the financial performance of the Foreign Banks in India for nine financial year.

## 2. Literature Review

**Shobana & Shanthi (2009)** studied with the object to analyze the profitability of Foreign Banks in India. Researcher was used secondary data and analyzed by different accounting and statistical tools like ratio. Researcher analyze financial performance with different parameter and concluded that analysis 13 selected banks exhibited high profitability, 18 banks below the mean of profitability of selected banks. (Shobana & Shanti, 2009)

**Sirisha & Malyadri (2018)** Studied on financial performance of scheduled commercial bank in India for the period of 2013-14 to 2015-16. Researcher used secondary data which was collected from RBI annual accounts, journal and official websites. Researcher analyzed financial performance with different parameter of ratios, and concluded that private sector banks perform well and sound well compare to another banks group. (Sirisha & Malyadri, 2018)

**Pourkiaei & Kumar (2016)** Conducted study with the object to analyze performance of selected Public, Private and Foreign Banks. Researcher selected three banks from Public, Private and Foreign Banks with the random sampling method. Researcher used ten financial years' data which was analyzed by accounting tools ratio and statistical tools ANOVA analysis. This study conclude that the foreign banks perform better compare to Public and Private with help of CAMEL model. (Seyad & Kumar , 2016)

**Singh (2018)** conducted study with object to analyze the profitability of all groups on the basis of the selected parameter. Researcher used secondary which was collected from RBI bulletins and conducted study for 2007-08 to 2016-17. Researcher used accounting tools ratio and statistical tools mean, standard deviation, standard error, upper-lower bound, Minimum-maximum and ANOVA. On the basis of the analysis researcher conclude that foreign banks interest income, non-interest income, operating profit, return on assets ratio was highest and highest return on equity was attained by private sector banks. (Singh, 2018)

**Dogan (2013)** compared the financial performance of Domestic and Foreign banks in turkey. For the purpose of the study researcher select 10 domestic and 10 foreign banks which operates in Turkish between 2005 and 2011. On the basis of the study researcher conclude that foreign banks perform better than domestic banks. (Dogan, 2013)

### ➤ Literature Gap

On the basis of the above literature researcher find that number of the studies focused on the scheduled commercial banks financial performance and its comparison. But no one the conduct the study on financial performance of foreign banks in India for 2010-11 to 2018-19.

### 3. Objective of Study

- To examine the financial performance of selected foreign sector banks.
- To study the comparative analysis of five selected foreign sector banks.

### 4. Hypothesis

H<sub>01</sub>: There is no significant difference between Interest Income to Working Fund of selected Foreign sector banks in India

H<sub>02</sub>: There is no significant difference between Non-Interest Income to Working Fund of selected Foreign sector Banks in India.

H<sub>03</sub>: There is no significant difference between Operating Profit to working Fund of selected Foreign sector Banks in India.

H<sub>04</sub>: There is no significant difference between Return on Assets of selected Foreign sector Banks in India.

H<sub>05</sub>: There is no significant difference between Loans to Deposit ratio of selected of Foreign sector Banks in India.

H<sub>06</sub>: There is no significant difference between CAR of Foreign sector Banks in India.

H<sub>07</sub>: There is no significant difference between Net Interest Income to Total Assets of Foreign sector Banks in India.

### 5. Research Methodology

This research paper study on the financial performance of selected Foreign Banks for the period of 2010-11 to 2018-19. For the purpose of the paper five foreign sector banks selected with the help of convenient sampling method. Selected sample are Citi bank, HSBC Bank, SC Bank, Deutsche Bank and AEBC Bank. To analyze the financial performance researcher used seven Ratios and ANOVA technique. For the purpose of the study secondary data was used, which was collected from annual reports of the banks, research journal, and official websites. Overall performance of each banks have been discussed in the paper.

### 6. Data Analysis

Data analyze by accounting tools Ratio and Statistical tools mean, co-variance and standard deviation. Single ANOVA factor is use for hypothesis testing. This research study is use seven ratios to check the financial performance.

#### 6.1 Interest Income to Working Fund

**Table 1: Interest to Working Fund**

Year	Citi Bank	HSBC Bank	SC Bank	Deutsche Bank	AEBC Bank	Mean
2010-11	6.05	5.46	7.54	5.81	5.37	5.678
2011-12	6.62	6.22	6.84	7.5	3.98	6.214
2012-13	6.96	6.57	7.46	7.8	3.89	6.546
2013-14	6.59	6.42	7.58	7.48	3.94	6.412
2014-15	7.26	6.79	8.03	8.04	3.99	6.918
2015-16	7.28	6.71	7.46	7.65	4.47	6.852
2016-17	7.07	6.49	6.7	7.03	5.16	6.52
2017-18	6.86	6.67	6.59	5.96	5.31	6.352
2018-19	7	6.49	6.7	6.02	5.68	6.548
<b>Total</b>	<b>61.69</b>	<b>57.82</b>	<b>64.9</b>	<b>63.29</b>	<b>42.95</b>	<b>58.13</b>
<b>Mean</b>	<b>6.85</b>	<b>6.42</b>	<b>7.21</b>	<b>7.03</b>	<b>4.77</b>	<b>6.456</b>
<b>Co-Variance</b>	<b>0.15</b>	<b>0.16</b>	<b>0.26</b>	<b>0.76</b>	<b>0.89</b>	<b>0.444</b>
<b>Standard Deviation</b>	<b>0.405189</b>	<b>3.605866</b>	<b>4.653303</b>	<b>4.31608</b>	<b>49.91575</b>	<b>12.57924</b>

The above table shows that the banks average aggregate basis remained 6.456, against which Deutsche Bank has highest mean value (7.03) and AEBC Bank has lowest value (4.77). Standard deviation of total interest income to working fund of Deutsche bank has 49.91 with highest cv 0.89% and Citi Bank has standard deviation of 0.405 with low cv 0.15% implying, Citi bank HSBC Bank is consistent to managing interest income.

**Table 2: ANOVA result of Interest Income to Working fund (%)**

Source of Variation	SS	Df	MS	F	P-value	F crit.
Between Groups	35.0734	4	8.77	19.72	4.94	2.61
Within Groups	17.78764	40	0.44			
Total	52.86104	44				

Above table shows that the result of ANOVA analysis and whether there is F calculated (19.72) is greater than F-critical (2.61), on the basis of that Interest income to working fund of selected banks different significantly.

## 6.2 Non-Interest income to Working Fund

**Table 3: Non-Interest Income to Working Fund**

Year	Citi Bank	HSBC Bank	SC Bank	Deutsche Bank	AEBC Bank	Mean
2010-11	1.85	1.88	2.93	3.03	25.45	7.028
2011-12	1.56	2.19	2.57	2.36	25.05	6.746
2012-13	1.19	1.61	2.31	2.7	24.77	6.516
2013-14	2.15	1.31	2.39	1.02	24.71	6.316
2014-15	2.33	1.7	2.6	2.5	22.05	6.236
2015-16	2.15	1.45	1.48	1.48	21.37	5.586
2016-17	2.53	1.68	1.85	1.58	20.22	5.572
2017-18	2.25	1.29	1.26	1.23	19.34	5.074
2018-19	2.35	1.28	1.17	1.29	17.88	4.794
<b>Total</b>	<b>18.36</b>	<b>14.39</b>	<b>18.56</b>	<b>17.19</b>	<b>200.84</b>	<b>53.868</b>
<b>Mean</b>	<b>2.04</b>	<b>1.59</b>	<b>2.06</b>	<b>1.91</b>	<b>22.32</b>	<b>5.984</b>
<b>Co-Variance</b>	<b>0.18</b>	<b>0.094</b>	<b>0.41</b>	<b>0.55</b>	<b>7.87</b>	<b>1.8208</b>
<b>Standard Deviation</b>	<b>0.593109</b>	<b>0.359334</b>	<b>0.690745</b>	<b>0.917872</b>	<b>1.901924</b>	<b>0.892</b>

Above table shows that the banks on an combined average of Non-interest income to working fund is 5.984, against AEBC Bank mean is 22.32 which is highest and 1.91 is lowest mean of Deutsche Bank. Standard Deviation of Non-Interest income to Working fund of AEBC Bank has 1.90 with highest CV 7.87%. HSBC Bank has lowest standard deviation (0.35) with lowest CV 0.094.

**Table 4: ANOVA result of Non-Interest Income to Working Fund (%)**

Source of Variation	SS	Df	MS	F	P-Value	F crit
<b>Between Group</b>	3001.33	4	750.33	412.14	6.36	2.61
<b>Within Group</b>	72.82	40	1.82			
<b>Total</b>	3074.15	44				

Above table shows that the result of ANOVA analysis and whether there is F- calculated (412.14) is greater than F-critical (2.61), on the basis of that Non-Interest Income to Working Fund of selected banks different significantly.

### 6.3 Operating Profit to Working Fund

**Table 5: Operating Profit to working Fund**

Year	Citi Bank	HSBC Bank	SC Bank	Deutsche Bank	AEBC Bank	Mean
<b>2010-11</b>	3.16	3.08	4.6	3.94	0.36	3.028
<b>2011-12</b>	2.96	3.5	3.88	4.71	0.96	3.202
<b>2012-13</b>	3.34	3.07	4.04	5.26	-1.41	2.86
<b>2013-14</b>	4.01	2.35	4.05	3.04	-0.24	2.642
<b>2014-15</b>	4.25	2.4	4.68	4.65	-0.81	3.034
<b>2015-16</b>	4.19	2.75	3.68	3.78	1.83	3.246
<b>2016-17</b>	4.59	3.14	3.42	3.35	3.62	3.624
<b>2017-18</b>	4.48	3.25	2.82	2.47	3.89	3.382
<b>2018-19</b>	4.54	2.93	2.51	2.64	3.54	3.232
<b>Total</b>	<b>35.52</b>	<b>26.47</b>	<b>33.68</b>	<b>33.84</b>	<b>11.74</b>	<b>28.25</b>
<b>Mean</b>	<b>3.95</b>	<b>2.94</b>	<b>3.74</b>	<b>3.76</b>	<b>1.30</b>	<b>3.138</b>
<b>Co-Variance</b>	<b>0.396</b>	<b>0.145</b>	<b>0.537</b>	<b>0.948</b>	<b>4.07</b>	<b>80.34</b>
<b>Standard Deviation</b>	<b>0.593109</b>	<b>0.359334</b>	<b>0.690745</b>	<b>0.917872</b>	<b>1.901924</b>	<b>0.892</b>

Above Table indicate the operating profit to working fund. Average of combined Banks has 3.138, Citi Bank has highest bank average 3.95 of operating profit to working fund and AEBC Bank has lowest average 1.30. Standard deviation of combined selected bank is 0.892, highest standard deviation has AEBC banks (1.90) with highest co variance (4.07) and HSBC has lowest standard deviation 0.35 with lowest variance 0.145.

**Table 6: ANOVA result of Operating Profit to working Fund**

Source of Variation	SS	Df	MS	F	P- Value	F crit
<b>Between Groups</b>	43.26	4	10.81	8.87	3.17	2.61
<b>Within Groups</b>	48.76	40	1.22			
<b>Total</b>	92.02	44				

Above table shows that the result of ANOVA analysis and whether there is F calculated (8.87) is greater than F Critical (2.61), on the basis of that Operating Profit to Working Fund is significantly different of selected banks.

### 6.4 Return on Assets

**Table 7: Return on Assets**

Year	Citi Bank	HSBC Bank	SC Bank	Deutsche Bank	AEBC Bank	Mean
<b>2010-11</b>	0.96	1.68	2.44	7.95	1.67	2.94
<b>2011-12</b>	1.64	1.97	1.49	2.58	0.2	1.576
<b>2012-13</b>	2.12	1.81	1.2	2.98	-3.23	0.976
<b>2013-14</b>	2.07	1.26	2.42	1.54	-3.46	0.766
<b>2014-15</b>	2.43	1.33	2.42	2.55	-2.22	1.302
<b>2015-16</b>	2.2	1.53	0.75	1.83	-0.64	1.134
<b>2016-17</b>	2.45	1.76	1.7	1.39	0.96	1.652

<b>2017-18</b>	2.23	1.76	1.31	1.14	1.27	1.542
<b>2018-19</b>	2.57	1.67	1.38	1.27	0.36	1.45
<b>Total</b>	<b>18.67</b>	<b>14.77</b>	<b>15.11</b>	<b>23.23</b>	<b>-5.09</b>	<b>13.338</b>
<b>Mean</b>	<b>2.07</b>	<b>1.64</b>	<b>1.67</b>	<b>2.58</b>	<b>-0.56</b>	<b>1.48</b>
<b>Co-Variance</b>	<b>0.248</b>	<b>0.053</b>	<b>0.379</b>	<b>4.48</b>	<b>3.79</b>	<b>1.79</b>
<b>Standard Deviation</b>	<b>0.469731</b>	<b>0.216459</b>	<b>0.580372</b>	<b>1.995765</b>	<b>1.836568</b>	<b>1.019779</b>

Above table indicate Return on Assets of selected banks. Average of combined Banks has 1.48, Citi Bank has highest average 2.07 and AEBC Bank has lowest average -0.56. Standard deviation of combined selected bank is 1.01, Deutsche bank has highest SD (1.84) with highest variance (4.48), and HSBC bank has lowest SD (0.21) with lowest variance (0.053).

**Table 8: ANOVA result of Return on Assets**

Source of Variation	SS	Df	MS	F	P-Value	F crit.
<b>Between Groups</b>	52.34	4	13.09	7.31	0.0001	2.61
<b>Within Groups</b>	71.64	40	1.79			
<b>Total</b>	123.98	44				

Above table shows that the result of ANOVA analysis and whether there is F calculated (7.31) is greater than F critical (2.61), on the basis of that Return on Assets is significantly different of selected banks.

### 6.5 Loan to Deposit Ratio percentage

**Table 9: Loan to Deposit Ratio**

Year	Citi Bank	HSBC Bank	SC Bank	Deutsche Bank	AEBC Bank	Mean
<b>2010-11</b>	71.64	50.64	84.22	97.59	207.56	102.33
<b>2011-12</b>	72.80	57.85	86.87	74.51	294.05	117.216
<b>2012-13</b>	78.18	62.79	99.92	107.60	253.5	120.398
<b>2013-14</b>	72.17	56.05	94.88	111.11	358.55	138.552
<b>2014-15</b>	68.49	47.16	93.90	93.54	226.07	105.832
<b>2015-16</b>	61.42	62.51	88.49	98.96	277.09	117.694
<b>2016-17</b>	52.74	53.17	85.66	90.28	249.37	106.244
<b>2017-18</b>	49	55.82	76.75	82.87	316.54	116.196
<b>2018-19</b>	48.16	65.20	63.60	85.95	249.96	102.574
<b>Total</b>	<b>574.61</b>	<b>511.16</b>	<b>774.29</b>	<b>742.40</b>	<b>2432.69</b>	1007.03
<b>Mean</b>	<b>63.85</b>	<b>56.79</b>	<b>86.03</b>	<b>93.60</b>	<b>270.30</b>	114.114
<b>Co-Variance</b>	<b>129.10</b>	<b>35.71</b>	<b>116.58</b>	<b>137.04</b>	<b>2195.37</b>	522.76
<b>Standard Deviation</b>	<b>10.71304</b>	<b>5.634435</b>	<b>10.17942</b>	<b>11.03711</b>	<b>44.17514</b>	<b>16.34783</b>

Above table shows that the combine average of operating profit to working fund has 114.11, highest average of operating profit to working fund has AEBC bank 270.3, HSBC bank has lowest average 56.79. Combined average Standard deviation is 16.35 and CV 522.76, AEBC bank has highest standard deviation 44.17 with highest CV 2195.37, HSBC bank has lowest SD 5.63 with lowest CV 35.71.

**Table 10: ANOVA result of Loan to Deposit Ratio (%)**

Source of Variation	SS	Df	MS	F	P-value	F crit.
<b>Between Groups</b>	282738	4	70684.49	135.21	1.1288	2.61
<b>Within Groups</b>	20910.53	40	522.76			
<b>Total</b>	303648.5	44				

Above table shows that the result of ANOVA analysis and whether there is F calculated (135.21) is greater than F critical (2.61), on the basis of that Loan to Deposit ratio is significantly different of selected banks.

### 6.6 Capital Adequacy Ratio (%)

**Table 11: Capital Adequacy Ratio**

Year	Citi Bank	HSBC Bank	SC Bank	Deutsche Bank	AEBC Bank	Mean
2010-11	17.31	16.04	11.88	15.03	23.61	16.774
2011-12	16.03	16.04	11.05	14.12	19.3	15.308
2012-13	15.09	17.1	13	14.08	18.17	15.488
2013-14	16.49	17.36	12.85	14.84	16.56	15.62
2014-15	15.3	14.84	12.49	15.62	19.07	15.464
2015-16	15.76	15.99	14.43	13.73	21.31	16.244
2016-17	17.63	18.76	14.05	15.38	20.73	17.31
2017-18	17	18.48	15.82	15.22	17.94	16.892
2018-19	16.49	17.89	15.46	16.3	24.36	18.1
<b>Total</b>	<b>147.1</b>	<b>152.5</b>	<b>121.03</b>	<b>134.32</b>	<b>181.05</b>	<b>147.2</b>
<b>Average</b>	<b>16.34</b>	<b>16.94</b>	<b>13.45</b>	<b>14.92</b>	<b>20.12</b>	<b>16.354</b>
<b>Co-Variance</b>	<b>0.77</b>	<b>1.72</b>	<b>2.59</b>	<b>0.38</b>	<b>3.87</b>	<b>1.866</b>
<b>Standard Deviation</b>	<b>0.827447</b>	<b>1.234721</b>	<b>1.516075</b>	<b>0.78003</b>	<b>2.470924</b>	<b>1.36584</b>

Above table shows that the combined average of CAR 16.35, AEBC bank has 20.12 highest average, SC bank has 13.45 with lowest average. 1.36 combined standard average of banks, AEBC bank has highest standard average 2.47 with highest variance 3.87, Deutsche bank has lowest bank 0.78 with lowest variance 0.38. SC bank is consistent during the period.

**Table 12: ANOVA result of CAR (%)**

Source of Variation	SS	Df	MS	F	P-value	F crit
Between Groups	224.96	4	56.24	22.27	9.84	2.61
Within Groups	100.99	40	2.52			
Total	325.95	44				

Above table shows that the result of ANOVA analysis and whether there is F calculated (22.27) is greater than F critical (2.61), on the basis of that CAR is significantly different of selected banks.

**6.7 Net Interest Income to Total Assets (%)**

**Table 13: Net Interest Income to Total Assets**

Year	Citi Bank	HSBC Bank	SC Bank	Deutsche Bank	AEBC Bank	Mean
2010-11	3.65	3.66	3.75	4.51	2.16	3.546
2011-12	3.8	3.43	3.49	6.71	1.38	3.762
2012-13	4.03	3.79	4.18	6.32	-0.11	3.642
2013-14	3.76	2.92	4.11	4.93	-0.63	3.018
2014-15	4.21	3.02	4.23	3.86	0.32	3.128
2015-16	4.18	3.08	4.21	4.14	1.21	3.364
2016-17	4.61	3.69	3.7	4.06	2.66	3.744
2017-18	4.5	3.61	4.02	3.53	3.07	3.746
2018-19	1.19	3.1	3.25	2.95	4.36	2.97
<b>Total</b>	<b>33.93</b>	<b>30.3</b>	<b>34.94</b>	<b>39.89</b>	<b>11.13</b>	<b>30.038</b>
<b>Mean</b>	<b>3.77</b>	<b>3.367</b>	<b>3.88</b>	<b>4.43</b>	<b>1.24</b>	<b>3.3374</b>
<b>Co-Variance</b>	<b>1.04</b>	<b>0.11</b>	<b>0.12</b>	<b>1.71</b>	<b>3.36</b>	<b>1.268</b>
<b>Standard Deviation</b>	<b>0.96261</b>	<b>0.31728</b>	<b>0.332023</b>	<b>1.17515</b>	<b>1.525762</b>	<b>0.8625</b>

Above table shows that combined average of Net Assets interest Income to Total Assets is 3.334%, Deutsche bank has highest average with 4.43%, AEBC Bank has lowest average with 1.24%. Combined Standard deviation is 0.8625 with 1.27 variance. Highest standard deviation 1.52% has AEBC bank with variance 3.36%. Lowest standard deviation has HSBC bank 0.31% with lowest variance 0.12%.

**Table 14: ANOVA result of Net Interest Income to Total Assets**

Source of Variation	SS	Df	MS	F	P-value	F crit
Between Groups	54.87	4	13.72	10.80	4.94	2.61

<b>Within Groups</b>	50.79	40	1.27			
<b>Total</b>	105.65	44				

Above table shows that the result of ANOVA analysis and whether there is F calculated (10.80) is greater than F critical (2.61), on the basis of that Net Interest Income to Total Assets is significantly different of selected banks.

## 7. Findings:

**Table 15: Findings of the study**

Ratios	Hypothesis	Accepted/ Rejected
<b>Interest Income to Working Fund</b>	There is no significant difference between Interest Income to Working Fund of selected Foreign sector banks in India	Rejected
<b>Non-Interest Income to Working Fund</b>	There is no significant difference between Non-Interest Income to Working Fund of selected Foreign sector Banks in India.	Rejected
<b>Operating Profit to Working Fund</b>	There is no significant difference between Operating Profit to working Fund of selected Foreign sector Banks in India.	Rejected
<b>Return on Assets</b>	There is no significant difference between Return on Assets of selected Foreign sector Banks in India.	Rejected
<b>Loan to Deposit Ratio</b>	There is no significant difference between Loan to Deposit ratio of selected of Foreign sector Banks in India.	Rejected
<b>CAR (%)</b>	There is no significant difference between CAR of Foreign sector Banks in India.	Rejected
<b>Net Interest Income to Total Assets (%)</b>	There is no significant difference between Net Interest Income to Total Assets of Foreign sector Banks in India.	Rejected

## 8. Conclusion

Standard chartered bank has highest Interest income to working fund, lowest CAR, Loan to Deposit Ratio during 2010-11 to 2018-19. Deutsche bank showed good in Return on Assets, Operating profit and Net interest income to Total Assets, lowest Non-interest income to Working Fund. AEBC banks showed the lowest interest income to working fund, Return on Assets, Operating Profit, Net Interest income to Total Assets but highest in CAR, loan deposit ratio, Non-interest income to working fund. Standard Chartered Bank and Deutsche Bank shows good performance compare to another selected foreign banks. Research conclude that there is significant difference between selected banks financial performance.

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# Characterization of Municipal Solid Waste Management in Bahir Dar City, Ethiopia

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## Abstract

Solid waste management is a multidimensional and challenging issue faced by developing countries due to huge waste production and ineffective management. The solid waste management (SWM) system was studied to identify the key issues in Bahir Dar and a survey was conducted to provide statistical guidance for effective management of solid wastes. The results show that, the household solid waste (HSW) generation was 0.34 kg per capita per day (kg/c/d) as of 2019. Food waste and yard waste took the majority share (81.08%), the rest were paper and cardboard (7.3%), plastics (4.2%), glass and ceramic (2.36%), metals (0.8%) and other materials (4.25%). The municipal solid waste (MSW) management system practiced in Bahir Dar was to be improved. First, the waste collection and sorting system was weak. Second, the waste composting and recycling efficiency was very low. Third, waste transportation and disposal management were not standardized and environmentally sound. It is suggested that government commitment, full stakeholders' engagement, and investment are essential to achieve the goal of sustainable solid waste management.

**Key words:** Waste Management, Household Waste, Waste Characterization, Bahir Dar

## 1. Introduction

Worldwide population has been growing rapidly, specially in developing countries[1, 2]. Such rapidly growth of population, together with the economic boom and rising and shifting of community living standards has led to an increasing MSW generation rate [2, 3]. The MSW management has become a worldwide challenge[4] [2, 5]. In urban areas, solid waste composition is more complex and heterogeneous[6]. In most of developing cities, the generated solid waste is not managed properly with respect to storage, collection and final disposal, and leads to serious issues [7-10]. Basic municipal solid waste management procedure refers to collecting of solid waste from residential, commercial and public areas, and then transport to the landfill [11,12]. A weak MSW system could lead to atmosphere, water and soil pollution and jeopardizes the public health [13, 14].

The collection stage is identified as a key problem due to the lack of knowledge, ability, and willingness. In developing countries, solid waste collection rate reaches up to 50% [15]. Municipal solid waste management (MSWM) accounts for 20-50% of government budget with 80-90% of that spending on waste collection [16]. However, less than 50% of the population obtains the services[17, 18]. It is very difficult to sustain the SWM system with government budgets [19] and local authorities has started to cooperate with private sectors[20, 21]. In addition, MSWM is strongly influenced by social-cultural, environmental, political, legal, and economic factors, which need to be all addressed to achieve a sustainable MSWM [22].

This study is to assess the entire SWM system in Bahir Dar, quantify and characterize the daily household (HH) solid waste analyze the household features, and then recommend on how to establish a sustainable SW management system.

## 2. Data and Methods

### 2.1 Description of The Research Area

This research was conducted in Bahir Dar, the capital city of Amhara national state of Ethiopia and is divided into 6 sub-cities administration. The city was awarded the UNESCO<sup>1</sup> Cities for Peace Prize in 2002. It is approximately 180km away from the ancient historical city of Gondar and 568 km away from Addis Ababa which is the capital city of Ethiopia. It covers an area of 16,000 hectares and the population has been rising and reached 388,683 in recent years (projection based on figures from Ethiopian Central Bureau of Statistics (ECBS),2007).

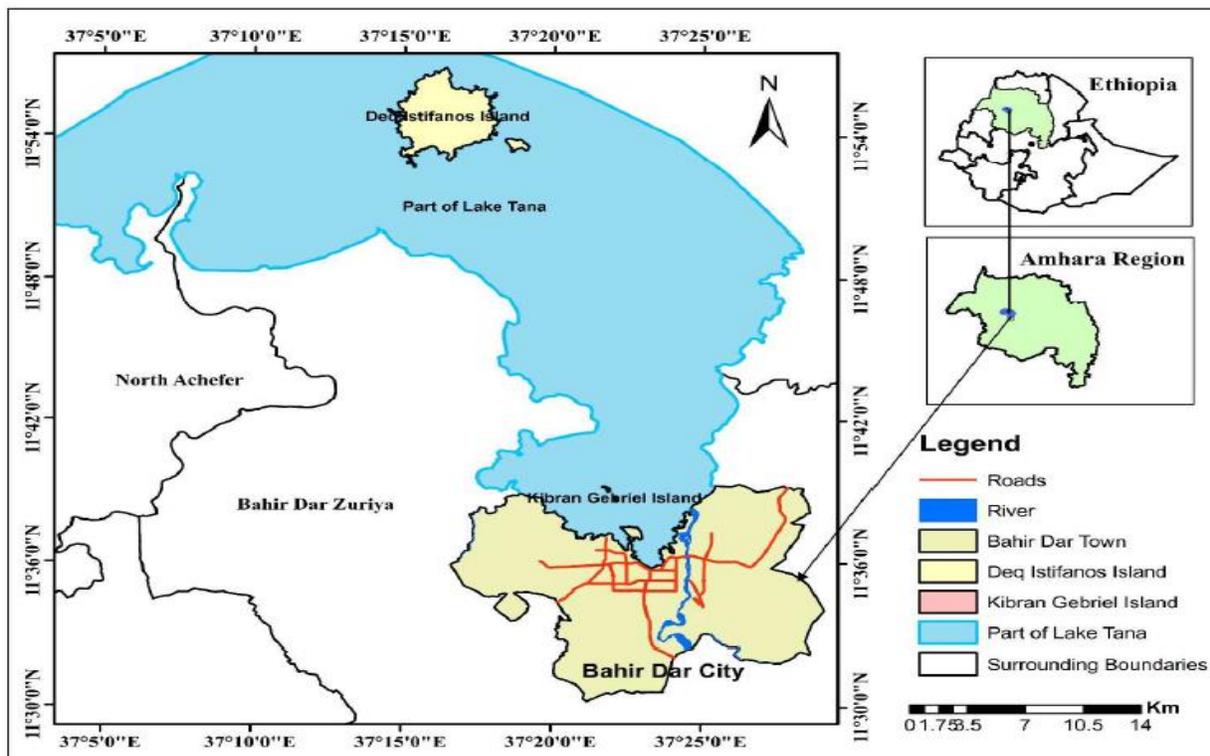


Figure 1: Geographical setting of the study area

Source: - [23]

### 2.2 Municipal Solid Waste Management Survey

A survey is designed to evaluate the current MSWM system. Firstly, interviews along with a questionnaire was completed by households. Secondly, interviews were conducted on micro-size waste collection service providers, MSW administration office

workers and other stakeholders. The questionnaire is designed to collect the data on residents' socio-economic characteristics, behavior pattern (i.e., reuse, waste separation and disposal), willingness and ability of paying for collection services, and their satisfaction level to the current service.

The survey on households (over 15years old) was conducted from Aug to Sep, 2019. It started randomly with the first family then moved towards the next with 4 houses in-between. If the selected household refused, it was replaced by the next one. From Sep to Oct, 2019 face-to-face interviews were conducted on waste collection service providers, transportation service providers and municipal solid waste administration officers. The aim is to collect the information on MSW collection quantities, availability of collection services, collection equipment and transportation, final disposal methods, collection fees, location of disposal site, environmental and socio-economic impact of SW to the city. Self-employed services providers were also included. Field investigation and interviews are conducted for robustness check from Aug to Oct 2019.

### 2.3 Waste Characterization Study

Random sampling techniques are used for computing the household waste composition[24, 25]. As stated by Sharma and McBean, [26] thirty samples are usually enough for solid waste characterization of the whole city. The SW sample collection was conducted in each selected household for eight days in Sep, 2019. Collection of wastes was conducted by giving identical size plastic bag for each 30 households and house code was labelled. At the time of waste collections, additional plastic bag was provided for the following day collection. Each household was instructed only to put their daily solid wastes generated in the plastic bag. To ensure for the accuracy of data, the first day waste was rejected. From the total sample we were analyzed, 16 sample from the Facilo sub city and 14 from the Tana sub city. And the sample size from each location is representative of the respective populations in each sub area. Components of solid waste were separated, measured and recorded based on a standard procedure. each sample was classified into the following components: (1) Glass and ceramics, (2) Plastics, (3) Paper and cardboard, (4) food and yard waste (organic waste), (5) Metals, (6) Other waste (Textiles, leather, wood, ashes, etc.). Data from the various sampling locations were compared using single factor analysis of variance (ANOVA). The F critical values were calculated using an alpha value equal to 0.05 and time steps as the replicate.

## 3. Results and Discussion

### 3.1 Solid Waste Generation and Management in Bahir Dar Municipality

Daily MSW generation in 2019 was roughly 421.125 M<sup>3</sup>/d. The percentage of organic components is the largest. Table 1 shows the MSW generation and the collection amount from different sectors. Including Agriculture and tourism sectors. Community residences sectors, commercial sectors (agricultural, tourist place, hotels, fish markets, shops), institutional sectors (governmental and non-governmental office) and street cleaning sectors. Fig. 2 shows the per capita MSW generated by different cities of Ethiopia.

Table 1. Municipal Solid waste generation from different sources M<sup>3</sup>/day

Sources of solid waste	Solid Waste Generated and collected
Total solid waste generated	421.125
Total Solid waste collected	344.5
MSW Collection rate	82%
Residential Solid waste collection	188.52

Commercial solid waste collection	84.51
Institutional solid waste collection	59.33
Street sweeping collection	12.42

Bahir Dar SW generation rate was 0.44 kg/c/d, it is the second largest. The city Laga Tafo has the highest solid waste generation rate (0.43Kg/c/d), in relation to the population (25,099).

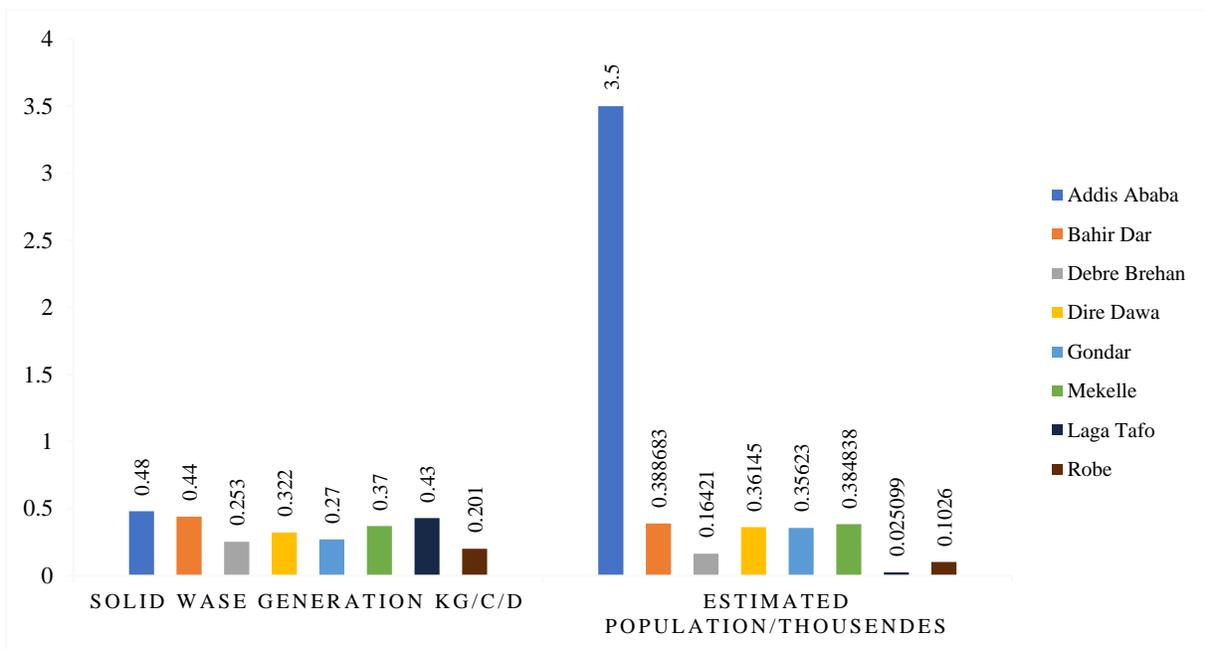


Fig. 1 Compares the per capita MSW generated by different cities of Ethiopia

Citation:- Addis Ababa [27], Bahir Dar [28], Dabre Brehan [29], Dire Dawa and Mekelle [30], Gonder [31], Lada Tafo [32] and Robe [33]

### 3.2 Household Survey

Waste generated from households varies according to income, food habits, numbers of family members, life style, educational and occupational status[34, 35]. 424 households took part in the survey. The majority of respondents (75.7 %) are females. The average family size is around 5. Almost all of the respondents live in the city of Bahir Dar. In terms of income, most households have a monthly income of less than 100.77 USD (62.97%) and only 12% of them obtain over 167.95 USD on the monthly basis.

The current solid waste collection fee is 8 Birr (\$ 0.27) per month. Based on the results, 59.2% of households would be able to pay 15 Birr (\$0.5) their payment per month for a better waste management service (at least 3-day interval waste collection). 40.8% of the households would be able to pay around 21 Birr (\$0.7) dollars in the monthly basis for daily waste collection service. The majority of households is not satisfied with the current services provided. Most of the community use sack for storage of the waste. It is interesting to note that 75% of respondents show willingness to volunteer in public campaigns. Regarding to the current waste

disposal practice of respondents, disposing waste at road sides and open fields, burry inside of compound and burn in their surroundings, has a present share of 7%, 1.8% and 9.5% respectively and mostly men are more responsible for such action.

Table 2 Demographic Characteristics of Respondents

Variables	Response Rate	Percentage
<b>Sex</b>		
Male	112	26.42
Female	312	73.58
Total	424	100
<b>Family size</b>		
1 - 3	116	27.36
4_7	256	60.38
8 and above	52	12.26
Total	424	100
<b>Monthly in come in Dollar</b>		
Less than 100.77	267	62.97
100.77 - 167.95	93	21.93
Greater than 167.95	51	12.03
Not mentioned	13	3.07
Total	424	100
<b>Level of satisfaction for SW service provided by municipality</b>		
Fair	108	25.47
Unsatisfactory	237	55.90
Very unsatisfactory	79	18.63
Total	424	100
<b>Waste disposal practice</b>		
Door to door collection service		81.7
At the road sides and open fields		7
Burry inside the compound		1.8
<b>Burn in the compound</b>		<b>9.5</b>

### 3.2.1 MSW Service Provider

SW cooperation's provide weekly collection services in residential areas, and daily services a for institutions, commercial and some industrial sectors. The collection rate has been increased to 82% compared to 71% in 2010. However, the uncovered collection area leaded to illegal waste disposal and water pollution in lake tana as well as Blue Nile river.

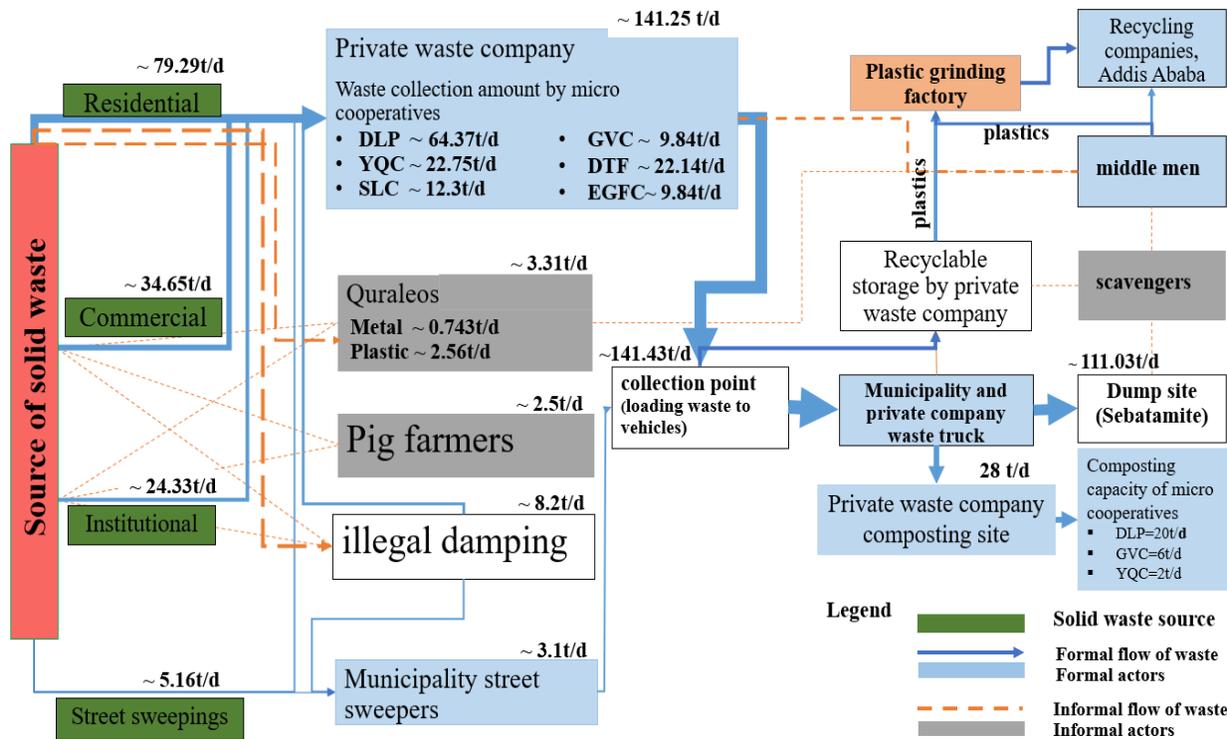


Figure 2: - The current solid waste system Process flow chart of Bahir Dar City.

Source: - 2019 survey.

Abbreviations: - DLP dream light SW plc, YQC Yifestemal Qalu SW Cooperative, SLC Sira Lehiwote SW cooperative, GVC Green Vision SW cooperative, DTF Diresse, Tigiste and their friend SW cooperatives, EGFC Emenat, Guadie and their friend's SW cooperatives

The municipality SW office provide all the vehicle for solid waste collection and transportation. Around 10 trucks and trickles are deployed. In light of this, all the vehicle used currently are not standard for the operation of SW transportation. They have no any cover and any facility to contained the flued generated from waste. Moreover, most of the vehicles and equipment are in need of replacement for the quality of service, for the health of SW collection workers, to the community and to minimize the environmental damage.

### 3.2.2 Waste Sorting

The major drawback of the MSW management system in Bahir Dar is the weak waste sorting stage. 42.6% of the respondents sort the waste in to bio degradable and non-bio degradable categories. It was observed that some of the waste collectors segregate recyclable wastes at source or temporary waste transfer station. Some street rag pickers segregate recyclable material such as plastics, glass and metallic items from illegal dumping areas and Sebatamite disposal site for their living income.

### 3.2.3 Waste Recycling

According to the data from Bahir Dar SW municipality office, less than 28 tonnes per day (19.8%) of waste are used to produce compost. There are 3 micro-cooperation's participated in compost production, Dream Light PLC, Yifestemal Qalu and Green Vision

treat 20t/d, 6t/d and 2t/d bio degradable city wastes respectively. In addition, recyclable material is mostly (metal, plastic, old shoes and clothes) collected by Quraleos and Liwach with door to door services. The recycled materials are sold to the recyclers, agencies or directly to plastic grinding factory.

### 3.2.4 Disposal System

Waste disposal is also an important problem. The Sebatamite dumpsite is the only legal site and it is around 6 Km from the center. The site is an open area of around 150,000M<sup>2</sup> with the following issues:, formal cell creation for the daily fill of waste dumped, there is no leachate containment or protection at the bottom like a geo-membrane nor any required infrastructure, leachate management pond, landfill gas management(vent), final soil cover and compaction process conducted in a very limited range, drainage for controlling the rain water, and fenced with a gate.

Due to lack of awareness and control, dead animals and hazardous waste such as battery are also disposed into the site. In the rain season, flood with leachate may contaminate the river, and the downstream communities' activities, such as farming, washing and basing are significantly affected. Such poor management resulted in socio-economic problems and ecological damage. Recently the SWM office has been working with different governmental and nongovernmental organization to addresses the environmental impact caused by this site. There are a series of actions to be undertaken within the frame work collaborations of UN-Habitat supporting for the improvement of the current disposal site and the design of a new sanitary landfill. World Bank is planning to provide financial support for the construction. In light of this, the municipality SW office should encourage citizens to compost the biodegradable waste at community level to reduce the overall volume of waste to be disposed at dumpsite.

### 3.3 Household Solid Waste Generation

**Table 3**, shows household waste generation rate by different days of a week, total waste generated and by waste fractions. Total weekly SW generation amount was found 349.4 kg/week and average daily solid waste generation was 49.91 kg/day. Based on 30 sampled households, the average family size was around 5. A total sample of 147 persons used for the analyzing per capita daily generation rate. Per capita/day waste generation rate was computed. The household waste generation rate of the city was 0.34 kg/person/day, which is within the estimated range of 0.09-3 kg/person/day in the African region [36].

Table 3  
 Household waste generation rate and composition in different day Kg/week

Days	Total SW	SD	Food and yard	SD	Paper and card board	SD	Plastic	SD	Glass	SD	Metal	SD	Others	SD
Monday	47.70	0.35	38.64	3.65	3.77	0.36	1.91	0.18	1.05	0.10	0.38	0.04	1.96	0.18
Tuesday	48.40	0.36	38.24	3.68	3.68	0.36	2.13	0.20	1.11	0.11	0.44	0.04	2.81	0.27
Wednesday	48.10	0.36	38.96	3.71	3.85	0.37	1.97	0.19	1.44	0.14	0.34	0.03	1.54	0.15
Thursday	47.90	0.36	37.88	3.60	3.98	0.37	2.16	0.21	1.44	0.14	0.43	0.43	2.01	0.19

Friday	48.50	0.37	38.80	3.88	4.37	2.32	1.94	0.19	0.97	0.10	0.44	0.44	1.99	0.20
Saturday	53.00	0.33	43.99	4.22	3.07	2.36	2.17	0.21	1.11	0.11	0.32	0.32	2.33	0.22
Sunday	55.80	0.44	46.78	4.43	2.90	2.38	2.28	0.22	1.11	0.11	0.50	0.50	2.23	0.21
Sum	349.40		283.28		25.61		14.56		8.24		2.84		14.86	
Average	49.91		40.47		3.66		2.08		1.18		0.41		2.12	
% share			81		7.33		4.17		2.36		0.8		4.25	
ANOVA(F)	0.01		0.11		0.29		0.07		0.38		0.37		0.50	

### 3.3.1 Waste Generation in Groups with Different Socio-Economic Status and Family Size

In the random selection of household survey, 16 low income, 8 middle income and 6 high income households were approached. There were no high variations among the three groups in terms of the waste generation rate (Kg/capita/week, ANOVA,  $F = 0.01$ ,  $p = 0.92$  check). The whole sample shows that food waste was the major component (80.4–82.77%) followed by papers and card board and plastics respectively. Table 4 describes household waste generation and composition of different socioeconomic groups. In the low-income class, the population is 85 and waste generated per week was 154.3Kg with the average waste generation rate of 0.259kg/c/d. food waste were take the major composition of SW share (82.77%) the rest are paper and card board waste (6.02%), plastic (3.89%), glass and ceramics (2.33%), metals (0.84%), and others (4.1%). The middle-income class has a population of 39 and the average waste generated were 93.9Kg with a generation rate of 0.583kg/c/d. The compositions were food waste (79.13%), paper and card board waste (9.3%), plastic (4.15%), glass and ceramics (2.37%), metals (0.79%), and others (4.25%). The high-income group has 23 persons in total and the total waste generated were 93.9Kg with the average generation rate of 0.583kg/c/d. Waste composition were food waste (80.4%), paper and card board waste (7.35%), plastic (4.58%), glass and ceramics(2.34%), metals (0.85%), and others (4.47%). The high biodegradable waste percentage suggests more frequent collection and removal services, and indicates a potentially booming bio-waste recycling industry.

Table 4

Generation rate and HH waster composition in different socio-economic groups in the city.

Socio-economic groups	Total population in each socio economy group	Total waste generated in Kg/week	Generati on rate kg/c/d	Food and yard %	Paper and card board %	plasti cs %	Glass and ceramic s %	Meta l %	Other s %	SD
low income	85	154.400	0.259	82.77	6.02	3.88	2.33	0.84	4.15	32.43
middle income	39	101.100	0.370	79.13	9.30	4.15	2.37	0.79	4.25	30.74

High income	23	93.900	0.583	80.40	7.35	4.58	2.34	0.85	4.47	31.30
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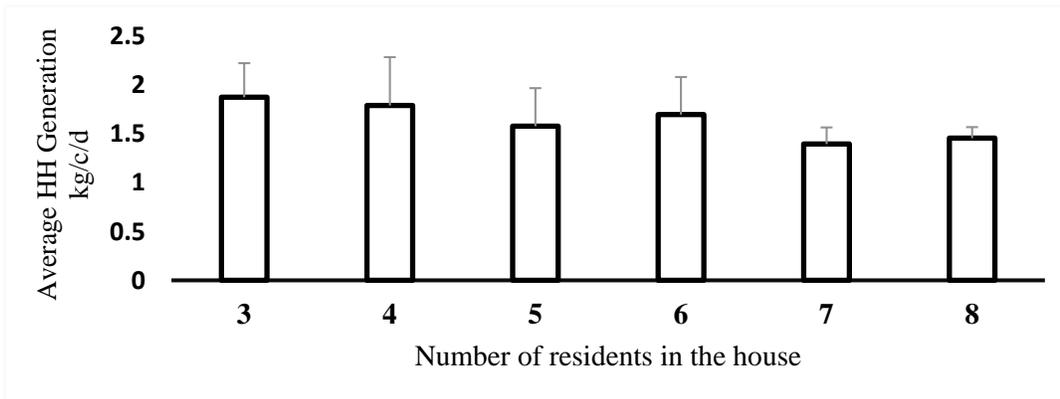


Fig. 3. The relationship between family size and per capita household waste generation rate.

In the statistical analysis of HH family size, most of the family were 4-6 person per households and household SW generation rate differs among households with different family size (Fig. 3). The highest amount of HH waste generation rate is recorded was 2.48 Kg/c/d in high socio-economic household with 4 family members. And the smallest amount of household SW was 1.29 Kg/c/d in the low socio-economic group with 5 family members. Families with 8 members and low income have the average quantity of 1.46 Kg/c/d and it ranges (1.3-1.6 Kg/c/d), In the group of household with 7 family members, the mean waste was 1.4Kg/c/day (range between 1.2-1.7 Kg/c/d), In the group of household with 6 family members, the mean 1.7Kg/capita/day and (range between 1.2-2.7 Kg/c/d). In the group of households with 3 family members, the mean 1.88 kg/c/d (range between 1.3-2.5 kg/c/d). Table 5 presents the statistical analysis of SW generation in groups with different family size. Families with 5 members generates the maximum 107.37 Kg/c/w household waste in a week. Households with 4 family members generate the maximum daily amount of waste (1.23-2.8kg/c/d). Correlation between household waste generation and family size was not too high ( $r = 0.318$ ,  $p = 0.086$ ). The outcomes are in line with the findings of [37] who have find out correlation between waste generation rate and the family size in their studies.

**Table 5**

Waste generation rate in groups with different family size

Size of the household	Frequency	Total waste generated /family size/week	Range		Mean	SD	Variance	ANOVA (F)	95% Confidence level of mean	
			Min	Max					Lower bound	Upper bound
3	5	65.67	1.30	2.50	1.88	0.35	0.12	2.07	1.73	2.02
4	6	75.26	1.23	2.80	1.79	0.50	0.25	2.03	1.76	1.83

5	10	107.37	1.10	2.10	1.58	0.39	0.07	1.70	1.42	1.65
6	6	71.34	1.20	2.70	1.70	0.39	0.15	0.44	1.57	1.83
7	2	19.56	1.20	1.70	1.40	0.17	0.03	2.30	1.25	1.54
8	1	10.20	1.30	1.60	1.46	0.11	0.01		1.35	1.56

### 3.4 Waste Compositions

Understanding the composition of household solid waste is essential for good solid waste management (reuse, reduction, and recycle). Literature suggests that household waste composition is closely related to socio-economic status of households, cultural conditions, food habits, season, geographical locations, etc. [38, 39]. Figure 4 shows the household wastes composition and their percentages generated in Bahir Dar community. Food wastes account for main fraction of the household waste. 81.08% is organic waste (food and yard), the rest are paper, plastics, glass and ceramics, metals and other waste (7.3%, 4.2%, 2.36%, 0.8% and 4.25%, respectively).

The main fractions are biodegradable waste contains (food and yard, paper) having the share ranges between 84.3 and 90.4%. Non-biodegradable ranges from 9.6 to 15.6%. The percentage of other waste (old shoes, textiles, leather and ash etc.), and wastes less than 10 mm is around 4.25% in average. Moreover, MSW composition have been an organic content of 74.6% and 25.4% inorganic waste released by UNEP (2010a). All these results indicate a substantial potential for resource composting and biogas production. It will reduce the amount of landfill waste, and help local industries (agriculture) to do soil amelioration.

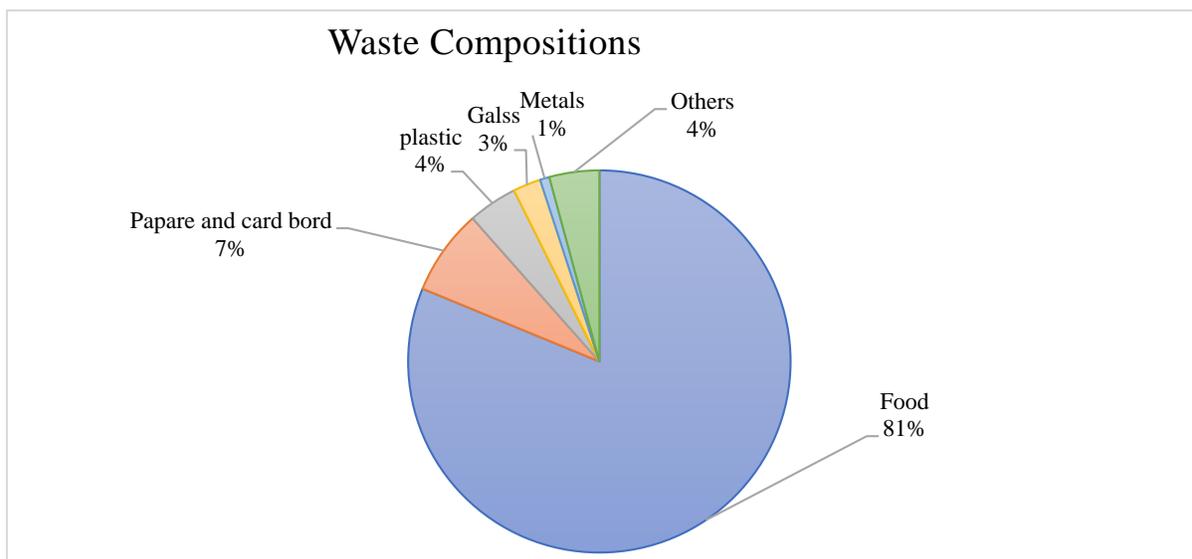


Figure 4: - household solid waste composition of Bahir Dar city.

Source: - 2019 survey

The composition and estimates of solid waste generated in Bahir Dar community could be considered representative for other cities of Amara national state communities with similar population. The generation and composition of solid waste changes with per-capital income, consumption habits, family, etc. Results showed that hazardous waste has a share of 0.2% and most of them are dry cells, fluorescent lamps and chemical contaminated containers for insect killers. Such waste has been collected and stored separately at household level and dumped separately in a specially designed landfill site. However, the management of this waste category has not been investigated thoroughly.

#### 4. Conclusion

This study carried out in the city of Bahir Dar, emphasized the existing situation of the SWM systems from the point of view of citizens and SWM program operators. Also, it investigates the residential solid waste and its components. The results show that solid waste collection, transportation, and disposal procedure is not standardized and environment friendly. The municipality generates 421.215M<sup>3</sup> solid waste per day. HSW generation rate is 0.33kg/c/d. 82% of the localities have access to SW collection service. 81% of household waste are organic which provides business opportunities for compost and biogas industry. Seasonal variations may also have a significant impact on analyzing waste components [40]. Therefore, the research in the future could be conducted in all seasons to give a comprehensive picture of the household.

In conclusion, waste sorting at source is vital for building a good waste management system. Understanding the current waste fraction is important for a better system. Apart from that, it is suggested to enhance the public awareness, build up necessary facilities, ensure a close collaboration with government other organizations, seek the worldwide technical and financial support. The ultimate goal is to help reducing ecological damage and health hazards drastically.

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## Abbreviations

ECBS	Ethiopian central Bureau statistics
HH	household
HSW	household solid waste
MSW	municipal solid waste
SW	Solid waste
SWM	Solid waste management

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# Land use and land cover change and its driving forces in Endachewa catchment, Tigray, Ethiopia

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## Abstract

The aim of this study was assessing the land use and land cover (LULC) change and its driving forces analyzed for the last 42 years in Endachewa watershed, Tigray Northern Ethiopia. Major drivers of Land-use/Land-cover (LULC) dynamics and the observed environmental degradation as a response to these changes in the Endachewa watershed, Northern Ethiopia were studied. Data for this study were generated through analyzed of household heads' perceptions supplemented with interpretation of landsat images. The data were analyzed using descriptive statistics and Land sat-based image processing. The satellite image classification of the five periods (1976, 1988, 1998, 2009 and 2018) result and farmers' response indicated significant land use and land cover change of the study area. Over the 40 years, the aerial coverage of forest, Bare Land and bush land were decreased from the study beginning year 1976 LU coverage by 275.76 ha (100%), 622.53 ha (72.08%), and 451.62 ha (41.9%), respectively. On the other hand, farmland and water body has increased by an aerial coverage of 1334.7 ha (108 %) and 14.49 ha (100%). This shows that most of the previously covered by forest and bare lands are mostly shifted to the rapidly expanding farm land use classes. This was due to the conversion of forest, bush lands, and bare lands to farm lands. This shows an increase in the expansion of farm lands at the expense of all the other three land use and land cover change types, but mostly at the expense of forest and bare lands. With regard to the Proximate Driving Forces of LULC changes, it is revealed that Population Growth, Agricultural expansion, Infrastructure and Settlement Expansion were major driven force of land use and land cover change in the study area.

**Key words:** *Ethiopia; Land Use and Land Cover Change; Endachewa watershed; Land sat images*

## 1. Introduction

Throughout the course of human history, the land has been tightly attached to economic, social, infrastructure, and other human activities [1]. Land use and land cover (LULC) are distinct yet closely linked. While land cover refers to the ecological state and physical appearance of the land surface (such as closed forests, woodlands or grasslands) [2]. Land use/cover is a composite term, which includes both categories of land cover and land use [3]. The land use/cover pattern of a region is an outcome of natural and socioeconomic factors and their utilization by the man in time and space [4]. Land cover change occurs through conversion and

intensification by human intervention, altering the balance of an ecosystem, generating a response expressed as system changes [5]. For centuries, humans have been altering the earth's surface to produce food through agricultural activities [6]. In the past few decades, conversion of grassland, woodland, and forest into cropland and pasture has risen dramatically, especially in developing countries where a large proportion of human population depends on natural resources for their livelihoods [7]. The increasing demand for land and related resources often results in changes in land use/cover [6] and it has local, national, regional, and global causes [8]. Land use/cover dynamics are widespread, accelerating, and significant process driven by human actions [9], but also producing changes that impact humans [10]. There are several important Factors influencing LULC, one of the key factors is human population growth [11]. Increase in population and a continuous decline in the amount of agricultural land have led to an indiscriminate exploitation of natural forests and fragile lands for agriculture [12]. Population growth is a major driving force in land cover change and contributes to resource degradation [13]. Deforestation and forest degradation have been influenced by a combination of underlying driving forces, including unclear land tenure, poor economic conditions, population growth, market (wood extraction), and sociopolitical factors [14]. On top of the rapid change in LULC of forestland, grazing land or bush lands to cultivated lands is becoming a common practice in most parts of Ethiopia [15]. Other important drivers of LULC change includes policies related to human settlement and land tenure [16] and agricultural [17]; changes in technology [18], culture [19] and political or socio-economic institutions [20].

The size of Ethiopian population was 40 million in 1984, 53.4 million in 1994, 73.7 million in 2007, 84.2 million in 2012, 85.89 million in 2013 as projected by (CSA), this population become nearly 100 million in 2015 [20] and now in 2018 according CSA 109,224,414. Rain fed agriculture is the major economic activity of the country providing employment for over 85 percent of the population [21]. Ethiopia's forests have suffered owing to harsh deforestation and degradation from an increased demand for fuel wood, construction wood, and cropping and grazing land [22].

Understanding the dynamics and driving forces behind LULC changes at the local level is fundamental to development planning, and the analysis of land-related policies [23], and understanding of possible future choices [24]. LULC changes have increasingly become a key research priority for national and international research programs examining global environmental change and impact analysis of the changes, which is a standard requirement for land use planning and sustainable management of natural resources as highlighted by many researchers [25]. Determining the effects of LULC changes on the ecosystem requires knowledge of past land use practices, current LULC patterns, and future projections [13]. LULC change studies are proven essential for the qualification and quantification of central environmental processes and environmental change [26]. It is also vital for the influence of environmental management on biodiversity, water budget, radiation budget, trace gas emissions, carbon cycling, livelihood [26], urban and rural agricultural land use [11], [27], and a wide range of socioeconomic and ecological processes [28]. Which in the aggregate affects global environmental change and the biosphere [20].

LULC changes can affect biodiversity, biogeochemical cycles, soil fertility, hydrological cycles, energy balance, land productivity, and the sustainability of environmental services [29]. Hence, there is a need for continuous monitoring of the changes and prediction [30]. It is a highly persistent that when the aggregated effects on environmental change globally. Consequently, it significantly affects the functioning of the earth's systems directly contributing to climate change [31]. LULC changes result in soil erosion and the formation of gullies, which are among the major cause of land degradation [32]. The highest average rates of soil loss are from previously cultivated lands, which are presently unproductive because of degradation and improper land use [33].

Land use through inappropriate agricultural practices, high human and livestock population pressure have led to severe land cover change. In Ethiopia, also most people lives in rural areas and depends directly on land for their livelihood [34], futhermore, the woody biomass fuel of households [35]. As a result, soil erosion, biodiversity loss, and land degradation occur in the study area. Soil erosion will again lead to loss of groundwater due to poor infiltration capacity and washed away of the soil nutrient and desertification will occur. These all evidences will contribute to low productivity leading to poverty. Therefore, a systematic analysis of LULC change is so crucial to exactly comprehend the extent of the change. Studies of LULC changes in the Ethiopian highlands concentrates in the Northern Ethiopian highland areas early settled and where population pressure is relatively high [36]. There have been very limited studies LULC change and driving force in the study area northern regions of the country. Even if there are a few studies conducted in Northern Ethiopia, there is no study on land use and land cover change in Endachewa watershed. LULC change is basic data on the extent and trend in the study area that would help for planning and the adoption of sustainable land management practices. In addition, it helps to understand the extent and the trend of LULC changes

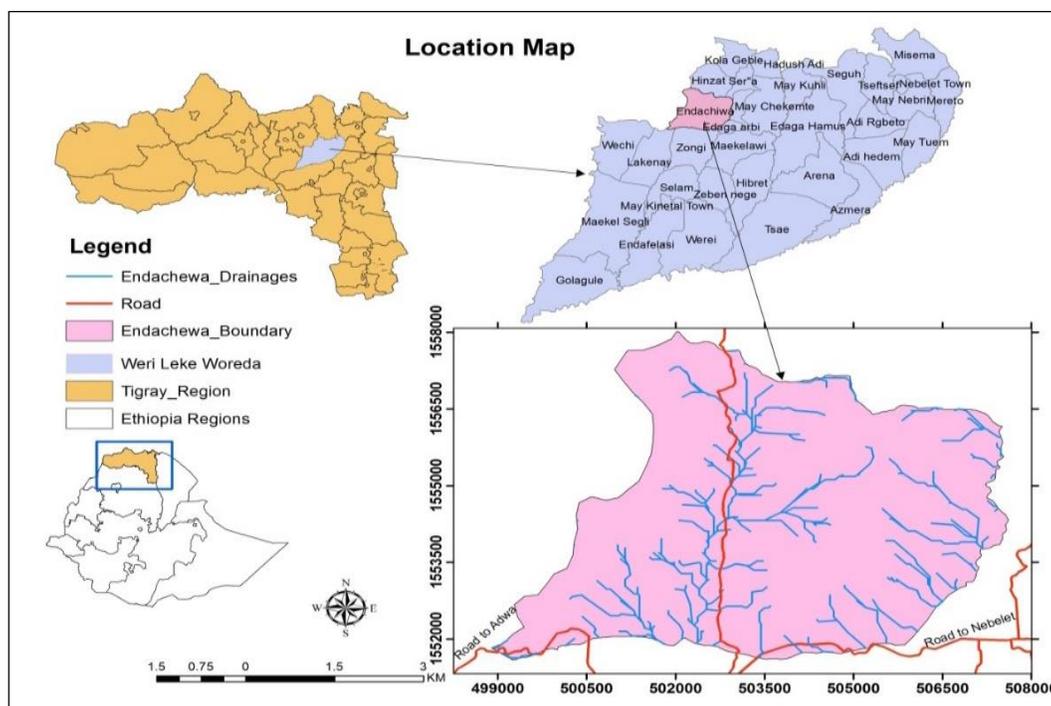
and its impact on communities' livelihood. Such studies are scanty in the present study area. Therefore, this study is mainly aimed to analyze the trend and driving forces of land use and land cover change in the watershed.

The general objective of the research was to assess land use and land cover change and its driving forces analyzed for the last 40 years in Endachewa watershed, Tigray Northern Ethiopia.

## **2. Materials and Methods**

### **2.1. Background of the study area**

Endachewa watershed is located in Tigray Regional State W/Leke woreda of Northern Ethiopia. The study area is located about 160 km west of Mekelle city, the capital of the Tigray Regional State. The watershed is located within 14<sup>0</sup> 02'12" N -14005'42" North latitude and 38059'26" E- 39004' 17" East longitudes, at an elevation range between 1941 m and 2406 m above sea level. It has a mid-latitude type of agro-ecology. The total area of the study area is **3452.47** ha.



**Fig 1: Location map of the study area**

The topography of the study sites is varied and includes some flat and gentle slopes as well as steep escarpments. The altitude of the area ranges from 1,941 m.a.s.l. At the lower limit to 2406 m.a.s.l at the plateau. Considering FAO's (2010) slope classification scheme, more than half of the study area is sloppy type topography [37]. Very flat and steep land surface covers very little coverage (3%).

The rainfall in the study area was disproportionately distributed throughout the growing months. The annual rainfall is influenced by the planetary wind pattern and topography, the yearly rainfall trend is real and its peak time during the summer months, and low values during the winter months. The rainfall taken from meteorological data was used to assess seasonal and annual variability. The rainfall patterns in the study area for the period's between 1990-1995 showed that there slightly decreases in rainfall pattern. Results revealed that a cyclic pattern of variations with alternating drier and wetter years is suggested. The decrease in annual rainfall trend over the past almost 40 years. The linear fit rainfall trend showed that variability observed in the three decades. However, between 2000 -2005 owed a slight increase and drastically this area are characterized by erratic rainfall and frequent droughts. The negative slope shows decrease in rainfall trend. The rainy season is between June and September.

## 2.2. Data acquisition and pre-processing

This research was dependent on primary and secondary data source. Field surveys were carried out by distributing a questionnaire to collect primary data, and understand the real ground and their impact. The field survey was supported by key informant interviews to gather information about the issues land use/ land cover change and to prepare the base map for analysis purpose and applying the different methods to achieve the researching objectives. GIS images (1976- 2018) of the study area was collected from the official map producer/owner called USGS.

The major data collection instruments were questionnaires, and key informant interviews to investigate the land use/land cover change and its driving forces in the study area. Both open and close-ended questioners were prepared in English and translated to local language ‘Tigringa,’ and The study was used purposive sampling technique. Hence, the study was involving 184 respondents for questionnaire. Besides, 39 participants for key informant interview and focus group discussion were involved.

For data processing visual image interpretation and digital image interpretation techniques were used. Signatures of the classes were identified from satellite imageries and verified in the field. Five classes of the land cover were created. Image pre-processing techniques were carried out including Geo-referencing, resampling, and image enhancement before initiation of the analysis. Enhancement techniques were applied to satellite image in order to increase visual distinctions between features and increase the amount of information that can be visually interpreted from the data. For accurate image classification, band selection also crucial since one feature which is not discriminated apparently may be clearly differentiated on another band. For this purposes false color composite (False color composite = 4:3:2) and true color composite (True color composite =3:2:1) were utilized. The Landsat MSS 1976, Landsat TM 1988, Landsat TM 1998, Landsat TM 2009 and Landsat OLI 2018 images have four, seven and twelve bands respectively with a spatial resolution of 60 meter and 30 meters.

Image correction compensates for distortion, errors, and noise during data acquisition and recording. In order to prepare the land cover of the years 1976, 1988, 1998, 2009 and 2018, the Landsat images have been pre-processed using standard procedures including Geo-referencing and geometric correction (Image rectification). Image rectification is an important procedure for many image processing applications. Simply, it is the process of converting a raw image into a specified map projection.

All images were spectrally enhanced on the rectified image to improve or increases the visual appearance and interpretability of imagery. Enhancements like principal components analysis, the tasseled cap transformation, etc. were utilized.

The final step of the processing portion is to layer stacking the different bands which would then be classified. Therefore, layer stacking was applied to extract the images of the study site (Endachewa). This had been done in ERDAS Imagine using the "Layer Stack" algorithm. unsupervised classification with ISODATA classification algorithm has been applied to identify the locations and directions of the individual land cover of the site. This is useful for generating a basic set of classes, and subsequently, supervised classification were applied to further definition of classes.

The satellite imageries for this study were Land sat MSS1-4, L5 TM & OLI L8 (1976, 1988, 1998, 2009 and 2018). These satellites were taken at different months and dates because of the cloud cover. Therefore, for the sake of clarity, the study was used at different times. The Digital elevation model (DEM) of the study area with 30 m by 30 m resolution, from Aster Global DEM was obtained. These data were used to examine the land use, land cover, and the topography of the study area in general by using ERDAS Imagine 2014 and Arc GIS 10.6 software.

The types of satellites with their acquisition of dates, path and row, as well as resolutions used in this study are summarized in Table 1.

*Table 1.- Details of satellite data acquisition*

No	Satellite Sensor	Acquisition date in day/months/year (G.C)	Path	Row	Resolution
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1	Landsat 1-5 MSS	25/01/1976	169	050	60m*60m
2	Landsat 5 TM	02/01/1988	169	050	30m*30m
3	Landsat 5 TM	29/01/1998	169	050	30m*30m
4	Landsat 5 TM	13/12/2009	169	050	30m*30m
5	Landsat 8 OLI TIRS	20/01/2018	169	050	30m*30m

As we have used Landsat images with 60 and 30 m resolution, our land cover classes become depending on pixel based image classification. This pixel based image classification better classifies five classes within the study area. These are defined or described as follows (*Table-2*):

**Table-2. The Land Cover Classification Scheme utilized in this study**

No	Class Name	Description of the Land Cover Class
1	Forest Land	Total canopy cover $\geq 20\%$ [(typically areas encompassed with Woody plants, a mix of more trees of enrichment planting and natural re-vegetation, on average $\geq 2\text{m}$ height & an area of $> 0.5$ hectare (MEFCC, 2015).
2	Farm Land	Refers to land surface covered with Cropland, irrigated land, agro-forestry and other heterogeneous agricultural areas. (MEFCC, 2015).
3	Bare Land	Refers to those land surface features little or devoid of any type of vegetation cover which includes degraded areas, rocky areas, gullies, bare soil, etc. (FAO, 2010)
4	Bush Land	Refers to those areas covered with more bushes and any tree, shrub, grasses. (FAO, 2010)
5	Water Body	Refers to land areas covered by surface water (Dams, rivers, Lakes, etc.). (FAO, 2010)
6	Degraded Land	Refers to land surface which is not vegetated, cultivated & settled. This includes big gullies, bare soils, degraded areas; and excludes rocky areas. (FAO, 2010)

### 3. Result and Discussion

#### 3.1. Socio-demographic characteristics of sample households

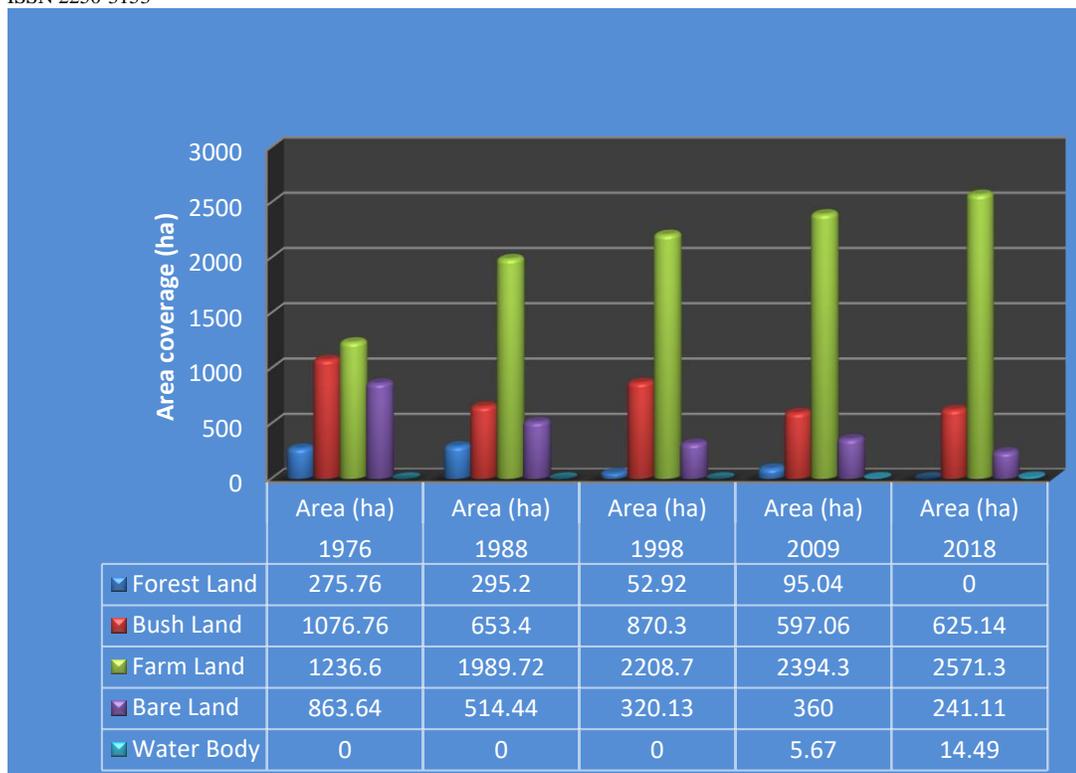
The study results show key demographic and socioeconomic characteristics of the surveyed households. A large percentage of household heads (85.1%) were males, whereas females constituted the remaining proportion (14.9%). Large proportions (52%) of

respondents were between the ages of 60 and 65 years, while 28.4% and 19.6% of them were between 66 and 71 years, and 59 or 58, respectively. Family sizes ranged from 1 to 9 persons, with an average family size of 5.9 persons. About 47.2% of respondents had between one and five household members, while a majority (52.8%) of them had six or more members in the family. Households with productive labor force of 2, 3-4, and 5 categories accounted for 45.5%, 33.9%, and 20.7% of the sample households, respectively. Economically dependent age groups (0-14) and elderly (65 and above) varied from family to family. In this regard, 56.6% of respondents had household dependency ratios of between 0.0 and 0.5, while 33.9% of households had dependency ratios of between 0.5 and 3. 23% of the respondents were illiterate. Relatively a greater proportion (38.8%) of the respondents could read and write whereas the educational achievements of 28.1% of respondents ranged from grade 1 to grade 8. A small proportion of the household heads (9.9%) had attended grade 9 and above level of formal education. Most of the surveyed, households were engaged in mixed farming activities (70.3%), and some of them (2.5%) were engaged in some form of off-farm activities like petty trading, informal labor and selling charcoal and wood. The land holdings of households in the study area varied from 0.5 ha to 1.8 ha with an average holding size of 0.6 ha per household. A large majority of the surveyed households (63%) had planted and keep natural trees for reversing land degradation and ecological reasons of sustainable land management. A large number of households were aware of land degradation, particularly soil erosion, soil nutrient depletion, and development of gullies as major problems in their localities.

### **3.2. Land use/Land covers of the study area**

The dynamics of LULC were analyzed using household heads' perceptions supplemented with interpretation of remote sensing images. The key findings of change detection results are presented from 1976 to 1988 (in Figure 2), and this can be compared with the perceived LULC changes. Analysis of the 1976 image classification reveals that the Farm Land covered 35.8% of the study area. The classification result shows around half of the watershed (40%) of the area was covered by both forest and bush lands. Bush land and farm land were almost proportional around 31% and 35%, respectively, bare land is 25.01% and the less cover is 8%.

As in the 1988 image classification analysis, reveals that the Farmland and forest land were increased significantly. But, bush land was decreased by almost half of the area. It can be seen in Figure 2, that Farm Land comprised the dominant portion (57.63%) of the land area followed by Bush Land 18.92%, Bare Land 14.90%. Forest Land occupied only 8.55% of the watershed area in 1988.



**Figure 2: Land use Land cover of the study area from 1976 - 2018 G.C**

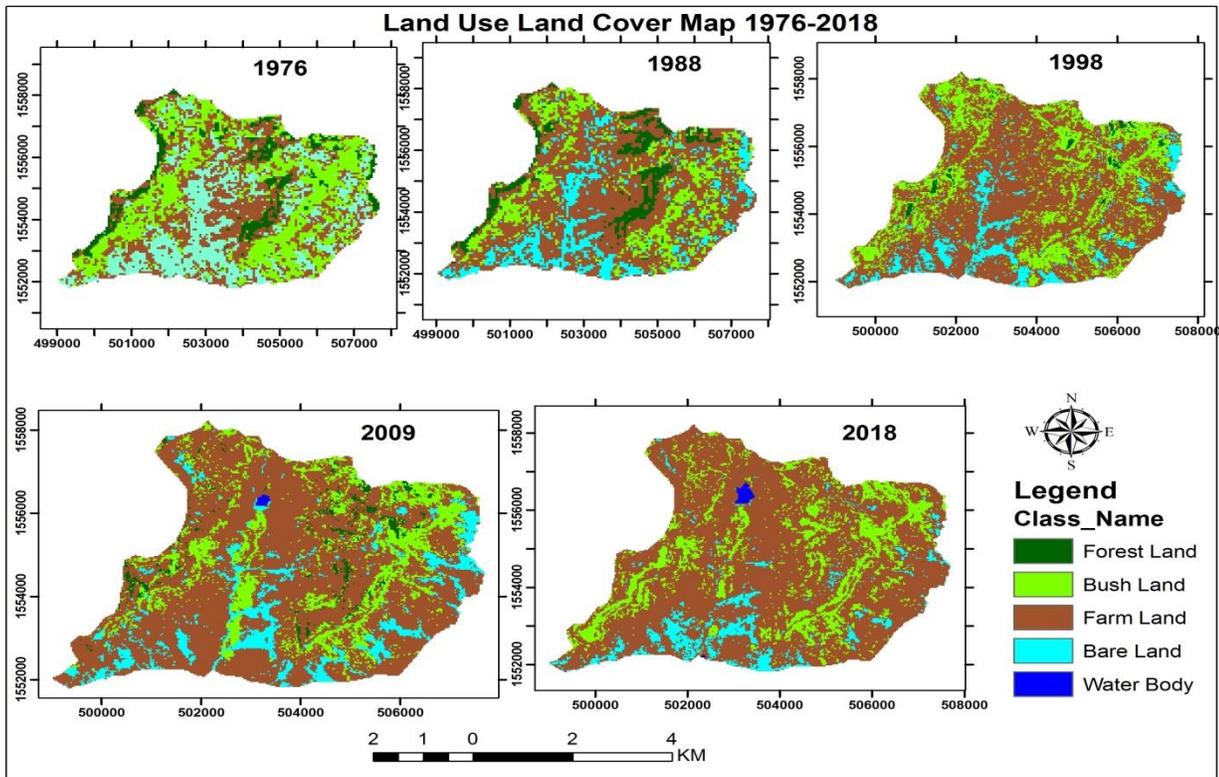
Analysis of the 1998 image revealed that Farm Land constituted the largest proportion of land in the watershed with a value of 63.98%, followed by Bush Land which accounts for 25.21% (Figure 2). Bare Land and Forest Land constituted 9.27% and 1.53%, respectively.

The 2009 image analysis result indicated that one new land cover created, which is a water body (5.7 hectare). The water body was formerly farmed and bare area as compared with 1998 G.C. The farm Land size increased and expanded to 70%, which was 64% in 1998. The other land use/cover is decreased in these current times as compared to the past 11 years. This is also due to different human activities like Farm Land expansion and population increase (Figure 2).

The 2018 image analysis result indicated that Forest land is completely removed due to agricultural expansion and deforestation. Water body increased to (15 hectare). The farm Land size increased and expanded to 75%, which was 69% in 2009. Bush land is slightly decreased due to agricultural expansion. The other land use/cover is decreased in these current times as compared to the past 9 years. (Figure 2)

**3.2.1. Land Use and Land Cover changes in Endachewa watershed from 1976-2018**

The satellite image classification of the five periods (1976, 1988, 1998, 2009, and 2018) results indicated significant land use and land cover change of the study area. The 1976 –2018 period change detection analysis also shows a significant increment and decrement in spatial extent of different land use land covers.



**Figure 3: Land use Land cover change Endachewa watershed from 1976-2018**

During this period, the areal coverage of forest, Bush lands and Bare Lands were decreased by 276.76 ha (100%), 451.62 ha (13.08%), 622.23 ha (18.03%), respectively. On the other hand, both farm and water body have increased by an aerial coverage of 1334.7 ha (138.68%) and 8.82 ha (0.26%), respectively. This was due to the conversion of forest, bush lands and bare lands into farm lands. As evident from table 3, farm lands were consistently increased during this period. This shows an increase in the expansion of farm lands at the expense of all the other three land use and land cover change types, but mostly at the expense of forest and bare lands.

**Table 3: Land use, land covers change image classification in Ha 1976-2018**

No.	Land Cover Type	1976		1988		1998		2009		2018	
		Area (ha)	Area (%)	Area (ha)	Area (%)						
1	Forest Land	275.76	7.99	295.2	8.55	52.92	1.53	95.04	2.75	0	0
2	Bush Land	1076.76	31.19	653.4	18.92	870.3	25.21	597.06	17.30	625.14	18.11
3	Farm Land	1236.6	35.81	1989.72	57.63	2208.69	63.98	2394.27	69.36	2571.3	74.49
4	Bare Land	863.64	25.01	514.44	14.90	320.13	9.27	360	10.43	241.11	6.98
5	Water Body	0	0.00	0	0.00	0	0.00	5.67	0.16	14.49	0.42
<b>Total</b>		<b>3452.76</b>	<b>100.00</b>	<b>3452.76</b>	<b>100.00</b>	<b>3452.04</b>	<b>100.00</b>	<b>3452.04</b>	<b>100.00</b>	<b>3452.04</b>	<b>100</b>

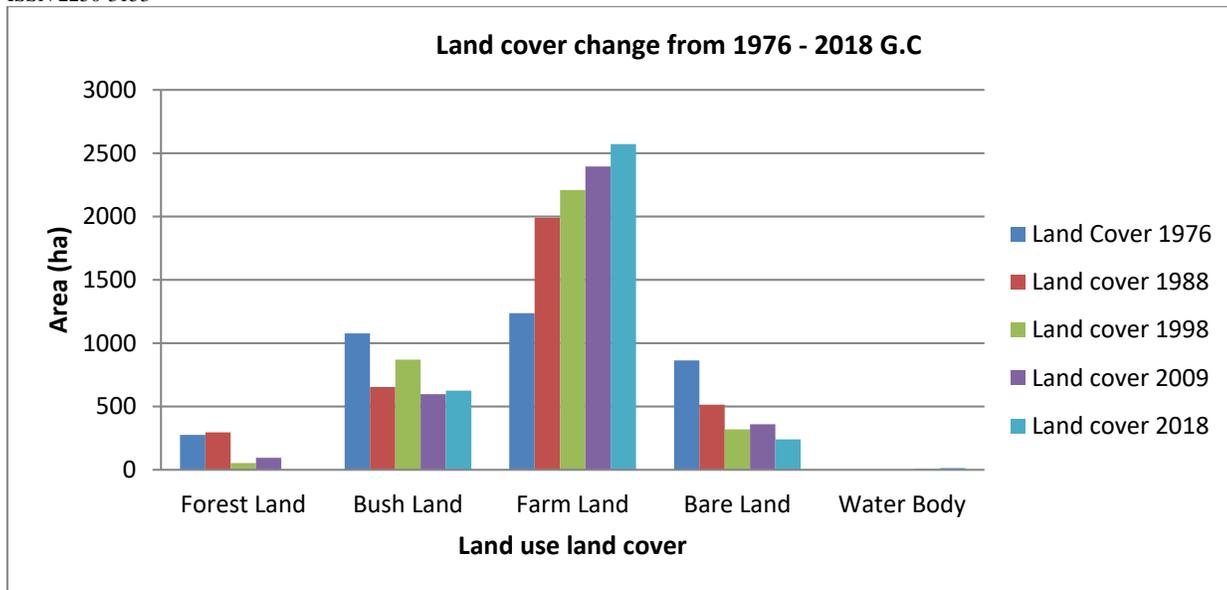


Figure 4: Land use land cover change from 1976 to 2018

3.2.2. The rate of land uses land cover changes:

The rate of change was calculated for each land use, land cover using the following formula:

$$\text{Rate of change (ha/year)} = (A-B)/C$$

Where A = Recent area of land use/ cover in ha.

B = Previous area of land use/ cover in ha.

C = interval between A and B in years

The result is presented using table and graph

Table4 : Land use land covers class in ha and rate of change in ha/year (1976 – 2018)

no.	Land Cover Type	Land use land cover (1976-2018 G.C)					Rate of change			
		1976 Area (ha)	1988 Area (ha)	1998 Area (ha)	2009 Area (ha)	2018 Area (ha)	1976-1988	1988-1998	1998-2009	2009-2018
1	Forest Land	275.76	295.2	52.92	95.04	0	1.62	-24.23	3.83	-10.56
2	Bush Land	1076.76	653.4	870.3	597.06	625.14	-35.28	21.69	-24.84	3.12
3	Farm Land	1236.6	1989.72	2208.69	2394.27	2571.3	62.76	21.90	16.87	19.67
4	Bare Land	863.64	514.44	320.13	360	241.11	-29.10	-19.43	3.62	-13.21
5	Water Body	0	0	0	5.67	14.49	0.00	0.00	0.52	0.98
	<b>Total</b>	<b>3452.76</b>	<b>3452.76</b>	<b>3452.04</b>	<b>3452.04</b>	<b>3452.04</b>				

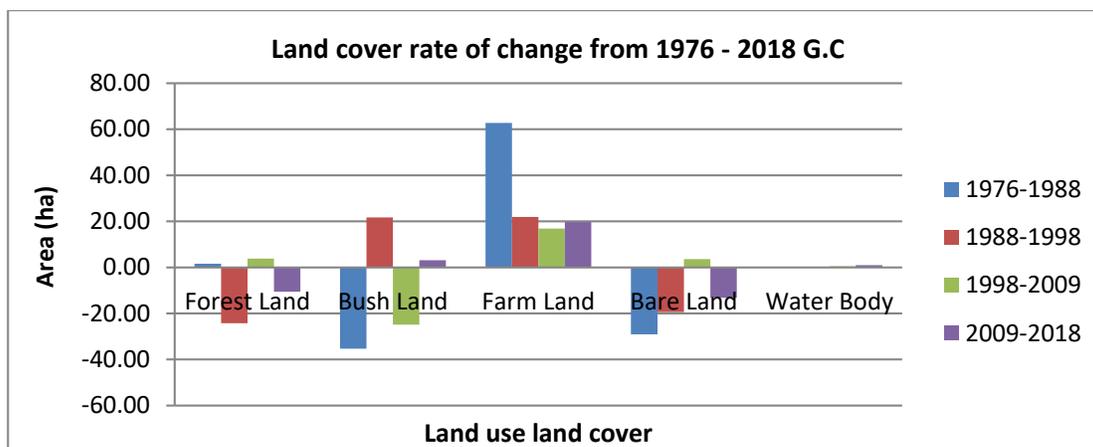


Figure 5: Land use land covers class in ha and rate of change in ha/year (1976 – 2018)

### 3.2.3. Land Use/Land Cover Change Matrix 1976 to 2018

An important aspect of change detection is to determine what is actually changing to what i.e., which land use class is changing to the other. This information will also serve as a vital tool in management decisions. This process involves a pixel to pixel comparison of the study year images through overlay analysis. The land use land cover change matrix depicts the direction of change and the land use type that remains as it is at the end of the day. For the land use land cover change matrix shown in (Table 5) the rows represents the older land cover categories and the columns represent the newer categories.

### 3.2.4. Land Use and Land Cover Change Detection from 1986 To 2000

The results of land use and land cover map as shown in (Table 5, Figure 3 and 6) between 1976 and 2018, there was a dramatic increment of cultivated land to some extent followed by water body, but due to the conversion of forest and bush land to grassland the areal coverage of the forest is covered by now is zero and bush land and bare land show a reduction. This is just the general impression of land cover dynamics based on comparison of individual land cover maps.

Table 5: Transition matrix between the years 1976-2018 G.C (ha)

From initial state (1976)	To final state (2018)					Total in 1976 (byha)	Loss (ha)
	Forest Land	Bush Land	Farm Land	Bare Land	Water Body		
Forest Land (ha)	0	79.38	192.78	3.24	0.18	275.58	275.58
Bush Land (ha)	0	374.58	691.47	8.73	1.98	1076.76	702.18
Farm Land (ha)	0	114.75	1066.68	48.87	6.3	1236.6	169.92
Bare Land (ha)	0	56.43	621	180.18	6.03	863.64	683.46
Water Body (ha)	0	0	0	0	0	0	0
<b>Total in 2018</b>	0	625.14	2571.93	241.02	14.49	<b>3452.76</b>	1831.14

<b>Gain</b>	0	250.56	1505.25	60.84	14.49	<b>1831.14</b>
<b>Net change</b>	275.58	-451.62	1335.33	-622.62	14.49	0

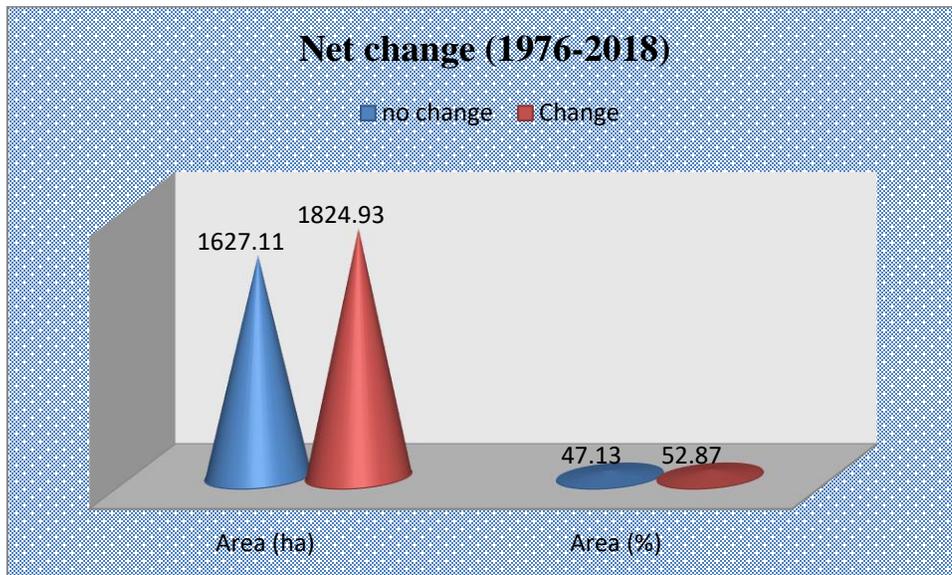


Figure 6: Transition matrix result between the years 1976-2018 G.C

### 3.3. Proximate Driving Forces of LULC changes in Endachewa watershed

During the period of 1976-2018, there was a number substantial change in population growth (9,689) and the farmland (1334.7 ha), but the productivity per hectare in ton (0.68) enhanced slightly due to the uses agricultural inputs such as fertilizer and water harvesting systems for farming purpose (table 6). These data expressly stated that a high population growth increases the demand for land for agricultural activities and biomass as the source of fuel and construction materials. Due to the increase in food and fuel wood demands resulting from population pressure, local farmers are forced to push farm lands at the expense of forest in the most marginal and fragile landscapes. There may be a similar change expected in the future, which can be a major cause of land degradation in the watershed, leading to a decline in crop production unless there is due considerations for natural resources conservation practices.

Table 6 : Population ,farmland covering and Agriculture productivities data during last 40 years(Source: werielek woreda Rural and Agricultural office)

Year	Population number	Farm land Area in ha	Productivity (ton) per ha	Average ton per person per year
1976	2,598.00	1,236.60	0.9	0.42
1988	3,919.00	1,675.92	0.11	0.504
1998	5,289.00	2,164.92	0.15	0.61
2009	7107.00	2,343.65	0.145	0.47
2018	12,287.00	2,571.30	0.158	0.33

The focus group discussion (FGD) participants and key informants in the study area indicated that four major proximate (direct) driving forces appears to explain a large part of the LULC change in Endachewa watershed. These are: (i) population pressure, (ii) agricultural expansion (iii), Infrastructure and Settlement expansion, (iv) wood extraction (Table 7). Nearly 4.1% of the respondents also argued that the expansion of built-up areas and other infrastructure was a cause of LULC change in the Endachewa watershed. Previous studies also highlighted that expansion of infrastructures was driving forces of LULC changes [38] .

The land cover conditions of the Ethiopian highlands have also been modified or significantly transformed by the rapidly increasing population pressure and growing livestock population. Human population in the highlands has grown fast on the limited land area; and almost every piece of land is converted into cultivated land to produce food [13] . Like elsewhere in the country, the study area watershed has experienced fast population growth. Over 79.5% of the surveyed farmers indicated that the rapidly growing population pressure is one of the major driving forces of LULC change and related (Table 7) and CSA report the population number indicate in the study area in 1976 and 2018 (study year) is 2598 and 12287, respectively ,they increase by 400% and above. Key informants also asserted that land holding per capita had declined due to the increasing population pressure. This situation has created pressure on the limited land for agricultural production. This is a clear evidence in favor of the Malthusian and Neo-Malthusian theoretical premise and the standards of political ecologist school of thought regarding population dynamics, land system change and resource degradation [39].

**Agricultural Activities:** Subsistence rain-fed farming and livestock husbandry are the major livelihoods of the rural community in the Endachewa watershed. As the study area is a typical rain-fed farming system, smallholder agricultural land expansion at the expense of other land covers is by far the most widespread proximate driver of land use dynamics and related land cover changes as reported by 13.6% of respondent's table (7)

A large number of respondents (2.8%) also suggested that wood cutting for the fulfillment of domestic uses was the most prevalent driving force of vegetation destruction. The majority of the surveyed farmers also noted that some households that are very poor were engaged in cutting and selling of trees for income generation. Discussion with key informants such as local natural resource conservation experts also confirmed that the increasing demand of tree products such as fuel wood, construction materials and charcoal for domestic uses in and around the Endachewa watershed was one of the major driving forces of land cover change.

**Table 7: Proximate Driving Forces**

No.	Proximate Driving Forces	%	Rank
1	Population Growth	79.5	1
2	Agricultural expansion,	13.6	2
3	Infrastructure and Settlement Expansion ,	4.1	3
4	Wood Extraction	2.8	4
Total		100.00	

**4. Conclusion and Recommendation**

Long term watershed level LULC change detection analysis is mostly done using remotely sensed images, however, this study verified that household level survey data provide an equally important source of information and even additional details can be extracted regarding the magnitude, driving forces and environmental and socioeconomic impacts of LULC changes.

The objective of this study was to assess the land use and land cover change and its driving forces in the Endachewa watershed, Tigray regional state, northern Ethiopia and the study found that significant LULC change has occurred in the study area, with associated land resource degradation. The major changes observed include expansion farm and water body, and loss of forest, bush lands and bare lands in the study area for the last 40 year (1976- 2018). The study identified population pressure, agricultural expansion, infrastructure and settlement expansion, wood extraction for fire wood and charcoal as the Proximate factors of LULC change in the watershed.

In the view of the conclusions drawn, the following suggestions are made to government, Households and Community managers

- The government shall provide and implementing strong family planning policy. To minimize the problems of landless youths, it would imperative to create and strengthen off-farm income generating activities due to limited capacity of land to accommodate the additional population. Together with this, the policy to drive modern farming is a step towards improving productivity and yield per hectare.
- The local and regional government should prepare strategic planning to monitor abrupt urban expansions and infrastructures and avoiding deforestation, wood land degradation through awareness creation and stringent enforcement of forest regulation. Additionally, provision of alternative energy from renewable sources such as wind, geothermal, solar, biomass at reasonable price to rural and urban residents.
- The Households should be applying modern methods of sowing, maturing and irrigating the new high-yielding varieties of seeds. Besides, using improved seed, pesticide, latest technologies and best practices for farm management could help to vastly increase yields. As a result, the households would enable them to produce enough food to carry over the entire consumption year. Thus, the farmland expansion would be minimized.
- The Community managers would participate the community in the protection of communally owned forest areas. Hence, rehabilitation, closure and distribution of degraded hills or other conservation practices has to be launched to minimize land degradation and to counteract the deteriorating of forest, Bush lands and Bare Land and avoid further extinction of important tree species.

## Acknowledgements

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# Cryptography: Avalanche effect of AES and RSA

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**Abstract-** Security is a major concern in the field of computer science. With the advancement in technology security of data from theft has become a major obstacle. It is necessary to encrypt data before sending it through the internet. Cryptography plays an important role. Through cryptography, one can easily convert his/her data in a human unreadable form and send it over the internet. In this paper two most widely used cryptography algorithms AES and RSA have been analyzed. Simulation is performed using CrypTool. This simulation is performed on two different types of data. These algorithms are analyzed based on the avalanche effect due to change in a single character of plain text and memory required by these algorithms in the secondary storage device.

**Index Terms-** AES, asymmetric key, avalanche effect, cryptography, RSA.

## I. INTRODUCTION

Nowadays transmission of plain data (readable data) over the internet is not considered safe because of various intruders, that try to steal our precious information. This precious information could be like e-banking passwords, confidential emails, or some social media private conversations. So, to make our data secure some safety mechanisms are used. One of those safety mechanisms is cryptography. Cryptography plays a vital role in the security of information [1]. Cryptography is a Greek word which means "study of hidden secrets" [2] [3]. In cryptography plain text message gets converted in some human unreadable form or ciphertext; termed as encryption and at the receiver side, that ciphertext or encoded text gets decoded into plain text which is in human-readable form; termed as decryption. So, from this, it is stated that decryption is the reverse process of encryption. The system which performs both encryption and decryption is called cryptosystem. Figure 1 shows how encryption and decryption were done.

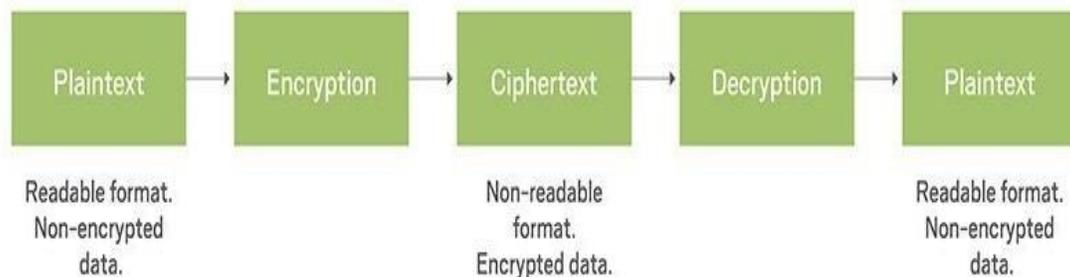


Figure 1: Cryptography [1]

The main aim of cryptography is to provide integrity, authentication, confidentiality, authorization, and availability [4] [5].

1. Integrity: When data is exchanged between two parties, the receiver has to ensure that data sent by the intended sender and not been altered by any other unintended person in between transmission. Cryptography secures the data from passive as well as from active attacks.
2. Authentication: when the receiver is not sure who sends the data. Authentication can be achieved either by using username or password, digital signatures or by using secret-key algorithms.
3. Confidentiality: Protecting the data from the disclosure from unintended persons. Other than legitimate users no other can read the data transmitted.
4. Authorization: setting the privileges or access levels to different users on different resources so that each user should get as much access as they need.

5. **Availability:** the ability of the user to access any resource or any information when needed. When any system gets attacked by the intruder the services of users should not affect. So, cryptography ensures that the user continues to get services even in case of an attack.

In cryptography avalanche effect [1] defines a specific property of encryption algorithm. Avalanche effect is one of the most essential property of any cryptography algorithm. It means that a minor change in plain text or even a bit of plain text gets changed then it should result in a significant change in the plain text or multiple bits of ciphertext should change.

A good cryptography algorithm should always satisfy the following equation:

$$\text{Avalanche} > 50\% [2]$$

This ensures that the attacker should not easily predict the ciphertext from plain text or vice versa. The cryptography algorithm that does not satisfy the Avalanche effect equation and easily breached by the cryptanalyst.

### A. Terms used

**Plain Text:** The unique message that Alice/sender wants to send to bob/receiver is called plain text. This message is in readable form, anyone can read this message.

**Cipher Text:** The encoded or encrypted message is called ciphertext. This message cannot be understood by anyone except the sender (who is sending the message) or by the receiver (to whom the data is sent).

**Algorithm or cipher:** It is a well-defined mathematical function that is used to encrypt or decrypt data.

**Key:** String of bits that are used by the cryptographic algorithm to convert plain text message into ciphertext [6].

**Avalanche effect:** if a single bit of ciphertext gets altered then it should alteration multiple bits of a plain text message or vice versa.

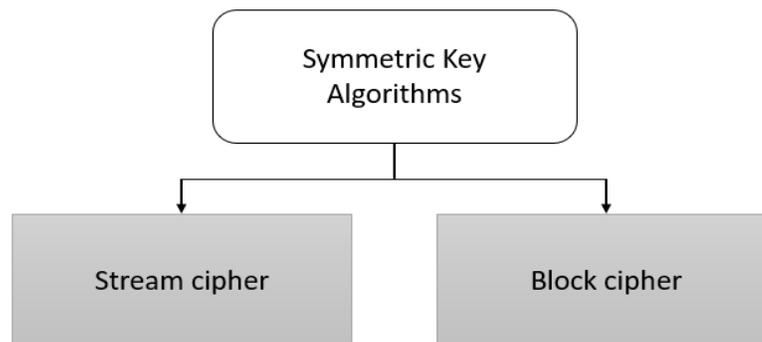
## II. TYPES OF CRYPTOGRAPHIC ALGORITHMS

Based on keys used for the encryption and decryption cryptography algorithms are categorized into two types:

1. Symmetric key cryptography
2. Asymmetric key cryptography (public-key cryptography)

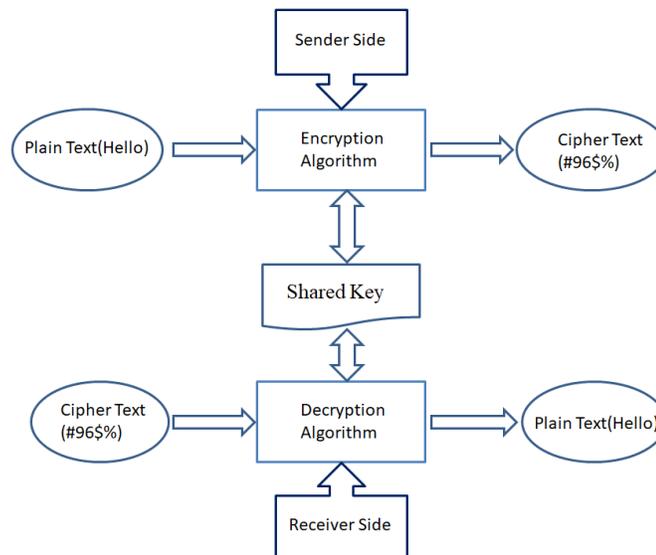
### A. Symmetric key cryptography (secret key cryptography)

It is also recognized as Private Key Cryptography or secret key cryptography. The symmetric key algorithm is divided into two types based on the type of data they use for encryption and decryption processes. In figure 2 categories of symmetric algorithms are shown.



**Figure 2:** Types of symmetric algorithms

The input of block cipher is a block of plain text and it generates a block of ciphertext, generally of the same size [7]. The size of the block depends upon the scheme the user is using. The choice of block size does not affect the strength of the encryption algorithm. The strength of cipher depends upon the key used in the encryption process. In-stream cipher one bit at a time gets converted into ciphertext. In the symmetric algorithm, the only key is used for encryption and decryption process, which is shared among the sender and receiver during the transmission of data. This key should be kept secret because a single key is responsible for encryption and decryption of data.

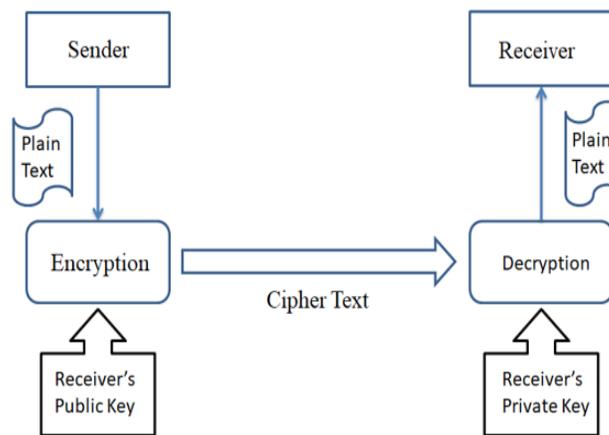


**Figure 3:** Symmetric key cryptography

Figure 3 shows the encryption and decryption process of symmetric key algorithms.

**B. Asymmetric Key Cryptography (secret key cryptography)**

In these algorithms, two different keys are used. One key i.e. public key is used for encryption of data and the second key i.e. the private key is used for decryption of data. Data get encrypted with the public key of the receiver which is declared publically and decrypted by the private key of the receiver which is kept secret by the receiver. No key other than the receiver's private key can decrypt data not even key used for encryption can able to decrypt that data [8].



**Figure 4:** Asymmetric key cryptography

Encryption and decryption process of asymmetric key algorithms are shown in figure 4.

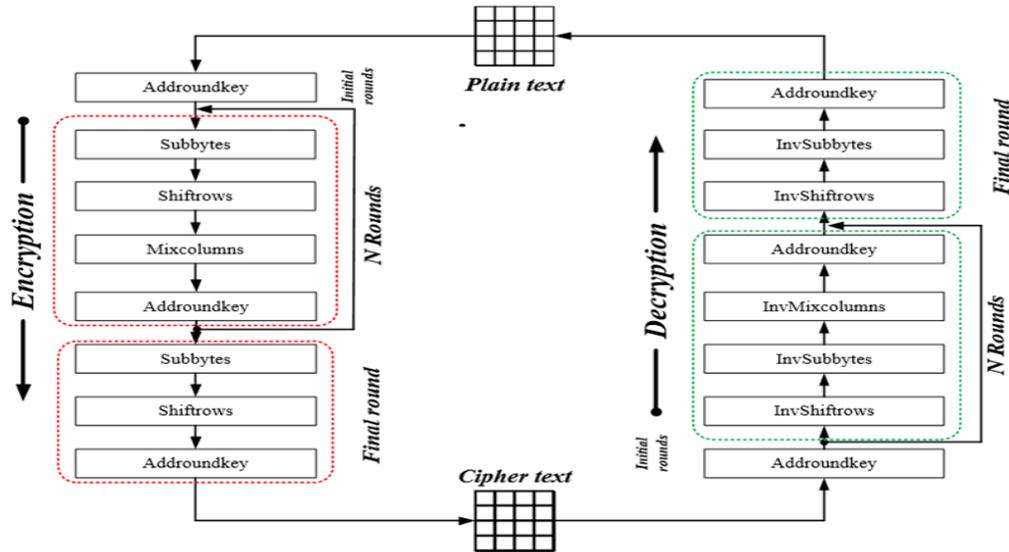
**III. ADVANCED ENCRYPTION STANDARD (AES) ALGORITHM**

AES is one of the most popular cryptography algorithms that is used in modern applications. Another name given to AES is Rijndael. Rijndael was proposed by Joan Daemen and Vincent Rijmen. The name Rijndael was a combination of their surnames (Rijmen and Daemen) [9]. It is used in many protocols such as Secure Sockets Layer (SSL)/Transport Layer Security. Rijndael operates on a mathematical concept known as the Galois field theory [10]. The plain text block size varies from 128 bits to 256 bits [11]. Table 1 shows the key size, plain text block, and several rounds.

**Table 1: Round Length**

Key Size	Block Size	Number of Rounds
128	128	10
192	128	12
256	128	14

Number of rounds in AES is variable and depends on the length of the key [12] [13]



**Figure 5: Advanced Encryption Standard [14]**

Each round uses a different 128-bit round key, which is calculated from the original AES key.

#### IV. RSA ALGORITHM

RSA algorithm is named after its inventors Ron Rivest, Adi Shamir, and Leonard Adleman [15]. It was developed in 1978. It is based on a mathematical fact that it is easy to find and multiply two large prime numbers but factoring them is a difficult task [16]. The private and public key used for encryption and decryption is based on this fact.

##### Algorithm:

1. Elect two big prime numbers P and Q.
2. Compute N by multiplying P and Q  
 $N = P * Q$
3. Choose the public key E such that it is not a factor of (P-1) and (Q-1)
4. Choose the private key D such that it satisfies the following condition  
 $(D * E) \text{ mod } (P-1) * (Q-1) = 1$
5. For encryption, calculate cipher text (CT) from plain text (PT)  
 $CT = PT^E \text{ mod } N$
6. Send ciphertext (CT) to receiver
7. For decryption calculate plain text (PT) from ciphertext (CT)  
 $PT = CT^D \text{ mod } N$

### V. PREVIOUS WORK DONE

The study presented by Mandal et al. [17], use two most common algorithms i.e. data encryption standard (DES) and Advanced Encryption Standard (AES) and they are implemented using MATLAB and compared on the basis of avalanche effect occurred due to variation of one bit in the key by keeping plain text constant. They concluded that the avalanche effect of AES is high as compared to DES.

Similarly, Bhat et al. [18], compared DES and AES based on avalanche effect and encryption time in MATLAB and they concluded that AES has a high avalanche effect and DES requires more encryption and decryption time as compare to AES.

### VI. EXPERIMENTAL METHODOLOGY AND ENVIRONMENT

For the experiment, CrypTool is used as a simulator. The computer used in the simulation was Intel® Core (TM) i7-7700 HQ CPU @ 2.80 GHz with 8 GB of RAM and 1TB HDD. The performance of these algorithms are evaluated on the basis of parameters such as avalanche effect and storage memory required by the algorithms to store ciphertext.

This experiment is performed on two different data:

- 1) **Data 1:** Contains alphabetical character (cryptography = cryptogrephy).
- 2) **Data 2:** Contains alphanumeric character (data4 = deta2).

**Table 2:** Algorithm Setting

Algorithm	Key in Bits	Block Size (Bits)
AES	256	128
RSA	512	64

Table 2 shows the algorithm setting for both types of data.

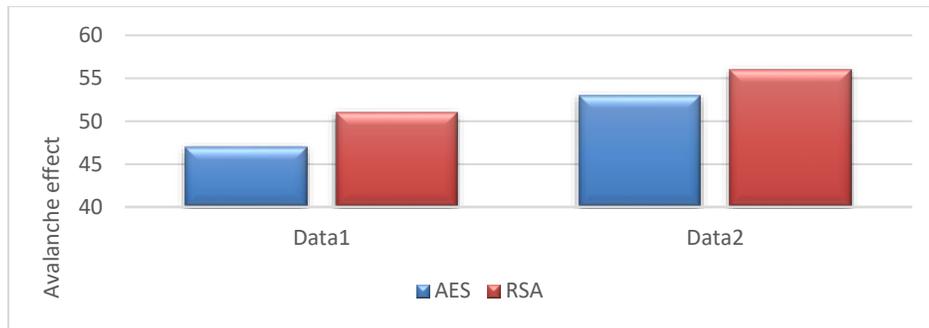
### VII. EXPERIMENTAL RESULTS AND ANALYSIS

Experimental Results of RSA and AES are shown in Table 3.

**Table 3:** Avalanche effect of algorithms

	Avalanche (AES)	Avalanche (RSA)
Data1	47%	51%
Data2	53%	56%

Table 3 displays the avalanche effect of cryptography algorithms. The results show that AES has a low avalanche effect therefor anyone can easily find out the plain text from the ciphertext. Whereas RSA has a high avalanche effect which makes RSA more secure.



**Figure 6:** Avalanche effect of algorithms

Figure 6 is a graphical representation of the avalanche effect. For analysis single character of plain text data is changed. The comparison shows that AES has significantly below average avalanche effect for data1. So, AES is not suitable for the encryption of a single character type of data. Whereas RSA performs well in both the cases hence making it suitable for the encryption and decryption process.



**Figure 7:** Storage size of algorithms

Figure 7 shows that in terms of storage space needed RSA performs poorly as RSA needs more storage space as compared to the AES algorithm. RSA needs four times more storage space as compared to the AES algorithm. If someone has storage as a constraint then AES can be used as a prime cryptography algorithm.

## VIII. CONCLUSION AND FUTURE WORK

In the security of data, cryptography plays an important role. This work presents the comparative study of cryptographic algorithms i.e. RSA and AES on the basis of avalanche effect and storage space these algorithms needed. An experimental result shows that RSA has a high avalanche effect as equating to AES which makes it difficult to break. Plain text encrypted with the RSA has more security other than plain text encrypted with AES. In terms of memory required, AES needs less storage memory. So, from a security point of view, RSA is an ideal algorithm for encryption. In the future, these algorithms can be implemented on different simulators. New performance matrix can be formed which can give more ideas about these algorithms and their effect on the data.

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# Assessment of Forest Land Cover Change and Its Driving Factors: A Case of Adaba-Dodola District, Ethiopia.

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**Abstract:** The magnitude and rate of forest cover change over the past 30 years in Adaba-Dodola district, Ethiopia have been investigated. The forest cover map based on land use/land cover of the area is generated by using remote sensing (RS) and geographic information system (GIS) techniques. The main land use/land cover types have been identified as dense forest, open forest, grassland, agriculture, settlement, and water body after collecting and examining literature and information from interviews, field observation, and multiple sources. Moreover, digital data from the Landsat satellite images in the year 1988, 2003 and 2018 were employed.

The result of change detection analysis displayed that the area had substantial land-use/land cover changes in general and forest cover change in particular. Specifically, the forest cover land declined from 236,433 ha in 1988 to 202,127 ha in 2003 and 200,476 ha in 2018. The dense forest cover reduced from 45.93% in 1987 to 16.19 % in 2018. The rate of deforestation between 1988-2003 was 2287.1 ha per annum but it declined to 110 ha per annum in 2003-2018. The decrease in deforestation occurred after the establishment of integrated forest management project. The problem of forest cover change is directly linked with human activities including population pressure and socioeconomic drivers like the expansion of agricultural activities, demand of fuelwood and construction materials, as well as using such resources for income. Countermeasures to alleviate the forest cover change and its impact have been suggested.

**Key Words:** Land use/land cover change (LU/LCC), Adaba-Dodola District, Geographic information system, Remote sensing

## 1. Introduction

Land use denotes the human utilization of the land, whereas land cover indicates the physical state of the land. The two interrelated but different effects, land use and land cover change, may be the result of natural processes or human activities. Furthermore, technological advances and expanding population have put increasing pressure on scarce resources and have created a variety of complex land use dilemmas that affect persons at all levels of society. Land use/ land cover change (LU/LCC) has become a central component in current strategies for managing natural resources [1]. LU/LCC is an endless process taking place on the earth surface starting from ancient time. Expansion of agriculture to meet the demand of growing population such as food and fibre at the expense of vegetated lands is the most significant historical change in all parts of the world [2].

LU/LCC plays a major role in the study of global change. It may interact with deforestation, biodiversity loss, global warming, and increase of natural disaster-flooding. Both natural and human activities are responsible for LU/LCC [3], but the latter is increasingly recognized as a dominant force [4]. Human activities are responsible for the conversion and transformation of plentiful of the world's natural land covers [5]. For instance, over the last 10,000 years, about 50% of the ice-free land surface has been changed by human activities [2]. During the last 3 centuries, around 1.2 million km<sup>2</sup> of forest and woodland, and 5.6 million km<sup>2</sup> of grassland and pasture

have been converted to other uses globally, while cropland has increased by 12 million km<sup>2</sup> [6]. It is also important to notice that LULC change is one of the challenges which powerfully influence the process of agricultural development and the food security situation in Ethiopia [7]. Being a land of great geographic diversity, Ethiopia is characterized by sharp and repeated environmental contrasts. There are areas where population pressure, in conjunction with a growing rural population and rising subsistence demand have contributed to the deterioration and depletion of the natural resource base. In the highlands of Ethiopia, the influence of human activity on the environment is so remarkable owing to intensive cultivation; land fragmentation, economic and political forces that relate to peasant agriculture. More than ever, the need for rational planning of land use/cover development and optimal use of the land resources is evident. That is why accurate and reliable data on land use /cover change and their trends are necessary for understanding local environmental problems [7].

LU/LCC has negative consequences on both the quality of the environment and life [8]. Noted that the environmental consequences of LU/LCC are as large as that of climate change. LU/LCC can affect food security, biodiversity, biogeochemical cycles, soil fertility, hydrological cycles, energy balance, land productivity, and the sustainability of environmental service provision it also contributes to global warming [2].

Forest is one of the most essential kinds of resources that human beings and other animals depend on. It adjusts environmental and ecological changes in which soil, water climate and rainfall are in good existence in a sustainable situation. The value of forest resources to the world's human population is becoming increasingly evident. The forest has been either modified or converted. If modified, once dense stands of closed forests have been replaced by more open stands of secondary species that yet further changed into savanna of open grasslands and the whole process frequently being a prerequisite to clearing for agricultural activities [9].

Assessment of the spatial and temporal distribution of LU/LC is an essential pre-requisite for land resources planning, management, and monitoring programs have also noted precise information on LU/LCC. Its driving forces are essential to understand what type of changes have occurred and are expected in the future. Moreover, analysis of LU/LCC and its drivers provides overall information for monitoring biodiversity loss and natural disasters (e.g. drought, floods, wildfires), and for identifying areas susceptible with severe land degradation (e.g. deforestation, overgrazing, diversion of water resources, etc.) [10].

GIS and remote sensing technologies have made possible to assess and analyze LU/LCC in less time, at low cost and with better accuracy [11]. Availability of remotely sensed data in various spatial and temporal resolutions made mapping and assessing LU/LCC possible [12]. On the other hand, GIS has tools for collecting, storing, analyzing, and visualization of the outcome of analysis [13].

Therefore, in this research study emphasis was given to assess the forest cover change and driving factor rate of deforestation in Ethiopia case of Adaba-Dodola district forest area and mapping the land use land cover change by using the integrated techniques of remote sensing and GIS technology.

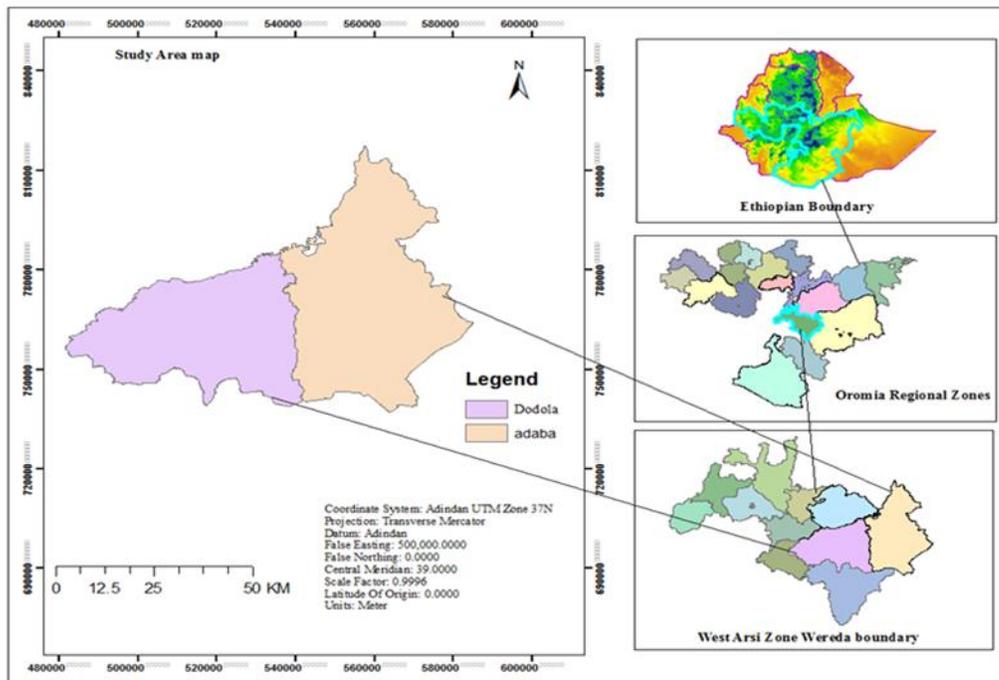
## **2. MATERIALS AND METHODS**

### **2.1 Study area**

Adaba-Dodola district is located in Southeastern part of Ethiopia, found in Oromia regional state, West Arsi Zone, which is approximately at a distance of 340 km far away from the capital city of Ethiopia, Addis Ababa. The study site is situated between 6<sup>o</sup> 5<sup>o</sup>- 7<sup>o</sup> 0' north latitude and 39<sup>o</sup> 07'- 39<sup>o</sup>22' east longitude. It shares border line with Kofale and Gadaba Asasa to the north, kokosa to

the west, Bale Zone to the East, and Nansabo district to the south. Most parts of the district have elevations of ranging from with an attitude between 2400-3753 m above sea level.

The agro climate zone of the study area ranges from dega to wurch (cool and humid) which are characteristics of most of the Ethiopian high lands. The rainfall distribution is bimodal having two rainy seasons per year. This great variation of temperature provides wide opportunities for the production of different types of crops range from warm to cool thermal zone. However, there is a slight variation in temperature from month to month. October to May is the hottest months while June to September is the cold and Mean Annual Rainfall for most of the areas, the rainy season starts in March and extends to November with the highest concentration in June, July and August. The dry season lasts from November to February, followed by the short rainy season during the months of March and April. From the weather records of 1994-2004, the average rainfall of the study area is 733 mm [14]. The temperature ranges from 7-24°C. and the average elevation ranges from 2,400 to 3,800 meter above sea level.

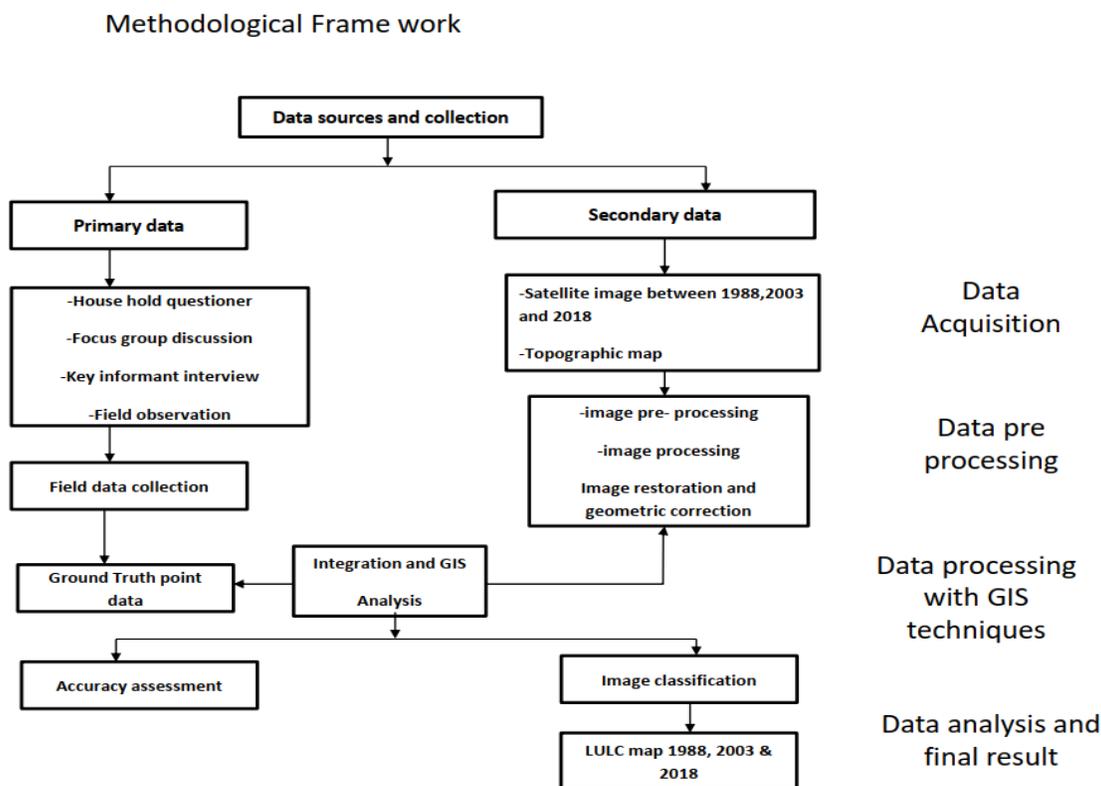


*Fig.1. Location map of the study area.*

## 2.2. Sources and Types of Data

To meet the objectives of this research different kinds of data were collected from both primary and secondary data sources. This study integrates both remote sensing and geographic information systems techniques based on a semi-structured questionnaire and interviews with village elders. To investigate forest LULC change in two study areas and to improve the accuracy gaps in information got from remotely-sensed images, local people are frequently used as a valuable complement. Besides filling the gap in information, interviews with local people could also clarify ambiguities in interpreting remotely sensed images; justify the data collected, and explain the underlying causes of the phenomena observed.

The procedure followed in this study was presented using the flow chart (Fig.2). It shows the steps followed beginning from the acquisition and classification of the multi-temporal satellite image of the study area to the extraction of the required information both secondary and primary data to answer the research questions.



*Fig.2. Conceptual framework of the study area.*

## 2.3. Data Acquisition

### 2.3.1. Image selection and acquisition

Thematic Mapper (TM) and Landsat-7 Enhanced Thematic Mapper (ETM+) images were obtained for the years 1988, 2003 and 2018 (Table 1), a period of 30 years which provide ample time to monitor LULC change. An effort was made to acquire cloud-free image scenes. The large area of the entire Landsat satellite scenes gained for difference years, it was necessary to clip out only the study district of interest, which covered 379755 ha, before any analysis was conducted. The images were processed using ERDAS Imagine 9.2, and ArcGIS 10.2 software. Image enhancements used on different year images were histogram equalization for stretching and false-colour composite for display. Supervised classification, using the maximum likelihood algorithm, was adopted. Training data for the supervised classification were established from the author’s knowledge of the area, and with the help of other supporting data sources, such as Google earth and interviews with elderly people. The field survey, conducted in September 2019 at a season comparable with that when the satellite images were acquired, also assisted in locating reliable training sites for the supervised classification.

**Table 1.** Remotely sensed data used in the analysis of land use/cover change.

Study area	Satellite Sensor	Path/Row	Acquisition data (M/D/Yr)	Spatial resolution
Adaba	Landsat7 ETM+	P168/55	1988/11/10	30
			2003/02/05	30
Dodola	Landsat8 OLI TIRS	P167/55	2018/01/29	15
	Landsat 7 ETM+		1988/11/10	30
			2003/11/28	30
	Landsat8 OLI TIRS		2018/03/11	15

Source: Satellite image data

### 3. Data Analysis

#### 3.1. Image pre-processing and atmospheric correction of scenes

The Landsat images were downloaded from the U.S. Geological Survey (USGS) Earth Explorer website. The images were already geo-referenced to rectify for alignment, and coregistered to the Universal Transverse Mercator (UTM) projection system (zone: 37N, datum: WGS-84) avoiding the need for geo-rectification, which would have employed ground control points (GCPs), paying attention to acquire the least root mean square error (RMSE) in pixels. The image layers were imported and layer stacked to form multispectral images. These steps were carried out in ERDAS Imagine 2014.

Remotely sensed satellite data are affected by artifacts, such as haze resulting from water vapor and aerosol particles present in the atmosphere which influence the sensor signal. For land cover change detection using multi-date satellite-derived images, proper atmospheric correction is necessary because differences in the atmosphere for the two dates can present a false indication of change or mask areas of real change [15]. Impacts of atmospheric correction on image classification are evaluated. This needed atmospheric correction of the scenes to reduce significant errors in image classification. Besides, the use of multi-temporal images requires atmospheric correction of scenes earlier classification processes.

#### 3.2. Image classification

A supervised land cover classification was used to classify the images into six main land cover/land use categories of open forest, dense forest, agricultural land, grass, settlement or built-up area, and water (**Table 2**). The supervised classification allows the user to define areas of interest (AOIs) that identify and recognize features on the image. The AOI's (training samples) were collected for the various land cover/use categories, based on a) prior knowledge of the area, and b) uniformity in appearance using ArcGIS 10.2. The AOI's were used to create a signature file for each Landsat scene. The signatures were evaluated using histograms, band by band scatter plots and a separability analysis to obtain the expected error, the covariance between bands in the classification for various feature combinations [16].

**Table 2.** Land use classes considered in image classification and change detection

Land cover/land use Classes	Description
Dense forest	This class represents the evergreen forest and mountain forests. The general tree height was from 18 – 40 m and the crown coverage is over 60% (IFMP, 1999).

Open forest	This class corresponds to the forest, which was disturbed by human activities. It is composed predominantly of regeneration forest from the past disturbance such as logging. The general height in this class range 2m to 25m tall. The crown coverage was generally below 60 % (IFMP, 1999).
Grassland/Rangeland	Both communal and/or private grazing lands that are used for livestock grazing. The land is covered by small grasses, grass-like plants and herbaceous species. It also includes land covered with a mixture of small grasses, grass-like plants and shrubs less than 2m and it is used for grazing
Settlement/Builtup area	All residential, commercial and industrial area, transportation infrastructure, settlements (may include greenhouse plastic covers).
Agriculture	Made to include areas allotted to rain-fed cereal crops Cultivated large-scale farms, fallow, cultivated crops such as wheat, maize, beans, vegetables, barley, and teff etc. Crop cultivation both annuals and perennials, mostly in subsistence farming
Water	Permanent open water, lakes, reservoirs, streams, dams, bays and estuaries.

### 3.3. Accuracy assessment

Accuracy assessment is important that it tells us to what extent the truth on the ground is represented on the corresponding classified image. Accuracy assessment analysis was carried out to validate the classification results. In this study, an error matrix was generated based on the year 2018 land use/land cover classification and 60 ground truth point data were made the study district see **Table 3**. The accuracy is essentially a measure of how many ground truth pixels were classified correctly.

These tables produce many statistical measures of thematic accuracy including overall classification accuracy, percentage and the kappa coefficient, an index that estimates the influence of chance [17]. Errors of commission and omission can also be expressed in terms of user's accuracy and producer's accuracy. User's accuracy represents the probability that a given pixel will appear on the ground as it is classed, while the producer's accuracy represents the percentage of a given class that is correctly identified on the map. One of the problems with the confusion matrix and the kappa coefficient is that it does not provide a spatial distribution of the errors [18]. The quality and sufficiency of reference data are important if reliable accuracy assessment is required. A reference data that is not verified thoroughly should not be expected to set accuracy standard. The insufficient number of verified data also affects the quality of the assessment [17].

**Table 3. Confusion matrix of the year 2018 Land cover/Land Use Supervised Classification**

	Grassland	Water	Dense forest	Settlement	Open forest	Agriculture
Grass land	90	0	0	0	0	0
Water	0	100	0	0	0	0
Dense forest	10	0	90	0	0	0
Settlement	0	0	10	100	0	10
Open forest	0	0	0	0	100	0
Agriculture	0	0	0	0	0	90
Total	100	100	100	100	100	100

Class	Product Accuracy (Percent)	User Accuracy (Percent)
-------	----------------------------	-------------------------

Grassland	90	100
Water	100	100
Dense forest	90	90
Settlement	100	83.33
Open forest	100	100
Agriculture	90	100

Overall Accuracy = (57/60) 95%

Kappa Coefficient =94.05

Overall accuracy of 95% was achieved with a Kappa coefficient of 0.9405. The Kappa coefficient lies typically on a scale between 0 and 1, where the latter indicates complete agreement, and is often multiplied by 100 to give a percentage measure of classification accuracy. This implies that the Kappa value of 0.9405 represents a probable 94% better accuracy than if the classification resulted from a random assignment.

### 3.4. NDVI Image Comparison and Change Detection Result

As indicated earlier, the spectral band ratio is one of the most common mathematical operations applied to multi-spectral data. Ratio images were calculated as the divisions of digital number values in one spectral band by the corresponding pixel value in another band. Based on the reflectance pattern of vegetation, different models of vegetation indices were developed to explain the healthiness, vegetation cover and biomass condition of vegetation. Various mathematical combinations of the Landsat channel 3(Red band) and channel 4(NIR band) data were found to be sensitive indicators of the presence and condition of green vegetation. Among these, NDVI is the most commonly used index for forest vegetation biomass monitoring. The absolute value of NDVI for vegetation change analysis is between 0 and 1. NDVI analysis was employed to get an overview of the vegetation biomass change based on 1988(Fig.3 A), 2003(Fig.3 B) and 2018 (Fig.3 C) satellite image. The NDVI empirical analysis is computed using equation (1).

$$NDVI = \frac{\text{Near infrared} - \text{Visible red}}{\text{Visible red} + \text{Near infra red}} \dots\dots\dots \text{Equation (1)}$$

Where, NIR=Image of Near-Infra Red,

As to vegetation conditions, NDVI values vary from 0 to +1. Healthy vegetation yields have high positive NDVI values because of their relatively high reflectance in NIR and low in the visible wavelength. After conducting NDVI analysis, the mean and standard deviations values were summarized using ERDAS IMAGINE 9.1 software to evaluate the trends of vegetation cover change condition of the area. Then, the mean and standard deviation result is obtained within the ranges of 0 and 1 and the following the statistical values of each of the images were presented in table 4.

**Table 4:** Statistics for NDVI analysis

Type	Year		
	1988	2003	2018
Minimum	-0.6667	-0.7067	-0.14474
Maximum	0.74699	0.70149	0.999872
Mean	0.1954	-3.8221	-0.029
Median	0.0374	0.0053	0.4253

Standard Deviation 0.195 0.185 7.998

Source: Satellite Image Interpretations

As indicated in table 4, the standard deviation of the 1988 image is 0.195, which is a greater value comparing with the value of the 2003 NDVI image has a value of 0.185 and 7.998 in 2018.

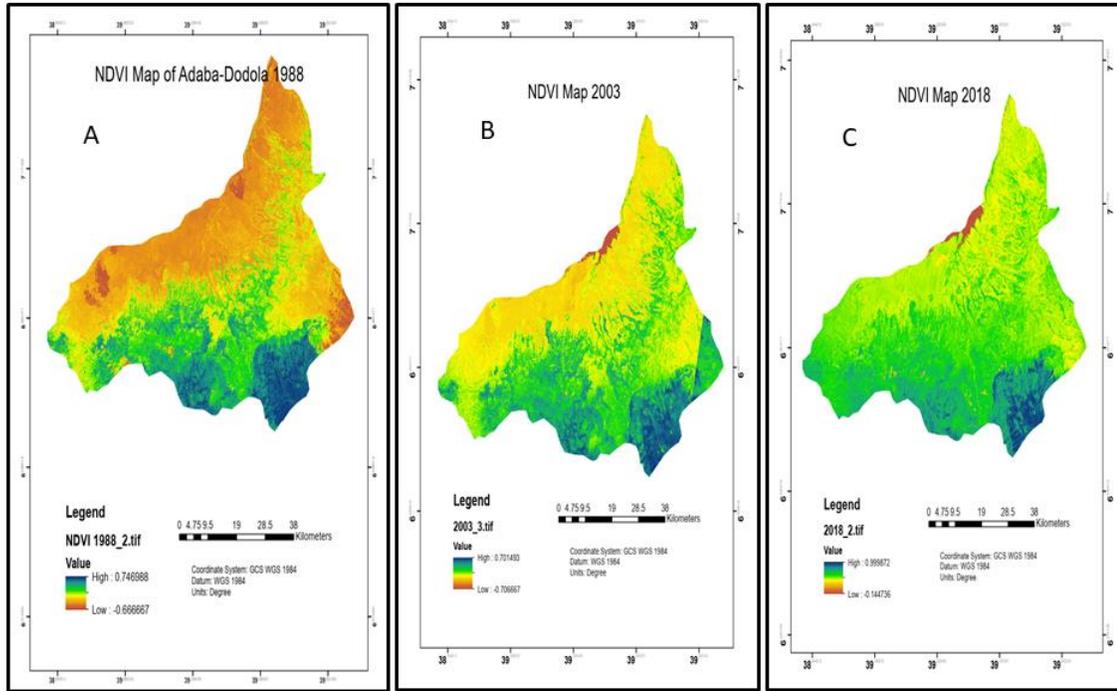


Fig. 3. NDVI Map of Adaba-Dodola District, 1988 A ,2003 B , and 2018 C  
 Source: 1988, 2003, and 2018 Image Interpretation

### 3.5. Characteristics of LU/LC units

The distribution of land cover/land use units of the study area is categorized into six classes, the major LU/LC types were identified by using the field data and satellite images of Landsat TM, 1988, 2003, and 2018. These were the dense forest, open forest, grassland, settlement/built-up area, agriculture, and water body (Table 2). The water body was added as a new LU/LC type in the Landsat images of TM 2003, and OLI TIRS 2018 to the presence of electric power dam in these images. Rivers, streams, and springs were not included in the classification. This is due to resolution problem of the image (30 m). In the classification, the forest was made to include human-made plantation forest and natural forest. This both natural forest and plantation forests categorized under dense forest and open forest based on NDVI value and field verification. The areal extent of each land covers land use types with a respective area in (ha) and the percentage is presented in Table 5.

Table 5. Summary Statistics of Land cover/ Land Use units of Adaba-Dodola District; 1988, 2003 and 2018

number	class name	1988		2003		2018	
		Area ha	%	Area ha	%	Area ha	%
1	Settlement	2347	0.61803	23452	6.175561	27476	7.235191

2	Grass land	34539	9.095074	26353	6.939474	33650	8.860976
3	Open forest	62004	16.32737	92297	24.30435	139008	36.60465
4	Dense forest	174429	45.93198	109830	28.92128	61468	16.18623
5	Agricultural land	106436	28.02754	125113	32.94572	115298	30.36115
6	Water	0	0	2710	0.713618	2855	0.751801
	total	379755	100	379755	100	379755	100

Source: Computed from Satellite Image Interpretation

#### 4. Results

##### 4.1. Land cover change in 1988,2003 and 2018.

The resulting maps indicate broad variations in LULC that occurred during the 30 years of study for Adaba-Dodola. **Fig.4** shows the land cover maps for 1988, 2003, and 2018 for the study area. The overall accuracies based on 2018 LULC maps were above 95%, and Kappa statistics were 0.94 or 94.05% indicating a strong to better accuracy acceptable agreement between the classification map and the Google Earth reference information[19].

From the 1988 landcover and land use map interpretation and classification, the areal coverage of dense forest was accounted for 174429 ha (45.9%) from the total study area. The open forest land and grasslands were occupied about 62004 ha (16.3%) and 34539 ha (9.1%), respectively. Besides, agricultural land 106436 ha (28%) and settlement 2347 ha (0.62%) was accounted for the total coverage of the study area.

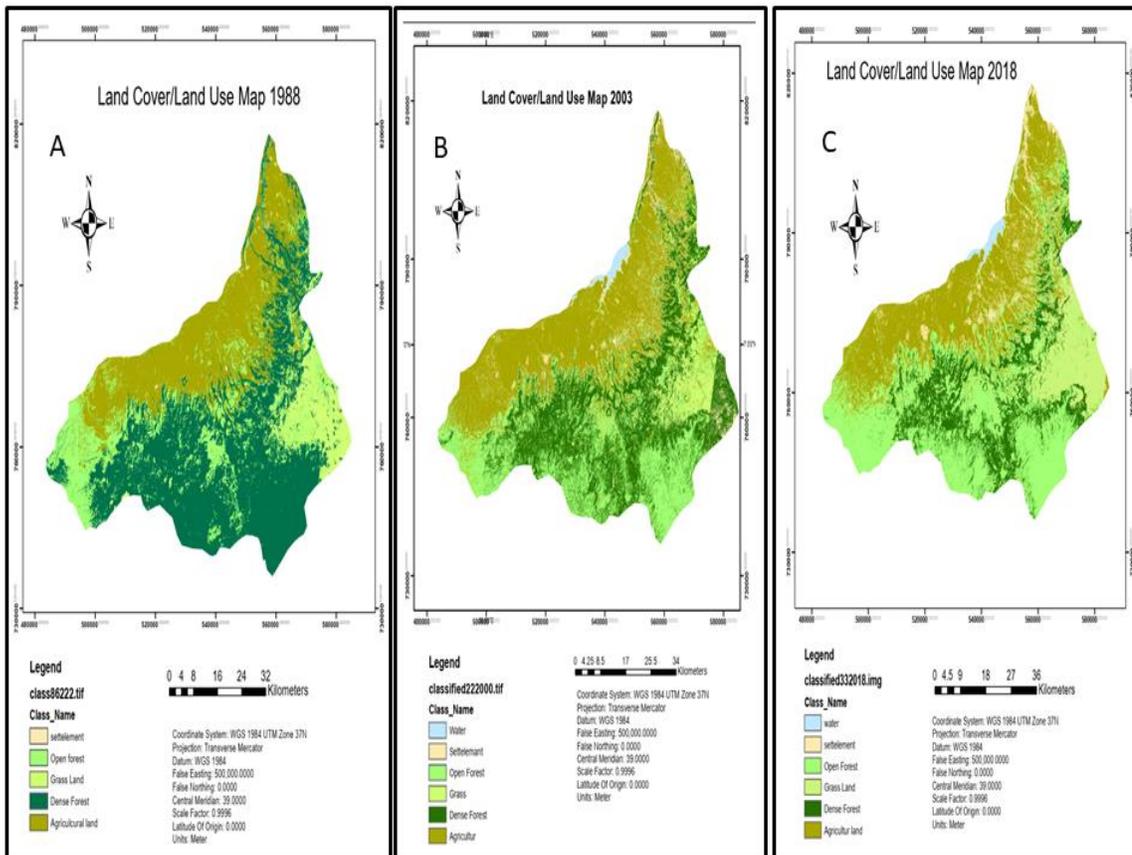
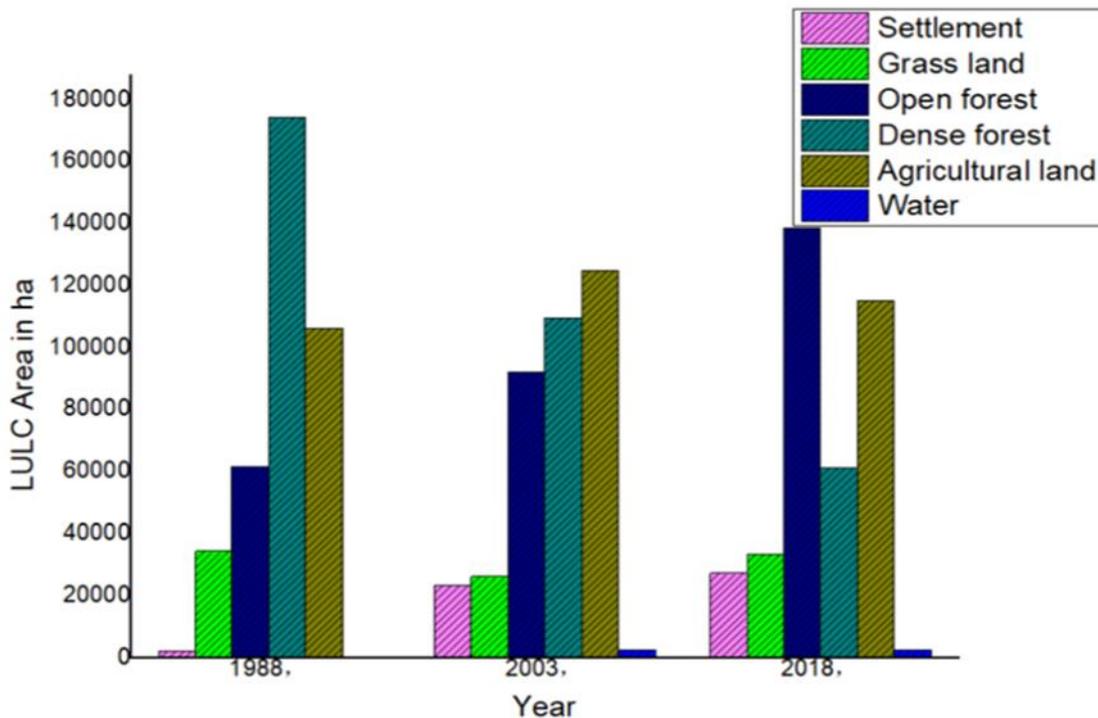


Fig.4. Land cover/land use map of Adaba –Dodola District,1988 A, 2003B & 2018 C.

**Source : 1988,2003 & 2018 Satellite Image Interpretation.**

From the 2003 land cover and land use map interpretation and classification, the areal coverage of dense forest was accounted for 109830 ha (28.9%) from the total study area. The open forest land, grassland and water body were occupied about 92297 ha (24.3%), 26353 ha (6.94%) and 2710 ha (0.71%), respectively. Besides agricultural land 125113 ha (32.95%) and settlement 23452 ha (6.18%) was accounted from the total coverage of the study area.

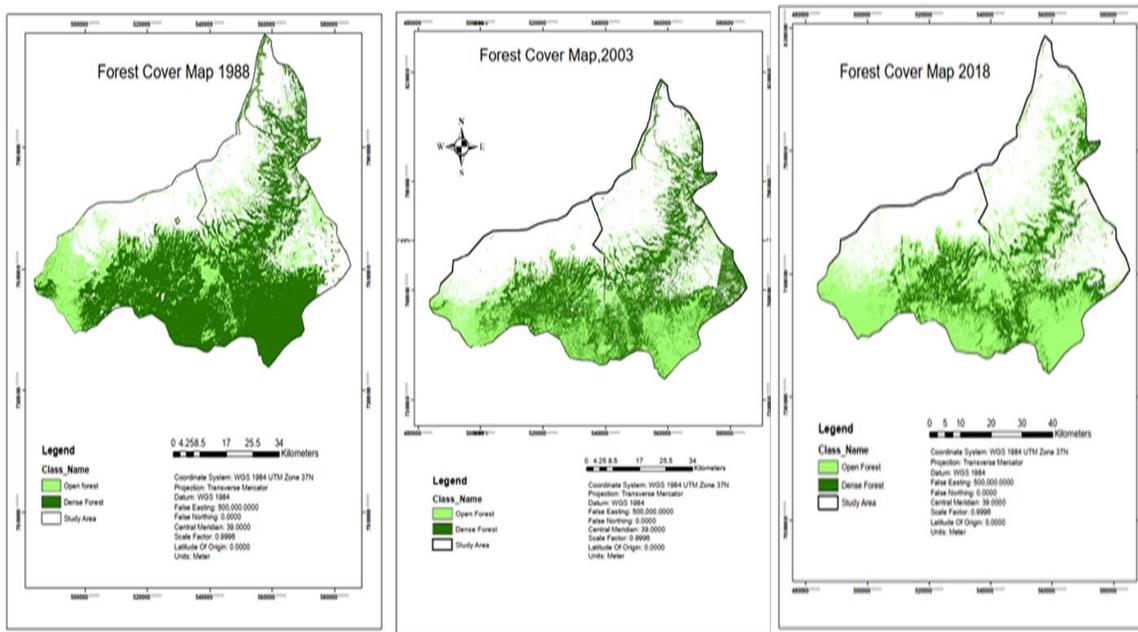
In 2018, from the total land coverage, agriculture land was accounted for about 115298 ha (30%). Dense forest and open forest take the share of 61468 ha (16%) and 139008 ha (36.6%), respectively. Waterbody 2855 ha (0.75%) covered from the total of the study area. The remaining area was covered with settlement and grassland 27476 ha (7.2%) and 33650 ha (8.86%).



**Fig.5. Land cover/land use of Adaba –Dodola District, 1988 , 2003 & 2018**

**4.2. Area extent and rate of forest cover change**

Assessment of forest cover change was done using remote sensing and GIS techniques with the integration of field survey. In this study, three Landsat satellite images (see table 1) were used to monitor the areal extent and rate of forest cover change within time sequence. During the analysis stage, digital image interpretation of forest cover area for each year was performed. The total area of the forest cover in terms of ha and its a percentage from each date of satellite interpretations were computed and summarized. In order to determine areas of the forest to be subjected to different change extract the area covered with both forest type (dense forest and open forest) therefore requires the extraction of polygons representing the forest areas. **Fig. 6** and **table 6** revealed that the pattern of forest cover changes between 1988, 2003, and 2018.



**Fig.6. Forest Cover Map of Adaba –Dodola District, 1988,2003 and 2018**

**Source: Derived from 1988,2003 and 2018 Land Cover/Land use Map**

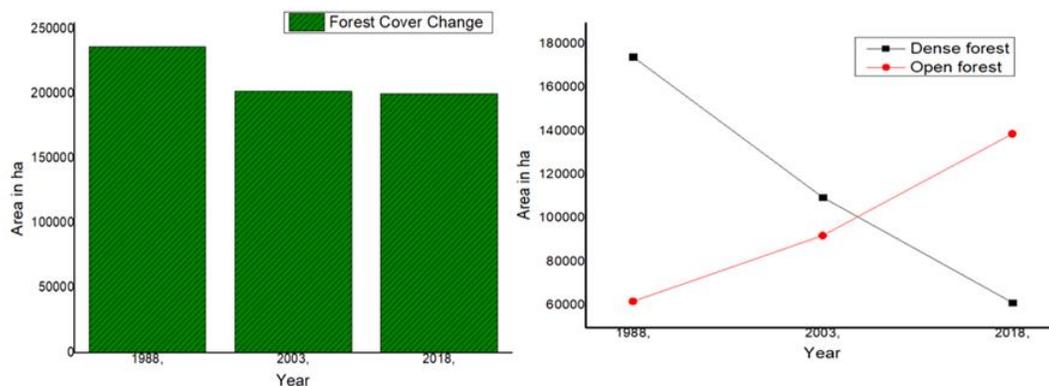
From this result, about 236433 ha of the district was covered with forest resource in the year 1988. Meanwhile, the forest cover land of the district was accounted for 202127 ha and 200476 ha in the year 2003 and 2018, respectively. The percentage share of each year forest cover value and with its diminishing trend is presented in **Fig. 7**.

**Table 6; Total Forest Covers Land Area of Adaba- Dodola District; 1988, 2003 and 2018.**

Year	Forest Cover Types	Forest Cover unit from the total area (in ha)	Forest Cover In %
1988	Open forest	62004	16.32737
	Dense forest	174429	45.93198
	total	236433	62.25935
2003	Open forest	92297	24.30435
	Dense forest	109830	28.92128
	total	202127	53.22563
2018	Open forest	139008	36.60465
	Dense forest	61468	16.18623
	total	200476	52.79088

Source: Computed from table 5.

Distribution and Forest Cover Change



**Fig.7. Distribution of forest cover with percentage and area in hacker value 1988,2003 &2018.**

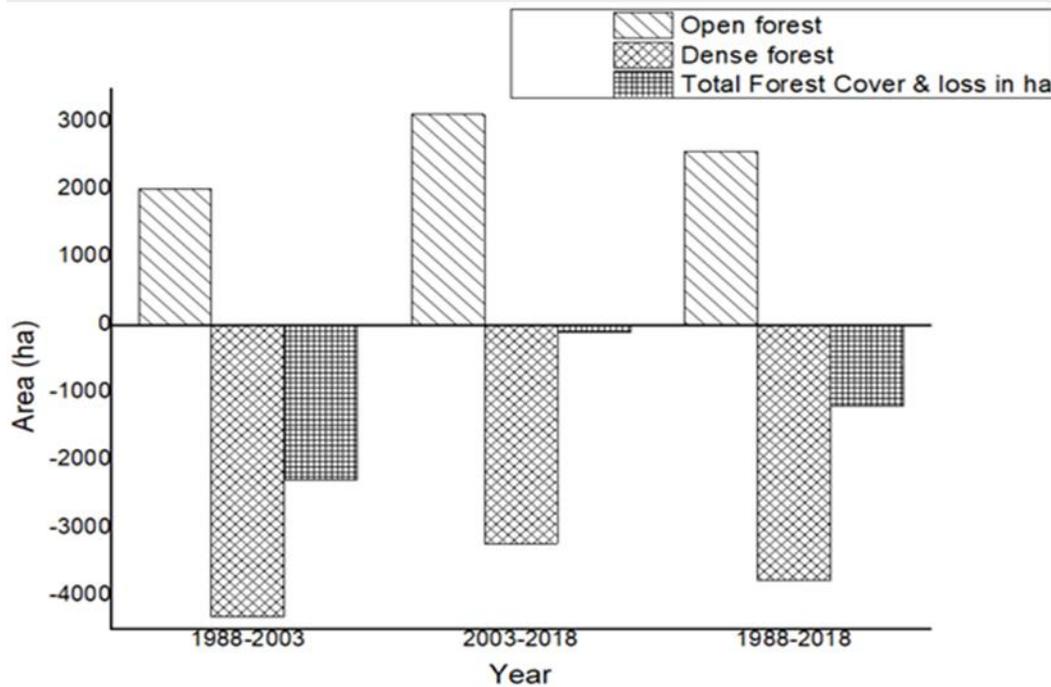
*Source: Computed from table 6.*

In the year 1988, 45.9% & 16.3% dense and open forest of the district was covered with forest resources while from the total area of the district about 28.9% & 24.3% was covered with forest resources in 2003. In the meantime, this figure turned down into 16.2 & 36.6 % in the year 2018. Based on this data, the rate of forest cover change also computed and its results presented in **Table 7**.

**Table7. : Trends and Rates of Forest cover change In Adaba-Dodola District**

cover class	year			Rate of Change		
	1988	2003	2018	1988-2003	2003-2018	1988-2018
Open forest	62004	92297	139008	2019.5	3114.1	2566.8
Dense forest	174429	109830	61468	-4306.6	-3224.13	-3765.37
Total Forest Cover & loss in ha	236433	202127	200476	-2287.1	-110.1	-1198.57

*Source: Computed From Table 6*



**Fig.8. Rate of forest cover change**  
 Source: Computed from Table 7

The computed result (Table 7. above) shows that the average rate of forest cover change from the year 1988 to 2003 is -2287.1 ha per year (202127 ha – 236433 ha / 15 years) and from the year 2003 to 2018, it was -110.1 ha annually (200476 - 202127 ha/ 15 years). the rate of forest cover change was lower in the year 2003-2018 than the rate in the year 1988-2003. Because from the year 2002 there was establishment of integrated forest management project in the area in local language WAJIB (Waldaa Jiraatoota Bosona) approach which means forest dweller association. Besides, considering the annual rate of forest cover change between 1988 and 2018, the computed result is -1198.57 ha per year (200476 – 236433 ha /30 year).

**4.3. Detection of land cover change matrix between 1988 and 2003.**

Giving special consideration to dense forest cover the major cover changes observed during this period shows that 79789.53 ha of forest cover were converted to other classes. From dense forest to grassland 5728.309 ha, dense forest to settlement it was 6713.272 ha, dense forest to open forest 63430.88 ha was converted and 3917.078 ha of dense forest was shifted to agriculture land. As indicated in **Table 8**, overall before the establishment of WAJIB institution forest cover loss was 79789.53 ha, gain 15259.27 ha and the net change was negative (64530.3 ha). During this period 94571.26 ha of dense forest land was unchanged (constant) to other classes.

**Table 8: Land-use /land cover change matrix between 1988 and 2003**

Land Class	Land Class 1988 Initial state					Class total
	Grass Land	Dense Forest	Settlement	Open Forest	Agriculture	
Class 2003 final Grass Land	14988.52	10533.16	3253.624	2221.91	3443.381	34440.6
Dense Forest	5728.309	94571.26	6713.272	63430.88	3917.078	174360.8

Settlement	41.11101	146.9231	858.646	82.86088	1121.317	2250.858
Open Forest	4499.262	3909.563	2741.476	24488.11	26285.93	61924.34
Agriculture	1095.439	669.6292	9884.84	2073.074	90345.5	104068.5
Class total	26352.64	109830.5	23451.86	92296.83	125113.2	377045.1
Gain	11364.12	15259.27	22593.21	67808.72	34767.7	
Loss	19452.07	79789.53	1392.212	37436.23	13722.98	
Net	-8087.95	-64530.3	21201	30372.49	21044.72	

#### 4.4. Detection of land cover change matrix between 2003 and 2018

During this period **58521.611 ha** of dense forest land was converted to other classes. Specifically, when we see the changes, 10716.055 ha was converted from dense forest to grassland, 7.367 ha to water, 4844.615 ha to settlement and 40739.815 ha was to open forest land. As indicated in **Table 9**, after the establishment of WAJIB institution agriculture land cover loss was 27059.632 ha, which is greater than it does before the local institution due to control expansion of illegal farmland. The gain from other classes was only 10205.56 ha and hence, the net change was **negative** (48316.05 ha). During this period 51205.045 ha of dense forest land was unchanged to other classes, which are minimal compared to the time before the local institution was established in the area and the areal coverage of agriculture was reduced.

**Table 9: Land-use /land cover change matrix between 2003 and 2018**

Land Class	Land Class 2003 Initial state						Class total
	Grass Land	Water	Dense Forest	Settlement	Open Forest	Agriculture	
Grass Land	16855.74	0.3249	2609.72	759.7463	4842.217	1305.447	26373.2
Water	0	2593.247	0.022394	10.03156	0.143294	102.4635	2705.908
Dense Forest	10716.05	7.367137	51262.44	4844.616	40739.82	2213.758	109784.1
Settlement	1614.347	203.7095	487.6751	6824.497	4994.964	9326.083	23451.28
Open Forest	3108.894	0.001072	6875.583	3255.382	74790.83	4256.49	92287.18
Agriculture	1354.96	50.3505	232.56	11781.73	13640.03	98093.76	125153.4
Class total	33650	2855	61468	27476	139008	115298	379755
Gain	16794.26	261.7531	10205.56	20651.5	64217.17	17204.24	
Loss	9517.455	112.6608	58521.61	16626.78	17496.35	27059.63	
Net	7276.8	149.0923	-48316.1	4024.724	46720.82	-9855.39	0

#### 5. Discussion and Conclusions.

This study offers an assessment of forest LU/LCC and its driving factors in Adaba-Dodola District in Ethiopia. The district is composed of six major LU/LCC types: dense forest, open forest, grasslands, agriculture, settlement, and water body. The quantitative evidence of land cover dynamics presented was delivered by repeated satellite images coupled with GIS analyses and field survey data analyses.

From the analyzed results, the magnitude of land-use/land-cover in general and forest cover change in particular was observed between the year 1988 and 2018 in the study area. Particularly, expansion of settlement, agriculture, and grassland decline of dense forest land were observed.

In relation to this, currently, the overall condition of the forest cover land of the study area is strongly disturbed. Besides, the areal extent of forest cover is reduced from time to time. The findings indicated that the total area of the forest land (both dense and open forest) cover was about 236,433 ha in 1988. But, the cover area declined to 200,476 ha in the year 2018. Moreover, for the annual rate of forest cover change between 1988 and 2018, the computed result indicated a loss of 1198.57 ha forest land into other land use. Yet the loss rate of forest cover was 2287 ha during 1988 to 2003, but reduced to 110 ha between 2003 to 2018, due to the practice of WAJIB project. The major factors for the forest land cover change in the study area are agricultural land & settlement expansion, firewood and charcoal production, demand for construction materials and income growth. Not only led to deforestation these factors also aggravated land degradation, soil erosion and biodiversity loss in the area.

Besides the land use/land cover change detection employed GIS and Remote sensing techniques, the results demonstrate that after the establishment of WAJIB institution, the areal extent of forest cover had declined and changed to the other land use land cover. Hence, this type of data was very useful for the concerned bodies in protecting the remaining forest resources from distraction.

Overall, it is evident that the forest cover land of Adaba-Dodola has declined despite the rate was alleviated in the past three decades. In order to protect the forest resources from further depletion and to use these precious resources on a sustainable basis, the following recommendations are suggested.

- 1) To increase the forest boundary awareness, additional forest boundary maps should be disseminated to the community. It will help to create a greater sense of forest resource ownership & lessen disputes resulting from confusion over the boundary of forest between communities.
- 2) To raise the carrying capacity on modern agriculture extension services.
- 3) To curb the woodcutting for household energy, improved stove for rural residents should be devised.
- 4) To overcome the problem of soil erosion, and water conservation methods should be studied and implement.
- 5) The family planning awareness creation campaigns with adequate health services should be introduced.
- 6) To protect the forest resources from further destruction.
- 7) To control illegal cutting trees for fuel wood and increase awareness of the ecological value of the forests as well as the consequences of deforestation.

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## Abbreviations

GIS- Geographical Information system

RS- remote sensing

NDVI – normalized different vegetation index

WAJIB (in local language Waldaa Jiraatoota Bosona) which means forest dweller association

KEBELE- A lower administrative structure of the country

LULC- Land use land cover

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# To identify the planning, designing errors & End user Satisfaction level in newly constructed apartment of Qasimabad Taluka

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**Abstract-** Qasimabad is one of four talukas of Hyderabad District in the province of Sindh, Pakistan. The people from many cities and areas of rural Sindh intend to live and settle in Qasimabad due to its location along national Highway. The continuous migration of people from rural areas of Sindh to Qasimabad has largely affected the population of this area and demand of new housing units rapidly increased; majority of migrated people can't afford the bungalow or independent house unit as compares to an Apartment unit. The Builders and developers take advantage of this demand and started to build new apartments buildings at Qasimabad. Majority of these Apartments have design and construction errors. Such Design and planning errors are the cause of resident's dissatisfaction, they spend a handsome amount on rework and maintenance of Apartments. This study identified the designs errors and peoples (residents) satisfaction through survey case studies and questionnaire.

**Index Terms-** Affected, Apartments, End user, Maintenance, Migration, Rework

## I. INTRODUCTION

There is growing recognition that built environment extremely influence the physical and mental health of inhabitants (Srinivasan et al., 2003; Peduc et al., 2003; Sallis et al., 2012;). In the built environment the housing is very much important because people spend the majority of the time at home (Hancock, 2002; Klepis et al. 2001).

Housing is one of the traditional areas of concern for public health, though it has been relatively neglected over recent decades. However, housing is important for many aspects of healthy living and well-being. The home is important for psychosocial reasons as well as its protection against the elements, but it can also be the source of a wide range of hazards.

The problems of housing in Pakistan are common in urban and rural areas. The situation is very severe in terms of quality with unsatisfactory environment especially in Qasimabad in case of newly

Constructed apartments. The people from many cities and areas of rural Sindh intend to live and settle in Qasimabad due to its location along national Highway.

This research will however remain to identify the planning, designing and construction errors in Apartment's buildings of Qasimabad.

## II. GOALS AND RESEARCH OBJECTIVES

The overall goal of this research is to identify the planning, designing errors & End user Satisfaction level in newly constructed apartment of Qasimabad Taluka.

## III. SCOPE AND LIMITATIONS OF RESEARCH

The scope of this research is to determine the errors in newly constructed Apartments at Qasimabad Taluka, district Hyderabad. The focus will not only be given on Apartments errors but the research will also try to find out the satisfaction level of the End-users. As defects are one of the major cause for dissatisfaction of the residents. The area of study is Taluka Qasimabad of Hyderabad District. A total number of six residential areas will be taken into this study to identify the housing defects and the satisfaction level of the occupants due to the occurrence of these defects.

This research is limited to find the Apartments defects and user's satisfaction level in six Residential areas of Qasimabad, Hyderabad i.e. Abdullah town, Goth Missri Khan Rind (Naqash Villass ph II, Bhtai Nagar, Al Mustafa Town Ph II, London Town and Al Rehman Cottages). The focus will only be given to the 'newly constructed Apartments. The research will only consider the six residential areas while the method of construction used is almost same in all areas, the climate of the areas is also same. It would also be better to take small area at initial level to get more accurate information for the better results.

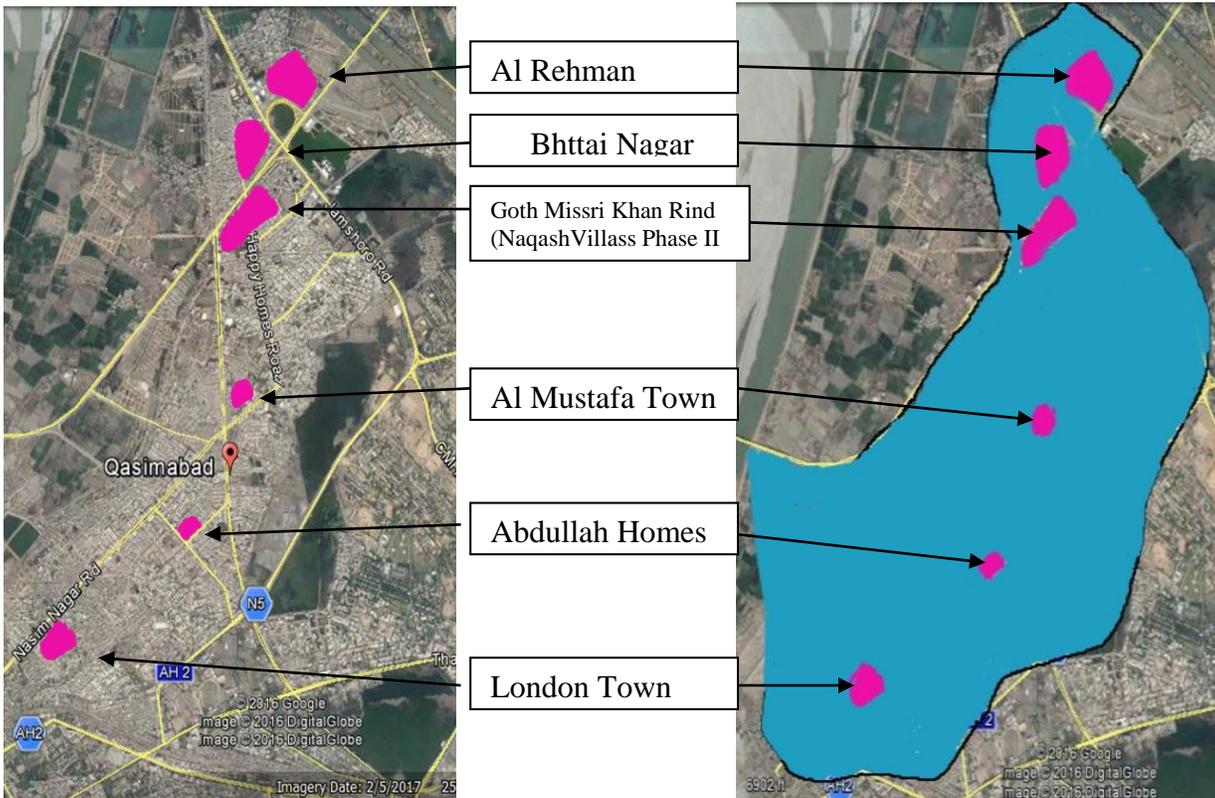
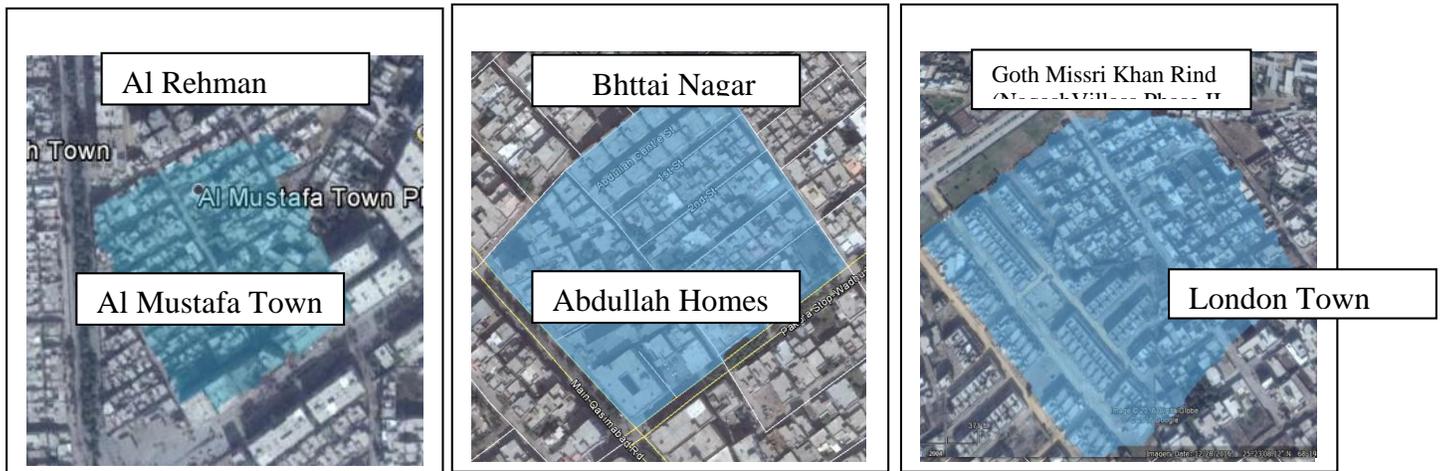


Fig 1 : Location map selected housing areas/schemes For Research at Taluka Qasimabad





#### IV. METHODOLOGY

Methodology is all about the system which is utilized in this research. The technique incorporates data about the research structure, population, sampling size, information gathering, survey plan, poll (questionnaire) content, instrument legitimacy, pilot contemplate, and the strategy for information preparing and investigation. The questioner survey will be the primary way to deal with gather the information and viewpoints of the respondents. The main purpose of this research is to identify the planning and designing errors in newly constructed apartment and to determine the satisfaction level of residents of Qasimabad Taluka. The questionnaire comprised of three sections i.e. "socioeconomic profile, household size (to determine the existing situation of apartment), Likert scale questionnaire for End User to determine their satisfaction level.

#### V. RESEARCH POPULATION

Two populations were targeted in this research. The first population is the residence of apartments of Taluka Qasimabad and second population is building experts (Architects, Engineers, building designers and contractors). According to population census 2017 the population of taluka Qasimabad is 305,000 with the change of +5.25% per year. So, now in 2019 the population of Qasimabad is 336,000 and approximately 20%-25% of population of taluka Qasimabad lives in apartments that's mean 680,00 to 850,00 people's lives in apartments of taluka Qasimabad.

#### VI. SAMPLE SIZE

Sample is the bit of the people that makes us draw inductions about the population. Get-together examination of the absolute information about the population is ludicrous and it is dreary and exorbitant. Subsequently, we need an appropriate precedent gauge with the objective that we can make acceptances about the population reliant on that model. An appropriate sample size is required for authenticity. In case the precedent measure it unnecessarily little, it won't yield significant results. An appropriate

Sample size can make precision of results. Also, the results from the little precedent size will be defective. A sample that is too immense will achieve wasting money and time. It is in like manner beguiling to pick too gigantic a model measure. There is no certain standard rule to choose the precedent gauge. A couple of experts do, in any case, reinforce a standard rule when using the sample.

#### VII. TARO YAMANE METHOD

The Taro Yamane method for calculation of sample size was formulated by Taro Yamane in 1967. Below is mathematical illusions for Taro Yamane formula.

$$n = N / (1 + Ne^2)$$

where

n = sample size, N = population under study, e = margin of error

Population study of Taluka qasimabd is 750,00 and margin of error which is selected is 5%. applying Yamane Method

$$n = \frac{75000}{1 + 75000(0.05)^2}$$

$$n = \frac{75000}{1 + 75000(0.0025)}$$

$$n = \frac{75000}{1 + 187.5}$$

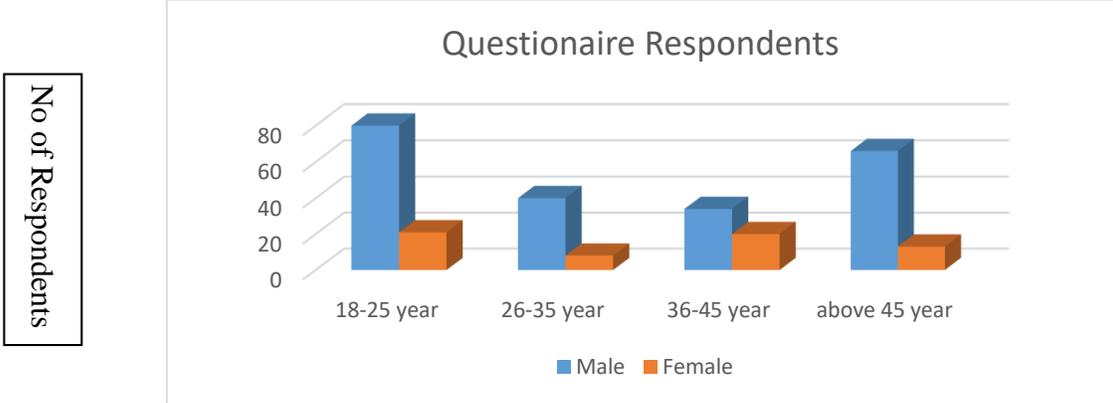
$$n = \frac{75000}{188.5}$$

$$n = 390$$

VIII. QUESTIONNAIRE RESULTS OF PART I

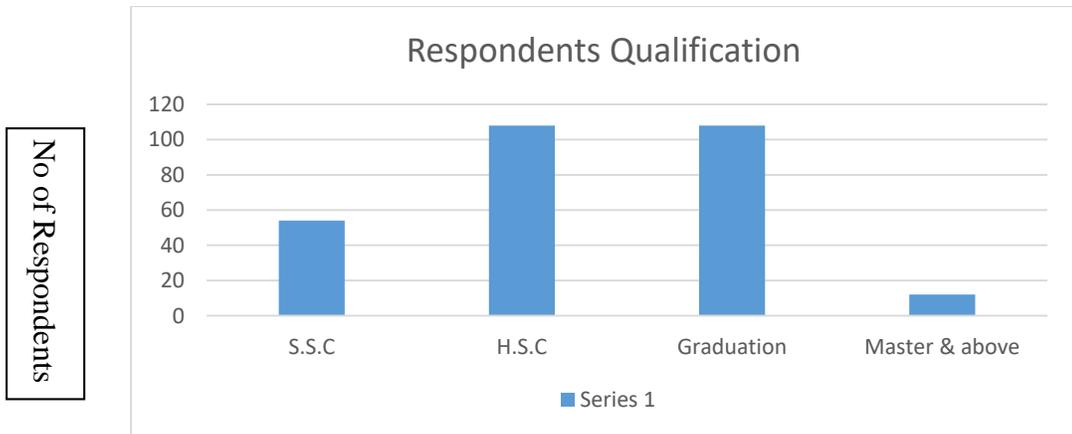
(EXISTING CONDITIONS OF APARTMENTS)

in part I questionnaire survey is conducting to determine the existing conditions of Apartments, the results are shown below in graphs



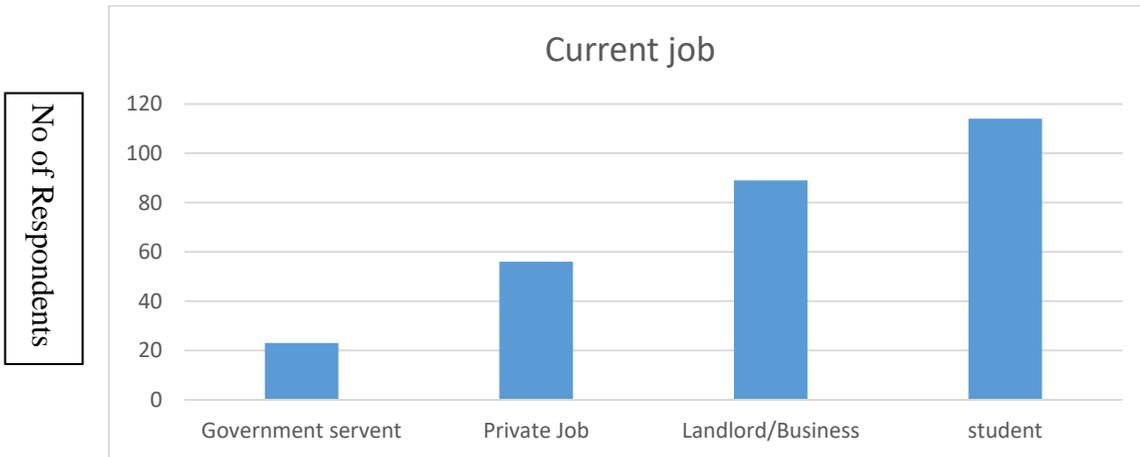
**Fig 2:** Bar chart showing the frequency of questionnaire respondents

101 respondents are 18 to 25 years old, 89 respondents above 45 years, 54 respondents are 26 to 35 years old and 48 respondents are 36 to 45 years old.

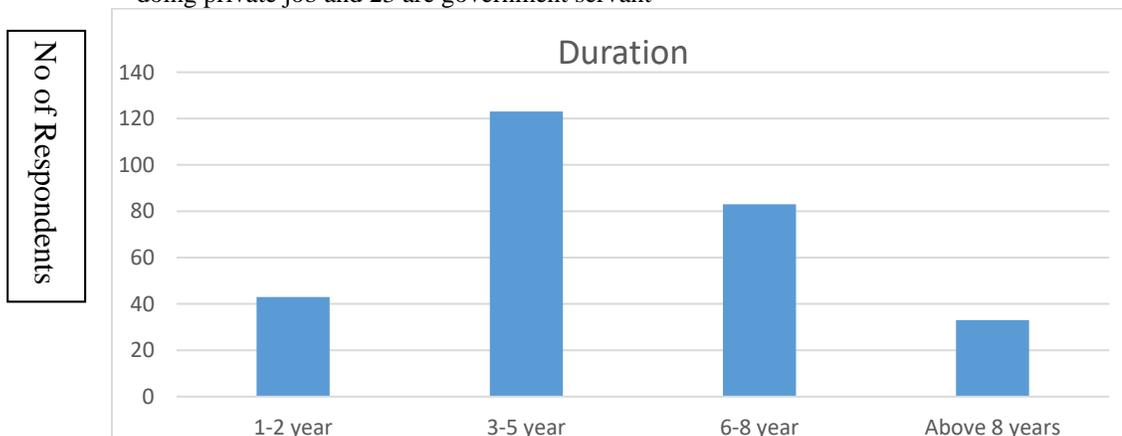


**Fig 3:** Bar chart showing the qualification respondents.

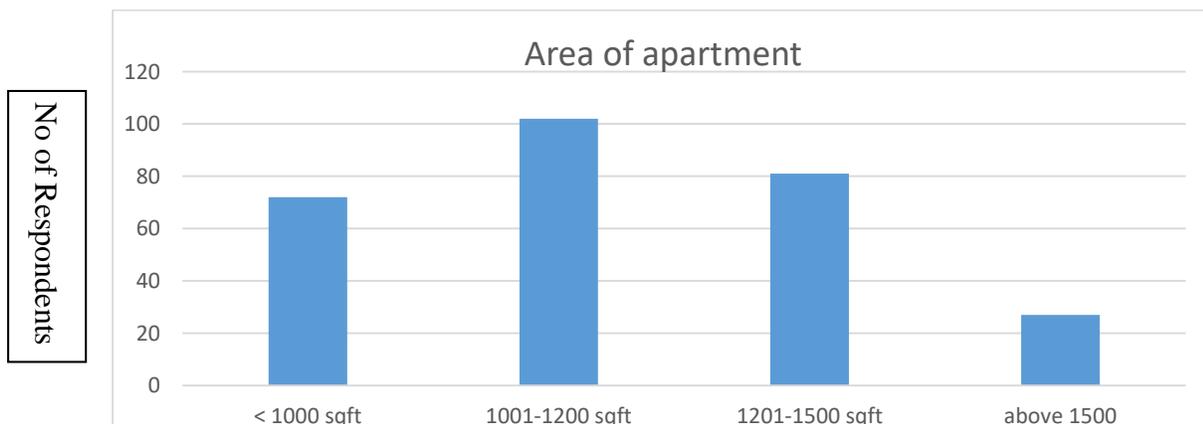
Bar showing that 108 respondents are HSC pass, 108 are graduated, 54 are SSC pass and 12 are master and above



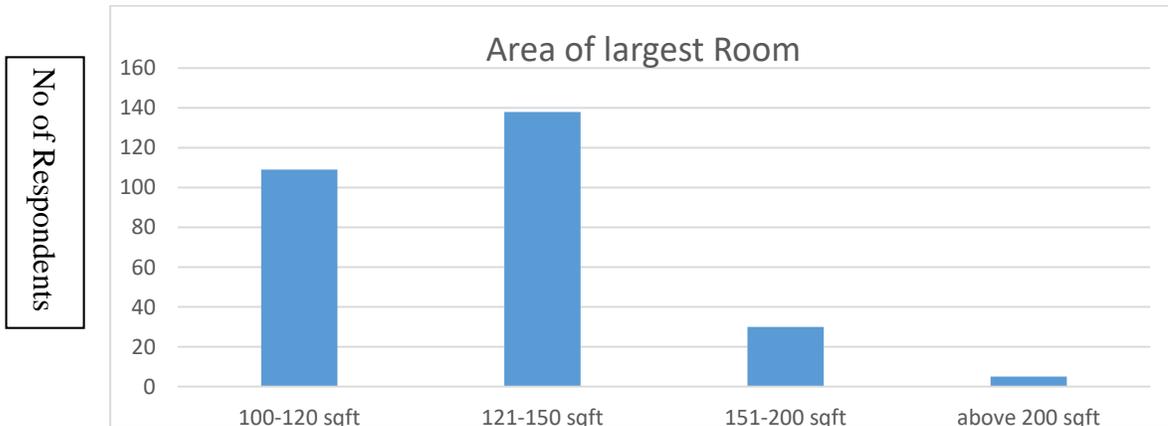
**Fig 4:** Bar chart showing the current job status of respondents  
 Bar showing that 114 respondents are students, 89 are Landlord/Business men 56 doing private job and 23 are government servant



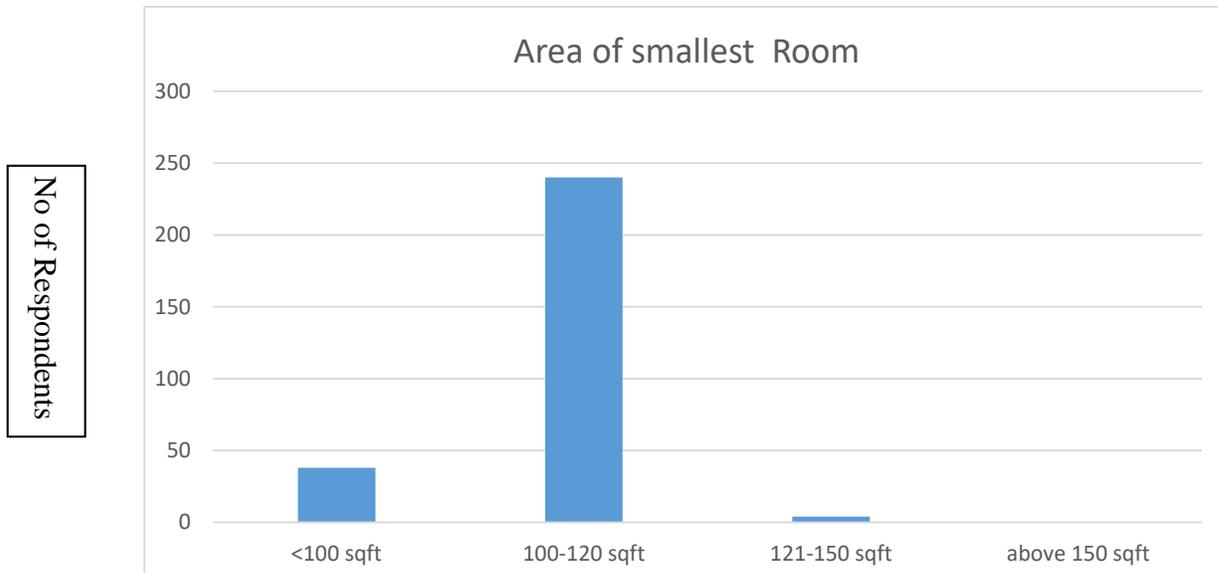
**Fig 5:** Bar chart showing the year/s spends by respondents at apartment  
 Bar showing that 123 respondents spend 3 to 5 years in Apartments, 83 respondents spend 6 to 8, year's 43 respondents spend 1 to 2 years and 33 of respondents spend Above 8 years



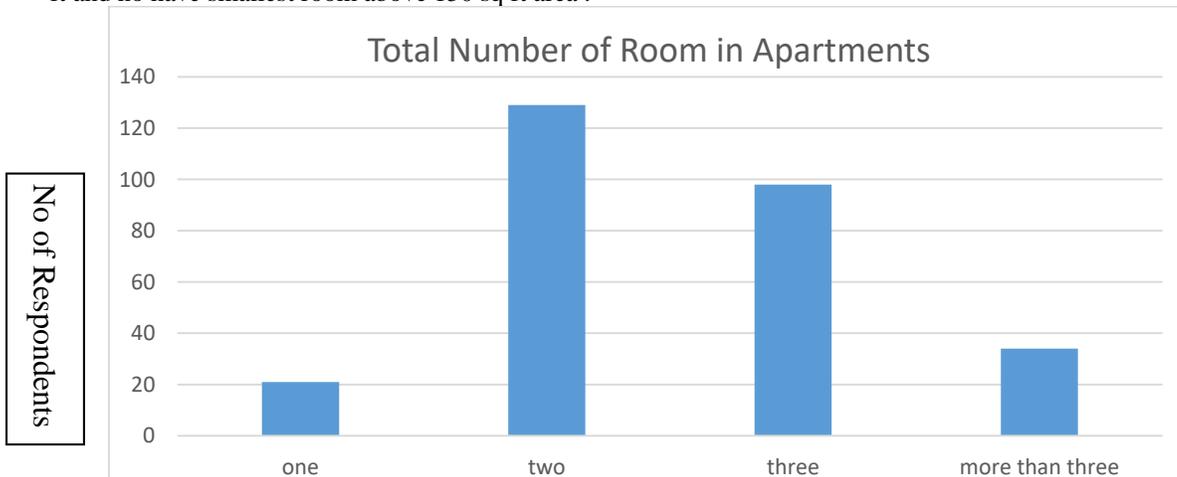
**Fig 1.6:** Bar chart showing the total covered area of respondent's apartments.  
 Bar showing that 102 respondents have apartments of 1001 to 1200 sq ft, 81 have Apartments of 1201 to 1500 sq ft, 72 respondents have apartment of less than 1000 sq ft and 27 have apartment of above 1500 sq ft area.



**Fig 1.7:** Bar chart showing the area of largest Room in respondent's Apartment Bar showing that 138 Apartments have largest room area 121 to 150 sq ft, 109 Have largest room area 100 to 120 sq ft, 30 have largest room area 151 to 200 sq ft and only 5 have above 200 sq ft area

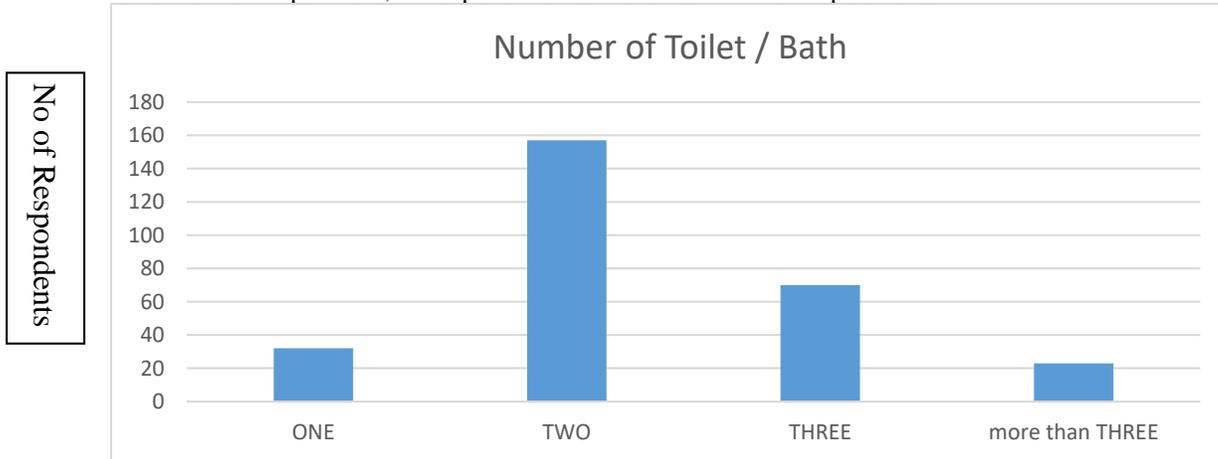


**Fig 8:** Bar chart showing the area of smallest Room Bar showing that 240 Apartments have smallest room area 120 to 120 sq ft, 38 have smallest room area below 100 sq ft, 4 have smallest room area 121 to 150sq ft and no have smallest room above 150 sq ft area .



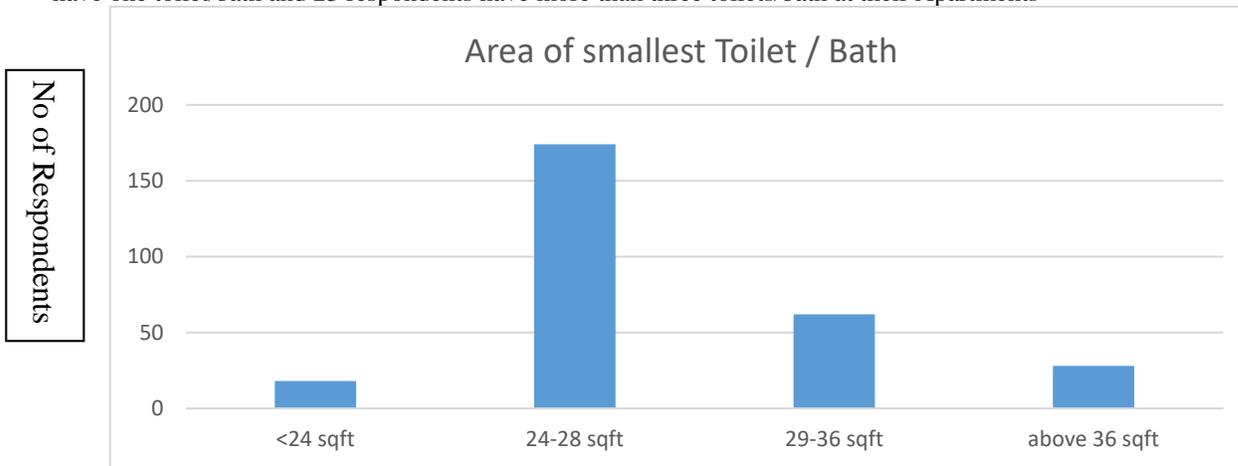
**Fig 1.9:** Bar chart showing the total numbers of Rooms in each Apartment.

Bar showing that 129 respondents have 2 room at their Apartment, 98 respondents have three room apartment, 34 respondents have more than three room Apartment, 21 respondents have one room in their Apartments.

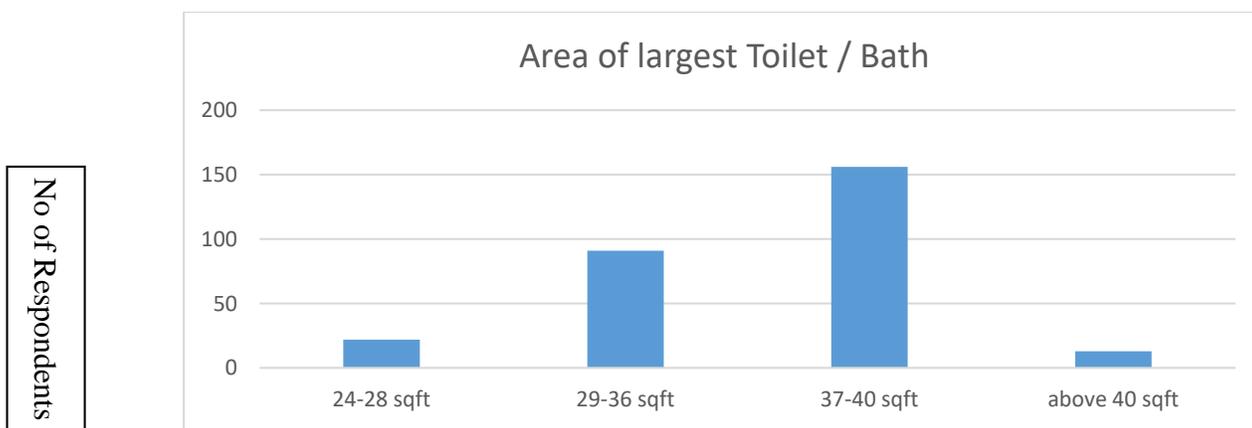


**Fig 9:** Bar chart showing the total numbers of bath/toilet in each Apartment

Bar chart showing that 157 respondents have two toilets/bath at their apartments, 70 respondents have three toilets/bath, 32 respondents have one toilet/bath and 23 respondents have more than three toilets/bath at their Apartments



**Fig 10:** Bar chart showing the area of smallest toilets/ bath.



**Fig 11:** Bar chart showing the area of largest toilets/ bath

Bar showing that 156 Apartments have largest toilet/bath area 37 to 40 sq ft, 91 have largest toilet/bath area 29 to 36 sq ft, 22 have largest toilet/bath area 24 to 28 sq ft and 13 have largest toilet/bath area above 40 sq ft area .

**PART TWO (LIKERT SCALE)**

After getting information about current situation of respondent's apartment, a Likert scale questionnaire was also filled by the respondents to determine the satisfaction level of resident of apartment.

Part one provided the information about current situation of apartment and part two told either residents satisfy or not from current situation.

**Table shows the LIKERT SCALE questions to investigate the satisfaction level**

Factors from survey and literature review	Question for end user after pilot study
<b>Parking issues</b>	Are you satisfied by parking area
<b>Narrow stairs &amp; Narrow corridors</b>	Are you satisfied by the width of stairs of Your Apartment Building
	Are you satisfied by the width of Corridors of Your Apartment Building
	Do you face difficulties while shifting furniture
<b>Width of doors</b>	Do you satisfied by the sizes of doors provided in your apartment
<b>Ramp ratios</b>	Do you face difficulties due to Ramp design (ramp ratio) of your apartment building, while parking your vehicles
<b>Mechanical transportation</b>	Are you satisfied by the number of lift/s provided in your apartment
	Are you satisfied by the size of lift/s provided in your apartment
	Is there any provision of cargo lift/s
<b>Security</b>	Do you felt secure in apartment
<b>Numbers of rooms</b>	Are you satisfied by the Number of rooms of your apartment
<b>Numbers of bath</b>	Are you satisfied by the Number of Bath rooms of your apartment
<b>Area of rooms</b>	Are you satisfied by the Area of rooms of your Apartment
<b>Area of baths</b>	Are you satisfied by the Area of bath rooms of your Apartment
<b>Cocking area</b>	Are you satisfied by the Area of kitchen
<b>Heights</b>	Are you satisfied by the ceiling height of your Apartment
<b>Ventilation &amp; lighting</b>	Is there proper ventilation of rooms?
	Is there proper ventilation of baths/Toilets
	Is there proper ventilation of lounge
	Is there sufficient natural lighting in living areas
	Is there is natural lighting in corridors
<b>Open spaces</b>	There is any balcony or gallery
	No proper open spaces
	There is any duct system if rectification required in drainage and water supply
<b>Drain blockage</b>	Do you faced any blockage in drain pipes

## IX. DATA PROCESSING AND ANALYSIS

The collected raw data was first sorted, edited, coded and then entered into computer software. Two methods were used, first one is EXCEL sheet and second SPSS software. Appropriate graphical representations and tables were obtained to to understand and analyze the questions. The ordinal scale was used in the analyses process. The ordinal scale is a ranking or rating data which normally uses integers in ascending or descending orders. The relative importance index (RII) was used in analysis process in addition to other approaches such as the one way ANOVA and frequencies and percentiles.

The relative index technique has been widely used in construction research for measuring attitudes with respect to surveyed variables. Many researchers used the relative importance index in their analysis.

Likert Scale was used for ranking questions that have an agreement level. The respondents were asked to give their perception in group of questions on five point scale

(1 for strongly disagree and 5 for strongly agree), which reflect their assessment regarding the factors affecting construction and design process. Then the relative importance index was computed using the bellow equation.

$$\text{Relative importance Index} = \sum w / AN = 5n_5 + 4n_4 + 3n_3 + 2n_2 + 1n_1 / 5N$$

Where “W” is the weighting given to each factor by respondent ranging from 1 to 5 (1n number of respondents strongly disagree, 2n number of respondents disagree, 3n number of respondents be neutral, n4 number of respondents agree n5 number of respondents strongly number of respondents strongly disagree agree). A is the highest weight (i.e strongly agree in the study), “N” total number of sample. The relative importance index range from 0 to 1. SPSS program was used to analyze all data, while MS –Excel was supportive for presentation and layout. The analyzed data was finally presented using descriptive methods for easy interpretation and enable comparisons.

## RESULTS

Table shows Rank and RII of factors related to un satisfaction of Apartment's residents of taluka Qasimabad Hyderabad

S.NO	FACTORS	RII	RANK
01	Un Availability of cargo lifts	0.949	1
02	No emergency exits	0.885	2
03	Parking problems	0.797	3
04	Ventilation of bed rooms	0.764	4
05	Area of kitchen	0.76	5
06	Numbers of passenger lifts	0.758	6
07	Duct system if rectification required in drainage and water supply	0.756	7
08	Size of passenger lifts	0.752	8
09	Lack of natural light in corridors	0.749	9
10	Area of Toilet/ Bath	0.741	10
11	Ventilation of lounge	0.719	11
12	Parking Ramp	0.695	12
13	Numbers of toilet/ bath	0.673	13
14	Area of bed rooms	0.662	14
15	Numbers of bed rooms	0.640	15
16	Balcony/ terrace (open spaces)	0.604	16
17	Width of corridors	0.604	17
18	Width of stairs	0.602	18
19	Ventilation of Toilets / Bath	0.544	19
20	Sizes of doors	0.537	20
21	Felt un secure in apartment	0.455	21
22	Ceiling height of apartment	0.326	22

From table 4.3, It is shown that, "un availability of Cargo Lifts in apartments of Taluka Qasimabad" was ranked at the first position by all respondents with RII of (0.949). there is no separate cargo (service) lifts along with passenger lifts for goods and furniture transportation.

Installing a cargo lift at apartment is a practical solution for movement of furniture and other goods from one floor to another floor without carrying them and without making many trips.

It is shown from above table that no provision of emergency exit was ranked in the second position by all respondents of apartments of taluka Qasimabad.

An emergency exit is an exit that is used to provide a safe means of escape from a apartment in the case of emergency, such as fire and etc. first responders may also use it as a way into the building so it is very important to make sure they are ready to use at all times. It is responsibility of every building designer and building owner to make sure that exits are clear and visible in case of an emergency. This mean both inside and outside. But unfortunately there is no proper emergency exit in any apartment of taluka Qasimabad, Hyderabad. Basic reason of this error is that there is no properly well define building bylaws regarding emergency exit in SBCA by laws.

Parking problems stand at rank 3 with RII (0.797). Almost all the newly constructed apartments of taluka Qasimabad have parking space at basement but the designed parking is not enough as compare to total numbers of apartments present in building there is no proper by laws of SBCA regarding apartments parking with reference to numbers of apartments. SBCA by laws regarding apartments parking as under

Minimum one motor vehicle parking space shall be provided for Apartment building or residential-cum-commercial or commercial building for 2000 Sqft (186 Sq.m). (Regional interim building & town planning regulations S.B.C.A ,2018)

Bad Ventilation of bed rooms stand at rank 4 with RII (0.764). ventilation moves outdoor air into a building or a room, and distributes the air within the building or room. General purpose of ventilation in a building or room is to provide healthy air for breathing by both diluting the pollutants originating in the building or room and removing the pollutants from it. ([Etheridge & Sandberg, 1996](#); [Awbi, 2003](#)).

According to environment protection agency, indoor air quality can be more polluted than outdoor air. This may come as a surprise but make sense. In Qasimabad Apartments generally do not have as many windows as houses, free flowing air in bed rooms is an important component of healthy air because it helps to regulate temperature and prevents buildup of mold and dust .

Area and design of kitchen in apartments of Qasimabad is stand at rank 5 with RII (0.760) . not enough storage one of the most common kitchen design problems resulting from poor planning is insufficient storage. For centuries, the kitchen was considered as an unimportant workplace and was often isolated from the home, typically at the corner of building. People usually considered it as a room for bare essentials. However, over the past decade, the kitchen has become one of the most important places in the home. People these days have started considering kitchen as active part of a family home. According to SBCA by laws the minimum floor area for a kitchen is 50 sqft, surprisingly 90 % of apartments of Qasimabad have 50 sqft or more than 50 sqft, but even they are not happy with provided floor area of kitchen.

Shortage or unavailability of passenger lifts ranked at 6 with RII (0.758) by the residents of apartments of taluka Qasimabad. A passenger lift has a fully surrounded with lift car that travels vertically within a particularly equipped lift shaft. Passengers are transported between floors at reasonably quick speeds and control systems are often designed to give the safest distribution of passengers throughout the building. Only 60% apartments of Qasimabad have passenger lifts. And those who have lifts they are facing problems of maintenance and traffic congestion, as number of lifts not according to population of apartment. According to SBCA by laws one lift will be provided from 46 ft to 59ft climbing height and two lifts for 59ft to above, the bylaws provided height but not area of plot and number of apartments.

No Duct system if rectification required in drainage and water supply is ranked at number 7 with RII (0.756). Only very few apartments have proper duct system for rectification of drainage and water supply lines. Most of apartments have no proper duct system due to which residents faced many problem in case of blockage of drain lines and this also caused of building decay.

Small Size of passenger lifts is ranked at number 8 with RII (0.752) by the residents of apartments of taluka Qasimabad. As only 60% apartments has lift. And out of that 60% almost all the apartments have only one passenger lift. That is why people feel congestion. So, by increasing the number of lift this issue may be solved.

Lack of natural light in corridors was ranked at number 9 with RII (0.749) by the residents of Taluka Qasimabad. Day light or natural light is the controlled admission of sun light. The components of daylighting system are designed to bring sun light into building in such a way that electric lights can be turned off for a portion of the day. Many apartments of taluka Qasimabad have lack of natural light in corridors which creates problem specially in case of load shedding.

Area of Toilet/ Bath was ranked at number 10 with RII of (0.741). According to SBCA by laws minimum area of WC is 15 sqft, for bath 15sqft and in case of combine WC and Bath the area should be 35 sqft. In case of apartments of Qasimabad the combined WC and Bath is most common trend.

Ventilation of lounge ranked at 11 with RII (0.719). People spend most of day time at lounge. So, it is very important to have well ventilated lounge at apartment, proper ventilation prevents air pollutants from affecting the health of residents. Not only can that, having airflow in lounge get rid of any unwanted smells such as from cooking.

Functional Errors in parking ramp ranked at 12 with RII (0.695). it is common practice at apartments of Qasimabad that the proposed ratio and width of ramp in submission drawings are according to by laws, which cannot create problems during parking but at the time of construction owner cannot follow the submission drawings and reduced the ratio and width of ramp to save the space

Numbers of bath/toilets ranked at 13 with RII (0.673) by the apartment's residents of Qasimabad. There is no any bylaws present in SBCA regarding number of bath and toilets as compare to area of apartment and as compare to numbers of rooms. During study it is found that 70% apartments have attached bath, toilet with all bed rooms. 16% apartments have one bed room without attached bath, toilet. While 14% of apartment have only common toilet, bath.

Area of Bedrooms ranked at 14 with RII (0.662) by the apartment's residents of taluka Qasimabad. It is very interesting that minimum room area according to SBCA bylaws is 100 sqft and no room bed room found during study which has area less than 100 sqft. But residents still think that area of rooms is insufficient to fulfill their requirements.

Numbers of bed rooms ranked at 15 with RII (0.640) by the apartment's residents of Qasimabad.

Open spaces (Balcony/Terraces) ranked at 16 with RII (0.604) by the apartment's residents of Taluka Qasimabad, Hyderabad. Open spaces (balcony/terrace) are not only beautiful but also provide the residents with a safe and secure environment for spending their time. Therefore, open spaces improve the general health and well-being of residents.

Width of corridors as ranked 17 with RII (0.604), width of corridors ranked 18 with RII (0.602), ventilation of toilets/ bath ranked 19 with RII (0.544), sizes of doors ranked at 20 with RII (0.537), and felt unsecure in apartments ranked at 21 with RII (0.455) and at last ceiling height was ranked at 22 with RII (0.326) .

## LIST OF ABBREVIATIONS

<b>S.B.C.A</b>	Sindh Building Control Authority
<b>H.D.A</b>	Hyderabad Development Authority
<b>S.P.S.S</b>	Statistical Package for Social Sciences

## **R.II** Relative Importance Index

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# Antioxidant action of a nanocomposite biological product Azogran on seeds development of different varieties of barley

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**Abstract-** Significant opportunities allow the use of biological products that increase the resistance of plants to adverse stress factors, increase yields and improve product quality. In the present work, the dependence on the suppressing effect of hydrogen on various seeds of different species was established. It was shown that the post-treatment of seed with the nanocomposite bacterial preparation Azogran exerts an antioxidant effect on plant growth at different development phases.

**Index Terms-** hydrogen peroxide, oxidative stress, *Bacillus subtilis*, *Azotobacter vinelandii*, Barley

## I. INTRODUCTION

Historically, cereals have been one of the main types of plants in agriculture. Barley is one of the most important nutritious crops, 100 kg of seeds is equal to 120 feed units, and has a high starch content (44-51%), which is a valuable raw material for beer and ethanol. Barley is currently the fourth most important cereal crop in the world, grown in more than 100 countries. In the last decade, Europe produced about 60% of the world's barley tonnage, while Asia and America produced 15% and 13% respectively [1, 2]. However, one of the important tasks of modern agricultural science is to increase the resistance of crops to abiotic stresses (soil drought [3], frost [4], and salinization [5], the action of heavy metals (TM), UV radiation, herbicides and flooding). Climatic instability increasing in recent years and an increase in the number of weather anomalies lead to disturbances in plant metabolism and a decrease in their productivity [6]. The plant can give in to stress even at the initial stage of ontogenesis, lose the ability to germinate at the seed stage as a result of the accumulation of degenerative changes. One of the early effects of stress on plants is excessive accumulation of reactive oxygen species (ROS) and the development of oxidative stress [7]. The study of plant reactions to stressful situations periodically occurring during the growing season is necessary to develop methods that reduce their negative impact. The solution to this problem in modern agricultural production is closely related to the use of microbial preparations. According to the literature [8], bacteria, in comparison with plants, are characterized by a wider spectrum of enzymatic and non-enzymatic antioxidant defense systems, which are less sensitive to the influence of stress agents. The use of biological products accompanies the better development of plants and the production of better products. In the department of microbiological processes on solid surfaces of the Institute of Microbiology and Virology. D.K. Zabolotny of the NAS of Ukraine created a highly effective nanocomposite complex bacterial preparation called Azogran. The components of this biological product is the nitrogen-fixing strain *A. vinelandii* IMV B-7076, phosphate-mobilizing bacteria *Bacillus subtilis* IMV B-7023 and the clay mineral bentonite. Earlier, we found that the metabolite complexes of these strains exhibit an antioxidant effect on the germination of wheat and rye seeds [9]. However, the antioxidant effect of Azogran as a whole has not been investigated. In this regard, the aim of this work was to study the effect of barley seed bacterization by the nanocomposite complex bacterial biological preparation Azogran on plant growth under peroxide stress.

## II. MATERIALS AND METHODS

In order to verify the effect of the nanocomposite complex bacterial preparation Azogran on the growth of barley plants under conditions of peroxide stress in the IMV named after D.K. Zabolotny of the NAS of Ukraine, his experimental batch was developed. The components of the preparation are strains of *Azotobacter vinelandii* IMV B-7076 [10], *Bacillus subtilis* IMV B-7023 [11] and bentonite nanoparticles. The number of viable cells in the biological product was:

- *A. vinelandii* IMV B-7076 -  $(3.1 \pm 0.1) \cdot 10^7$  cells/ml;
- *B. subtilis* IMV B-7023 -  $(3.4 \pm 0.1) \cdot 10^7$  cells/ml.

The seeds of spring barley of the varieties Burkhant (Mongolia), Virazh (Ukraine), and Copeland (Canada) were used in the experiment. In the first series of experiments, 50 seeds of each cultivar were selected and treated with hydrogen peroxide (6%, 20%, and 33%) for 30 min. Seeds were washed three times with physiological saline and laid out on filter paper moistened with sterile distilled water for germination at  $t=20^{\circ}$  C. The experiments were carried out in laboratory conditions in triplicate. In the second series of experiments, plants of 3 varieties of barley were grown in a greenhouse. Pre-seed was subjected to processing according to the scheme:

1. Control - seeds treated with sterile distilled water ( $H_2O$ );
2. Seeds bacterized by the nanocomposite complex bacterial preparation Azogran (CX);
3. Seeds treated with 33% hydrogen peroxide for 30 minutes. ( $H_2O_2$ );
4. Seeds exposed to 33% hydrogen peroxide (30 min.) and bacterialized with 3 ml of the nanocomposite complex bacterial preparation Azogran for 1 hour ( $H_2O_2 + CX$ ).

The seeds of each grade of barley were sown in 4 replicates of 50 pcs. in a row. During the growth of barley, the following phases were noted: GS-24 tillering, GS-45 booting, GS-61 flowering, GS-87 dough development, GS-91 ripening. The onset of the developmental stages of barley plants was noted according to the method described in [12]. In each phase, the height of the plants was investigated. Harvesting and recording of crops was carried out in the phase of full ripeness in the plots in accordance with traditional methods manually [13]. The data obtained were processed using standard statistical methods [14] and using standard computer programs Microsoft Office Excel. The figures and tables show the arithmetic mean values and standard deviations. The significance of differences between the mean values was evaluated by student t-test.

### III. RESULTS AND DISCUSSION

At the first stage of experiment, the parameters of peroxide stress were experimentally selected. Hydrogen peroxide is a natural metabolite of cells and is formed during the dismutation of the superoxide anion radical and during the oxidation of various reduced cellular components (iron-sulfur-containing proteins, flavoproteins).

However,  $H_2O_2$  can accumulate in excess in the cells of prokaryotes, eukaryotes and act as one of the most aggressive promoters of lipid peroxidation (LPO), as well as contribute to the development of oxidative stress. This stress agent activates the lysis of cell membranes, which in turn is accompanied by a decrease in cell viability and causes necrosis in general, and also acts as a factor in abnormal ontogenesis [15-17].

It was shown that 6% hydrogen peroxide was not an aggressive oxidant and accordingly, did not inhibit the similarity of seeds, but rather increased it (Table 1). From literary sources it is known [18] that dilute aqueous solutions of  $H_2O_2$  are used as an environmentally friendly growth stimulant and disinfectant for vegetables and grain crops. However, under the action at 20% and 33%  $H_2O_2$ , the values of this indicator decreased significantly. The development of oxidative stress was especially pronounced under the influence at 33% of hydrogen peroxide. In particular, when incubating barley seeds of Virazh variety in 33%  $H_2O_2$ , their germination rate decreased by 31.7%, Burkhant variety - by 66.9% and Copeland variety - by 41.2%, relative to the control.

During ontogenesis, plants are exposed to changing environmental conditions, to which they are forced to adapt, developing protective mechanisms to reduce their negative impact and preserve life potential [19].

However, the implementation of such mechanisms is accompanied by significant energy costs, and this in return leads to a decrease in productivity [20].

TABLE 1. THE EFFECT OF DIFFERENT CONCENTRATIONS OF HYDROGEN PEROXIDE ON THE GERMINATION OF SEEDS OF DIFFERENT VARIETIES OF BARLEY

Barley variety	Seed germination (%) under the action of different concentrations of $H_2O_2$			
	Control	6%	20%	33%
Virazh	50,4 ± 1,1	186,5 ± 0,9	36,1 ± 1,8	18,7 ± 0,2
Burkhant	75,6±0,6	98,1±0,5	56,1±2,0	8,7±0,5
Copeland	68,0±1,4	99,4±1,1	65,6±1,6	26,8±1,2

Notes: 1. - control - seeds treated with sterile distilled water; 2. - the treatment time with hydrogen peroxide was 25 minutes

Among the responses of plants to the influence of various stress factors are mutually beneficial bonds of plants with rhizospheric microorganisms that are able to synthesize a wide range of antioxidant metabolites [21].

Such soil microbes are of interest in creating biological plant protection products. Since they are characterized by the formation of long-term protection of the macroorganism from stressful environmental factors [22].

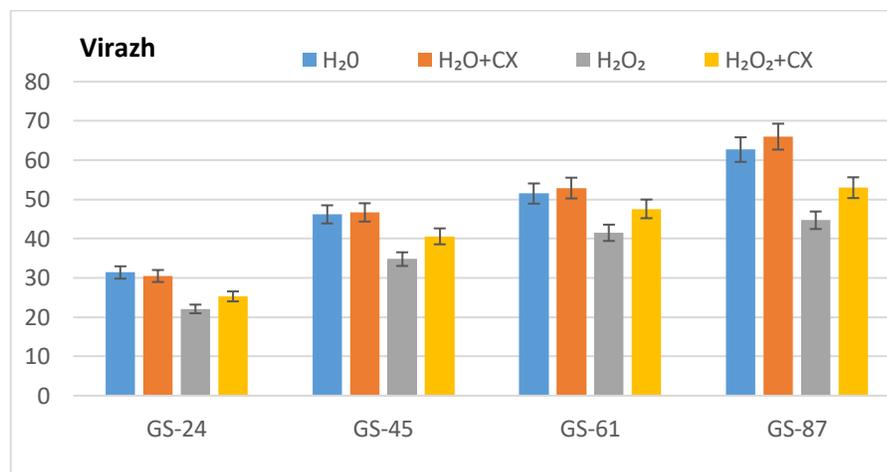
According to the results of experiments in the greenhouse, it was found that the post-treatment with a nanocomposite complex bacterial preparation of seeds of rape barley, strains Virazh, Burkhan and Copeland, stressed by hydrogen peroxide, significantly stimulated plant growth at different stages of development (Fig. 1, 2, 3). So, at the tillering stage, the height of the Virazh barley plants in the pre-sowing seed treatment variant 33% H<sub>2</sub>O<sub>2</sub> + Azogran increased by 20.5%, the Copeland cultivar - by 9.6%, compared with the variant where the stress agent acted on the seeds (Fig.3). However, stimulation of the studied parameter was not observed for the Burkhan variety (Fig.2).

The tillering phase is a very important stage of organogenesis, at which regenerative organs are laid and formed. The future harvest depends on their normal development. In addition, in this phase of development, young plants are in great need of nitrogen and phosphorus nutrition [23].

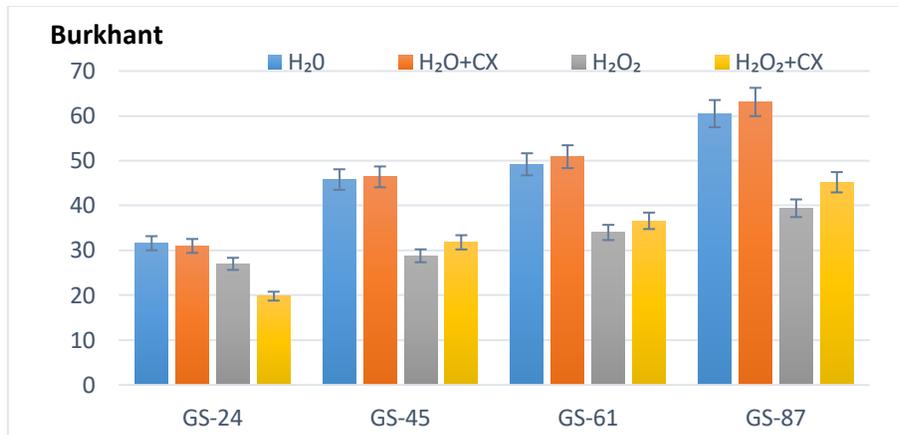
Highly effective nitrogen-fixing and phosphate-mobilizing microorganisms, in particular, bacteria-components of the biological product Azogran, can take part in eliminating this problem [24, 25].

Analysis of data on the height of barley plants in the phase of exit to the tube (stem) for the variant using hydrogen peroxide and the preparation Azogran also showed an increase in this indicator. Accordingly, for the Virazh variety - by 16.7%, for the Burkhan variety - by 10.4% and for the Copeland variety - by 7.7%, in comparison with the option where the plants developed from seeds treated with a 33% H<sub>2</sub>O<sub>2</sub> solution (Fig. 1, 2, 3 ). It should be noted that the barley plants of the Copeland variety did not develop in subsequent stages. Presumably this could be due to greenhouse conditions, which may not have been optimal for growing this variety. Accordingly, further studies were carried out on 2 varieties of barley: Virazh and Burkhan.

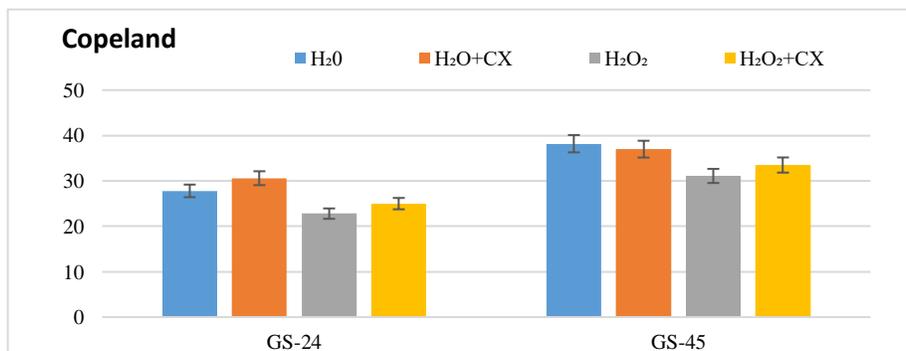
In the flowering phases - wax ripeness, differences in the height of barley plants between the treatment options for seed 33% H<sub>2</sub>O<sub>2</sub> and at 33% H<sub>2</sub>O<sub>2</sub> + Azogran were preserved. Correspondingly, the studied indicator for barley of the Virazh variety during these development phases increased in the variant with post-treatment of seeds with a nanocomposite complex bacterial preparation by 14.7 - 18.6%, and for the Burkhan variety-by 7.6 - 14.7%, respectively, to the variant where the seeds were exposed to hydrogen peroxide (Fig.1, 2).



**Fig. 1.** The effect of a nanocomposite complex bacterial preparation on the height of Virazh barley plants in different phases of development, after seed treatment with hydrogen peroxide



**Fig. 2.** The effect of a nanocomposite complex bacterial preparation on the height of Burkhant barley plants in different phases of development, after seed treatment with hydrogen peroxide

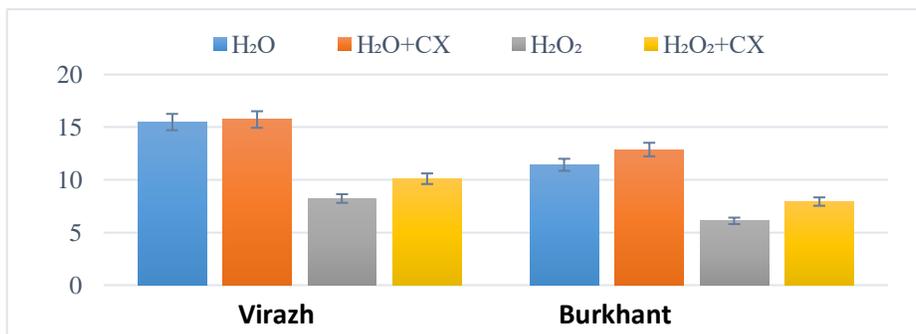


**Fig.3** The effect of a nanocomposite complex bacterial preparation on the height of Copeland barley plants in different phases of development, after seed treatment with hydrogen peroxide

The number of grains in an ear is important when selection plant varieties for their productivity and is a prerequisite for a high yield. This indicator is determined by both the genetic characteristics of the variety and the environmental conditions in which it is cultivated [2].

Also, the number of grains in an ear is the main factor of its attracting ability - activation of transport of nutrients to the organ with the highest concentration of phytohormone stimulants [26].

It was shown that post-stress treatment of barley seed with a nanocomposite complex bacterial biological preparation Azogran accompanied an increase in the number of grains per ear for the Virazh variety by 22.8%, and for the Burkhant variety by 29.9%, compared with this indicator for plants grown from stressed seeds (Fig. 4).



**Fig. 4.** The effect of hydrogen peroxide and nanocomposite complex bacterial preparation on the number of grains in the ear of plants of varieties between Virazh and Burkhant

#### IV. CONCLUSION

The obtained results allow us to conclude that the inhibitory effect of hydrogen peroxide on the germination of seeds of different varieties of barley increases with increasing the concentration of this stress agent. Post-treatment with a nanocomposite complex bacterial preparation of stressed barley seed stimulated the growth of plants at different phases of their development, as well as the formation of a larger number of grains in the ear. This indicates the ability of the bacteria-components of Azogran to synthesize antioxidant compounds. The studies allowed us to recommend a nanocomposite complex bacterial preparation, created on the basis of nitrogen-fixing and phosphate-mobilizing strains, to increase the resistance of barley plants to an increase in the content of hydrogen peroxide in cells as a stress agent.

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# Assessment of Physicochemical Properties of Well-water Samples in Zing Local Government Area of Taraba state. Nigeria.

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**Abstract:** This study was carried out to assess the physicochemical parameters of hand dug well water samples in the ten political wards of Zing local government area of Taraba state. Sixty different samples were collected in 10 wards between the months of October 2019 to March 2020. The findings showed that, temperature (°C), PH, electrical conductivity ( $\mu\text{s}/\text{cm}$ ), Total hardness, Total dissolved Solids, Chlorides, Sulphates, Calcium, Magnesium and nitrates concentrations expressed in mg/l were within the safe limits recommended by World Health Organization (WHO) and Nigeria Standard for Drinking Water Quality (NSDWQ) for safe drinking water purposes. Whereas turbidity in all the wards were found to be above the 5 NTU except yakoko (2.07NTU) and Monkin A (0.69NTU) wards. Total alkalinity, Phosphates had a high value above the permissible range in all the wards with mean and standard deviations of  $182.75 \pm 48.8668$  and  $8.48 \pm 4.2339$  respectively. Fluorides ion concentrations were above the recommended/permissible values in all the ten (10) wards except Zing A<sub>2</sub> and Monkin B ward. Therefore, it was concluded from the studies that the hand dug well water in Zing can be used for drinking purposes after suitable treatments.

**Introduction:** Water is life because it is a basic necessity for living. One can survive for weeks without food but no one can survive for weeks without drinking water. Water is consumed not only as liquid water ( $\text{H}_2\text{O}_{(\text{L})}$ ) but also in soft and energy drinks, some food stuffs, fruits and beverages.

Water is described as a universal solvent; it's a polar solvent and is used for multi-purposes such as industries, household and domestic chores, laboratories, market places, worship centers, etc. Because of these reasons, it becomes imperative to assess the quality of water to serve its intended purposes and functions. Potable Water is an essential ingredient for good health and socio economic development of both man and nation (Udom et al 2002).

Water supply is one of the fundamental requirements for human life. The quality of water drawn by households is an important aspect of domestic supplies that influences public health (Howard and Bartram, 2003).

The most managed resource in the world is water [Mohammed S 2017]. Groundwater is generally an excellent source for drinking, cleaning, bathing, irrigation and industrial purposes.

Water is essential to human life. In all its use, quality is the most important term to consider. Quantity of water differs from place to place due to geographical and climate differences of land user. In other hand the quality of water may differ due to pollution from nutrient pollutant flows through disposal of sewage and other urban waste. Physical properties of water include odourless, tasteless, transparent liquid that is colourless in small amounts but exhibits a bluish tinge in large quantities. It is the most familiar and abundant liquid on earth. In solid form and liquid form it covers about 70 % of the earth's surface. It is present in varying amounts in the atmosphere. Most of the living tissues of human beings is made up of water. It constitutes about 92% of blood plasma, about 80 % of muscle tissue, about 60 % of red blood cells and over half of most other tissues. It is also an important component of the tissue for most living thing (Gleick, 1993).

Water plays a significant role in maintaining the human health and welfare. Clean drinking water is now recognized as a fundamental right of human beings. Around 780 million people do not have access to clean and safe water and around 2.5 billion people do not have proper sanitation. As a result, around 6–8 million people die each year due to water related diseases and disasters (Rahmanian N. et'al 2015). Therefore, water quality control is a top-priority policy agenda in many parts of the world. In the today world, the water use in household supplies is commonly defined as domestic water. This water is processed to be safely consumed as drinking water and other purposes. Water quality and suitability for use are determined by its taste, odor, colour, and concentration of organic and inorganic matters. Contaminants in the water can affect the water quality and consequently the human health.

However, this research work examined the quality of hand-dug well water samples which predominantly is the major source of water in Zing Local Government Area of Taraba state, Nigeria.

The research was specifically aimed at assessing the:-

1. The physical parameters of (Temperature, PH, Total Dissolves Solid, Electrical Conductivity and Turbidity) hand dug well water samples in the ten political wards of the Zing Local government Area.
2. The concentration of inorganic (chemical) constituents of the hand dug well water samples in the local government area.

**Materials and Methods****Study Area**

Zing Local Government Area is one of the 16 LGAs in Taraba State, North-East Nigeria. It is bounded by Yorro LGA in the south, in the North-East and West respectively by Adamawa State. It has ten wards with Zing A<sub>1</sub> [zing town] as the headquarter. The area lies between longitude 10° and 11°E and latitude 9° and 10°N of the equator with land area of 1,030km<sup>2</sup> estimated population of about 170,600 (NPC 2016). The area falls within the transitional belt of savanna in north eastern Nigeria. It has good climatic conditions and rich in agricultural opportunities with the temperature ranging from 25 to 34°C, the mean annual rainfall of the area is 1,500 mm. The study area is endowed with abundant natural resources including, streams, natural grassland and economic trees. Musa Y.H et'al (2011). It is characterized by a tropical climate with two clear seasons; rainy seasons ( May –October) and Dry seasons ( November- April).

*Fig. 1 sketch map of Zing showing the sampled community.*



different samples were analyzed using standard methods. Clean sterile 1000ml plastic bottles labeled A<sub>1</sub>, A<sub>2</sub>, B, Yak., M<sub>A</sub>, M<sub>B</sub>, Lm, BTK, BU and Din. which represents Zing A<sub>1</sub> ward, Zing A<sub>2</sub> ward, Zing B ward, Yakoko ward, Monkin A ward, Monkin B ward, Lamma ward, Bitako Ward, Bubong ward and Dinding ward respectively were used for sample collection.

#### **Analysis of physicochemical parameters of water samples:**

The Physical characteristics were determined according to standard methods for the examination of water and wastewater, (APHA, 1998), these parameters includes PH, Electrical conductivity, temperature, turbidity and total dissolved solids (TDS) were determined in-situ using standard probe meter. TDS meter (3in1) were used to measure Total dissolves Solids, Electrical Conductivity and Temperature, Hanna PH meter were used to measure PH while turbidity were measured using turbidity meter Lutron TU-2016 model. Total Alkalinity and Total Hardness were determined titrimetrically in the laboratory. While chemical parameters such as chloride, sulphates, phosphates, fluoride, nitrates were analyzed at the Department of Pure and Applied Chemistry Laboratory, Adamawa state University Mubi using laMottewater analyzer and Buck 210VGP model-AAS for calcium and magnesium determinations.

#### **Data Analysis.**

The data obtained from this study were analyzed using SPSS software version 20. The mean and standard deviation values were used to compare with the WHO (2006) and Nigerian Standard for Drinking Water Quality NSDWQ (2015) recommended/Permissible values for safe and drinking water quality.

#### **Results and Discussions.**

The mean and standard deviations of physicochemical parameters of the sampled hand dug wells in the ten (10) political wards of Zing Local government area were analyzed and presented as shown in Table 1.

Table 1. Mean and Standard Deviations of the Physicochemical Parameters of Hand Dug Well Water Samples in Ten Wards of Zing Local Government Area of Taraba State, Nigeria. (October 2019-march 2020)

Parameter	Wards										Mean:SD	Range	WHO	NSDWQ
	A1	A2	B	Yak.	M <sub>A</sub>	M <sub>B</sub>	Lm	BTK	Bu	Din				
Temp.	31.17	31	30.50	31	32	30.50	30.17	30	29.8	31.37	30.75±0.6765	29.83-32	ambient	ambient
PH	6.99	7.01	7.08	6.72	7.10	7.40	6.58	7.54	7.79	7.37	7.16±0.3703	6.58-7.79	6.5-8.5	6.5-8.5
EC	820	358	663.67	905.67	217	78.66	136	351.67	376.67	323	423.03±281.53	78.66-905.67	1,000	1,000
Turb.	5.23	13.52	7.50	2.07	0.69	34.59	53.74	7.83	12.58	7.87	15.56±16.0871	2.07-53.74	5	5
T.A	196.67	246.67	200	204.17	165	118.33	87.50	170	224.17	215	182.75±48.8668	87.50-246.67	-	150
T.H	239.67	202	286	337.67	99.17	100.83	54.67	122	143.33	141	172.60±90.9028	54.67-337.67	100-500	500
TDS	397.50	183.17	308.50	457	105.5	93.83	65.0	180	190.50	162.33	214.37±131.3902	65.0-457.00	500	500
Cl <sup>-</sup>	1.53	0.53	0.83	0.60	0.67	0.69	4.70	2.07	1.32	0.34	1.33±1.2993	0.34-4.70	200-600	250
SO <sub>4</sub> <sup>2-</sup>	51.50	14	43	57.17	18.67	14.0	35.67	13.3	13.05	16	27.64±17.4720	13.05-57.17	200-400	100
PO <sub>4</sub> <sup>2-</sup>	5.87	12.42	1.65	1.86	10.69	9.27	13.37	10.86	6.99	11.83	8.48±4.2339	1.65-13.37	6.50	6.50
F <sup>-</sup>	3.18	0.83	1.57	3.28	2.12	1.00	2.38	5.18	6.50	1.17	2.72±1.8737	0.83-6.50	0.5-1.5	1.50
Ca	12.56	1.82	14.49	16.23	3.17	3.40	5.42	5.78	8.18	4.43	7.55±5.1169	1.82-16.23	75-150	75
Mg	10.91	13.93	9.75	10.54	15.22	8.60	13.37	8.22	15.77	9.31	11.56±2.7835	8.22-15.77	30-150	-
NO <sub>3</sub> <sup>-</sup>	16.85	9.28	8.82	3.12	9.90	9.82	34.78	4.75	5.08	5.82	10.82±9.2161	3.12-34.78	50	50

Source : Moses, A. N. and Ishaku, S. (2020).

All concentrations are expressed in mg/l except for the Temperature (°C), turbidity (NTU), electrical conductivity (µs/cm), and PH has no units.

**Temperature:** The mean values for the hand dug wells water temperatures in the ten (10) wards of Zing local government area varies from 29.83°C to 32°C. The values obtained are within the recommended range of ambient temperature by National Standard for Drinking Water Quality (25°C-33°C) and WHO recommended values. Bubong ward (Bu) recorded the lowest mean value of 29.83°C while Monkin A ward (M<sub>A</sub>) recorded the highest temperature of 32°C. The overall mean and standard deviations for the ten (10) sampled wells water temperature measured were 30.75±0.6765 for the period of October to march studied.

**PH:** defined by Sorenso as the  $-\log[H^+]$ . The test measured the acidity or alkalinity for the well water. The result indicated that the PH mean values for the ten (10) wards of Zing varies from 6.58-7.79 with Lamma (Lm) and Bubong (Bu) wards having the lower and upper limits respectively. The values are within the acceptable limits of 6.50-8.50 recommended by WHO (2006). The result showed the average value and standard deviations for the ten wards as  $7.16 \pm 0.3703$ .

**Electrical Conductivity (EC):** This is the measure of the ability of the aqueous solutions to conducts electric current. The conductivity is dependent on the amount of soluble ions present in the solution, the mobility, valency of ions and the temperature of measurements. The observed mean and standard deviation value for the sampled hand dug wells in the ten wards were  $423.03 \pm 281.53$  which is within the permissible value recommended by WHO and NSDWQ. Lamma ward (Lm) has the lowest mean value of  $136 \mu\text{s}/\text{cm}$  while Yakoko ward has the highest mean value of  $905.67 \mu\text{s}/\text{cm}$ .

**Turbidity:** Turbidity is an expression of the optical property that causes light to be scattered and absorbed. Turbidity in water is caused by suspended matter such as Clay, Silt, Finely divided organic and inorganic matter, Soluble coloured organic compounds, Plankton and other microscopic organisms. It is measured in Nephelometric turbidity units (NTU). This study revealed the mean turbidity value of  $15.56 \pm 16.0871$  for the sampled hand dug well water in the ten political wards of Zing. The value is far above the recommended and permissible value allowed by WHO and NSDWQ of 5 NTU. With the exception of Monkin A ward with turbidity value of 0.69NTU which is within the safe and recommended range by standard and regulatory bodies, all other wards Zing A1, Zing A2, Zing B, Yakoko, Monkin B, Dinding, Lamma, Bitako and Bubong wards recorded high value above the permissible value of 5 NTU see Table 1. The risk of having gastrointestinal diseases increases as the turbidity increases (Eri & Catherine 1997).

**Total Alkalinity:** This is the acid neutralizing capacity of the water due to all titratable bases in the water such as carbonates, bicarbonates, hydroxyl, phosphates, borates etc. 0.5N Sulphuric acid were titrated against 50ml of water sample using methyl orange / phenolphthalein as an indicator. The mean and standard deviation of all the sampled wells water were found to be  $182.75 \pm 48.8668$ . The ranges of mean values for the Total alkalinity for the ten wards were from 87.50-246.67. Only Monkin B and Lamma has  $118.33 \text{mg}/\text{l}$  and  $87.50 \text{mg}/\text{l}$  respectively below the WHO recommended value of  $150 \text{mg}/\text{l}$ . while the Zing A1, Zing B, Zing A2, Yakoko, Bitako, Bubong and Monkin A were found to be higher than the maximum recommended value by the WHO and NSDWQ. See table 1. The high value may be due to carbonates, bicarbonates and hydroxyl ions present in the water.

**Total Hardness:** is defined as the sum of the calcium and magnesium concentrations, both expressed as calcium carbonates in  $\text{mg}/\text{L}$ . The mean and standard deviation for the ten wards studied were found to be  $172.60 \pm 90.9028$  with the ranged values of mean total hardness from 54.67-337.67. All the values are within the safe limits recommended by WHO and NSDWQ but are high enough to cause hardness of water except Lamma ward ( $54.67 \text{mg}/\text{l CaCO}_3$ ).

**Total Dissolve Solids:** is the portion of solids that passes through a filter of 2.0 $\mu$ m pores or smaller pore size. The mean and standard deviation values of total dissolve solids for the ten wards were 214.37 $\pm$ 131.3902 with variation range from 65.00-457.00.mg/l. The obtained values were within the permissible value by WHO and NSDWQ with Yakoko ward having the highest mean value of total dissolve solids of 457.00mg/l while Lamma has the minimum or lowest mean value of dissolves solid of 65.00mg/l.

**Chlorides Cl<sup>-</sup>:** Chlorides in water bodies are often as a result of dissolution of salt deposits, discharge of effluents and sewages, irrigation drainages, etc. it imparts a particular taste when present in high concentration above the WHO minimum and maximum permissible value of 200-600mg/l and 250mg/l for NSDWQ. The mean chloride ion concentration recorded for the ten (10) wards ranged from 0.34-4.70 with mean and standard deviation of 1.33 $\pm$ 1.2993. This value is far below the permissible value recommended by WHO and NSDWQ.

**Sulphates SO<sub>4</sub><sup>2-</sup>:** Occurs in natural waters and has laxative effects when in high concentration. Also causes corrosion and odour in waste water treatment due to reduction to hydrogen sulphide (H<sub>2</sub>S). The mean value obtained for each of the wards studied were low compared to WHO and NSDWQ permissible values of 400mg/l and 100mg/l respectively.

**Phosphates PO<sub>4</sub><sup>2-</sup>:** Phosphate occurs in traces in many natural waters, and often in appreciable amounts during periods of low biologic productivity. Waters receiving raw or treated sewage, agricultural drainage and certain industrial waters normally contain significant concentrations of phosphate. The phosphates concentrations obtained in all the wards were above the limits of 6.50mg/l and 0.3mg/l recommended by WHO and NSDWQ respectively except Zing A1, Zing B and Yakoko wards this is in line with what was reported by Sulaiman et al 2015. This may be due to rocky nature of Zing Local government area and likely presence of high phosphates bearings rocks in ground water aquifers.

**Fluorides F<sup>-</sup>:** This is one of essential parameters in water to monitor due to its effects when in high or low concentrations. The mean and standard deviations for all of the ten wards (Table 1.) Were 2.72 $\pm$ 1.8737 which is higher than the acceptable concentrations permitted by WHO and NSDWQ. Only Zing A2, Monkin B and Dinding ward has the mean concentration within the permissible limits while Bubong ward has the highest mean value of 6.50mg/l followed by Bitako, Yakoko, ZingA1, Lamma, Monkin A and Zing B in decreasing order. This result showed the likely reason for the cases of mottles teeth commonly found in in Zing are from the water sources.

**Calcium Ca:** The mean values for the ten (10) wards in Zing were obtained to be 7.55 with standard deviation of 5.1169. The concentration in mg/l ranges from 1.82-16.23 with Zing A2 having the least mean value while Yakoko had the maximum concentration of 16.23mg/l. The result indicated that all the concentrations in the ten (10) wards were below the minimum permissible value by WHO and NSDWQ.

**Magnesium Mg:** The concentration of magnesium in the studied wards ranges from 8.22-15.77 with the mean value of 11.56 and standard deviations of 2.7835. These values were far below the permissible value for the magnesium concentration in safe water for drinking as recommended by WHO and NSDWQ.

**Nitrates NO<sub>3</sub><sup>-</sup>:** High Nitrates ions concentration in water meant for drinking causes blue blue diseases in infants and promotes algal growth. The sources of this ions into water bodies includes decayed vegetables, fertilizers and manure, leachates from dump refuse, industrial discharge etc. The result showed that the mean concentration for the ten wards in Zing were 10.82 with standard deviation of 9.2161. This value is below the permissible value recommended by the WHO and NSDWQ. See Table 1.

### Conclusions:

The main aim of the research was to assess the physicochemical properties of the hand dug well water samples in the ten (10) political wards of Zing Local Government Area of Taraba state. The study revealed that the well water had an ambient temperature ranges from 25°C to 32°C in all the ten wards. The PH and electrical conductivity were within the safe limits. The chemical parameters of chlorides, sulphates, calcium, magnesium and nitrates were found to be within the WHO and NSDWQ permissible values whereas turbidity, total alkalinity, fluoride and phosphates were found to exceed the maximum value permitted. It is therefore concluded that for drinking and other domestic utilizations of these well water by the community, proper treatment should be done to avoid being exposed to health effects posed by parameters that are above the permissible limits.

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# The Adaptation Process Of Intercultural Communication Of Mercu Buana University Students In Student Exchange Programs

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**Abstract:** This study entitled the adaptation process of intercultural communication of Mercu Buana University students in student exchange programs. The concepts and theories were the concepts of intercultural communication, the process of cultural adaptation, Anxiety and Uncertainty Management Theory, Culture Shock, Student Exchange. This research used a qualitative approach with the phenomenology method. The results of this study indicated that adaptation was an adjustment process that must be experienced to learn a new culture contained in a new environment, so that the process of social interaction in a place run well. The adaptation was carried out in order that the students could follow and balance the social life in their destination. To achieve it all, there were several factors and phases of cultural adaptation experienced in the process of cultural adaptation that is carried out by student exchange program students. From the phases of the cultural adaptation process, some participant reached the final phase and there were also participant who did not experience. Four out of the six participants arrived at the bi-cultural phase, and two participants only reached the adjustment phase which means that there rarely anyone were going to abroad and meeting a new culture. Thus, they did not adapt and they would also reach the bi-cultural phase or having a successful adaptation. In this case, they are able to understand the local culture, beside they do not eliminate the local culture that they have.

**Keywords:** cultural adaptation, Intercultural communication, Exchange Student

## INTRODUCTION

Communication has been found as a part that covers the whole of intercultural adaptation. The culture has influenced the concept of certain interpersonal communication styles within groups and diverse individuals. These differences often lead to communication misunderstandings, which can adversely affect the psychological and socio-cultural adjustment of intercultural students. When we communicate with other people, we are faced with different languages, rules, and values. Sometimes it is difficult to understand what they communicate if we are very ethnocentric. According to Sumner ethnocentrism is "seeing everything in the group itself as the center in everything, and the other things are measured and assessed based on the reference group".

Communicating with people from different cultural backgrounds can now be applied in some ways, for example by traveling abroad, holidays and so on. In the academic field itself, it can be done by joining student exchange programs and Double Degree programs, which are usually provided by universities or some government or private institutions. The increased interest of students in conducting student exchange programs abroad, so that they must cross geographic boundaries which will face new cultures for a period of time while making students aware toward the importance of an intercultural adaptation process.

At Mercu Buana University, student interest in conducting student exchange programs and double degrees are quite high. Within the last five years according to data from the alumni innovation center and international cooperation of Mercu Buana University, 136 students of Mercu Buana University went abroad to participate in student exchange programs and double degrees in various countries such as Malaysia, Korea, China, and Taiwan.

Conducting activities such as student programs and double degrees have their own challenges such a cultural adaptation. Mercu Buana University students in conducting student exchange programs for example, there are various challenges and obstacles that are felt. For example, when they come to the destination of a new country, they will feel a variety of feelings such as anxiety, pleasure and fear. It was all felt because individuals had never encountered and felt the atmosphere, norms and culture of other countries destination. This is what they will experience and must pass to survive in order to balance the environmental conditions in the destination of other countries. Various obstacles such as language, mindset, food, and cultural differences are experienced in the process of achievement. However, when individuals get through it all, they can individuals who can adapt and follow the daily life and the new environment. This happens in the communication that occurs between Indonesian students in the student exchange program that communicating with local Malaysian students. Furthermore, it occurs a misunderstanding of a word meaning. The different meaning of word can also be a problem in communication.

We can take misunderstandings containing ethnocentrism, for example: Indonesian students in New York consider foreigners who give something with their left hand to them as uncivilized, even though people in America think that they are not meant to this, because in their culture, they use their hands left is not an act of impertinence. In addition, a woman from Australia is surprised when they are on a way from Bandung to Yogyakarta seeing an Indonesian woman who was breastfeeding her child in public. He considers these behaviors to be primitive, because in his own country, the woman have never been done. These

intercultural misunderstandings above can be reduced if we know the language and cultural behavior of others, know the principles of intercultural communication and practice it in communicating with others (Mulyana & Rachmat, 2014: viii-ix).

The process of communication adaptation is important because, when we are in a new social environment, and a new place, we must know, learn, and respect their traditions and habits, because actually every communication we make with different people contains the potential for intercultural communication, because we have different cultures, no matter how small the differences are. So intercultural communication should be a decision for anyone who wants to communicate effectively to others.

This is a way so that we can be accepted as part of the environment. Likewise with communication, to interact with the community, communication can be our weapon in mingling and understanding what is the intent and purpose conveyed by them. The communication in question is verbal communication, as well as non-verbal communication. By knowing how the social procession they do, it can facilitate us in carrying out daily activities, and carrying out social interactions easily. So that obstacles and challenges in the environment can be overcome. When students immerse themselves in a new culture, they will become familiar with new practices, in which to learn a new atmosphere, a place, to know new condition and learn to interact with new people, all this as time goes by, it will enter and create a new identity. Eventually, this becomes accustomed to a new way of life, not realizing that these small changes or habits determine what they now know. All new routines and habits will become the new norm for creating a new identity.

Carrying out an adaptation process using broad concepts, quoting from research journals conducted by Yang Soo Kim and Young Yu Kim quoting from Kim, states that: Cross-cultural adaptation can be said to be an "overall phenomena of individuals who migrate from origin to foreign or new socio-cultural environment which is trying to build and maintain a relatively stable relationship to the surrounding environment, reciprocity, and the creation of functional environments." With the aim of achieving a "Match of" overall "between individuals who adapt to the new environment, in order to maximize the opportunities for individual social life" (Kim & Kim, 2016: 62-63).

One thing that becomes one of the perspectives of intercultural communication is to emphasize that the purpose of intercultural communication is to reduce the level of uncertainty about other people. In interpersonal encounters, they are often confronted with ambiguities about each other's relationships. Considering the importance of intercultural communication competencies, the researchers were interested in conducting research related to the process of adaptation of intercultural communication of students at Mercuru Buana University in participating in student exchange programs. This research is expected to be a reference for students who will participate in various student exchange programs or conduct activities in other countries so they will not experience cultural shock.

## LITERATURE REVIEW

### Intercultural Communication

Intercultural communication firstly appeared in 1974 by Fred Casmir in *The International and Intercultural Communication Annual*. Then Landis strengthened the concept of intercultural communication in the *International Journal of Intercultural Relations* in 1977. Then in 1979, Molefi Asante, Cecil Blake, and Eileen Newmark published a book that specifically addressed intercultural communication, namely *The Handbook of Intercultural Communication*. Since then many experts have begun to study intercultural communication. Furthermore, in 1983 the *International and Intercultural Communication Annual* was born which in a special rubric accommodates writings on intercultural communication. The first theme of *Intercultural Communication Theory* was launched in 1983 by Gudykunts. Then another edition on communication, culture, the process of intercultural cooperation was also written by Gudykunts, Stewart and Ting Toomey in 1985, inter-ethnic communication by Kim in 1986, cross-cultural adaptation by Kim and Gudykunts in 1988, and finally communication / languages and culture by Ting Toomey and Korzenny in 1988 (Ridwan, 2016: 3-4).

In the journal of Bhernadetta Pravita Wahyuningtyas, there are mentioned two main concepts that characterize intercultural communication, namely the concept of culture and the concept of communication. The relationship between the two is very complex. Culture influences communication and in turn communication also determines, creates and maintains the cultural reality of a community / cultural group. In other words, communication and culture are like two sides of a coin that are inseparable and influence each other (Wahyuningtyas, 2016: 21-22). The focus of attention in communication and culture studies also covers how we understand meaning, patterns of action, as well as how these meanings and patterns are interpreted into a social group, a cultural group, to an environment that involves human interaction.

### Cultural Adaptation Process

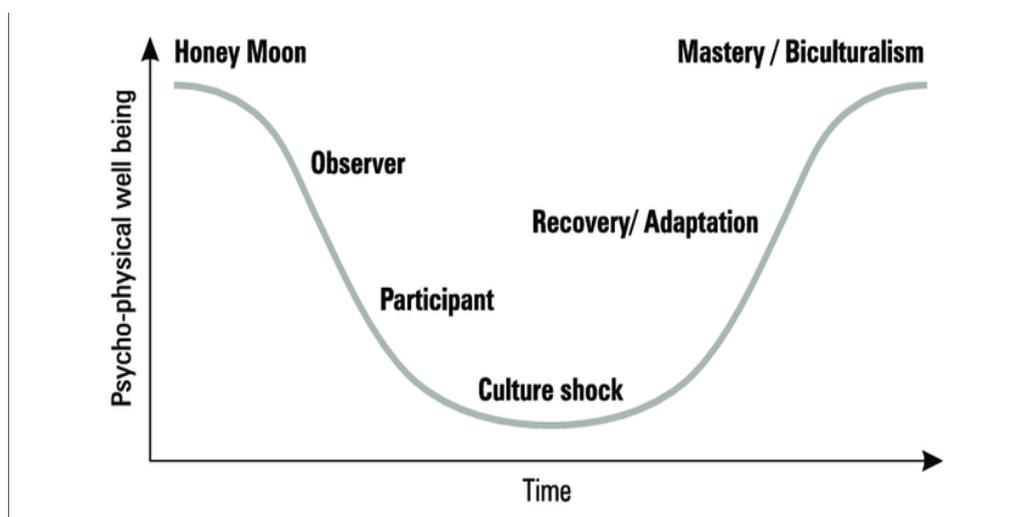
Adaptation is described as a three-step process by Kim, namely stress-adaptation-growth. Stress process. When entering a new environment, newcomers will experience stress or pressure due to culture shock, avoidance, or selective attention. Stress motivates someone to adapt to the new environment or the host environment to restore balance. Adaptation process. Adaptation can be achieved through acculturation and deculturation. From this learning process adaptation, it occurs in the form of internal growth transformation. Finally the process of growth. The process of growth is not linear but helical, namely, an increasingly circular shape shows attention to the fact that the communication process moves forward and what is communicated now will affect the structure and content of the communication that follows, which is marked by the ups and downs of the process of stress-adaptation (Soemantri, 2019: 49).

The process of cultural adaptation is closely related to the situation where there are excessive worries and anxieties experienced by people who occupy new and unfamiliar territory. Gudykunst and Kim in Samovar (2010) describe four levels of the process of self-adaptation in the form of a U-Curve so-called U-Curve. The four stages of the adaptation process are as follows:

1. The Honeymoon Phase. A stage where we feel happy, because it will take a trip to a different place that we have never visited. This stage is called the "honeymoon" phase or the excitement / optimistic phase. This first phase is described as

- the left end in the U-Curve. Usually individuals adjust to new pleasant cultures because they are full of new people, as well as new environments and situations.
2. The Crisis Phase. The second stage is the mass where their attraction and novelty often turn into frustration, anxiety, and even hostility because the reality of life of an unfamiliar environment or situation becomes more visible. This phase is also called the disappointment phase and individuals which begin to have difficulty adapting and communicating. The phase where we feel the difference between our country and the country we visit, both in terms of food, environment and language that may be difficult to understand. This can make us feel isolated from the environment. However, this phase will be passed if it is able to adjust well.
  3. The Adjustment Phase. This third stage is identified as the beginning of readjustment process as each begins to develop ways to overcome their frustrations and face the challenges of new situations. This phase is also called the initial resolution. In this case, people gradually make some adjustments and modifications in how they deal with the new culture. In this phase, interacting with the new environment is already done. Cultural differences are no longer a fear of obstacles to interact with people who have different cultures.
  4. Bi-cultural Phase. The final stage is the continues re-adjustment. This last phase is called the effective functioning phase where the position is at the upper right-hand end of the U-Curve, one begins to understand key elements of the new culture (values, special habits, beliefs, communication patterns and others). At this stage, you feel comfortable living with two cultures at the same time. This is a good indication or progress because indirectly we feel comfortable and can blend in with the new environment. But there are also students who worship foreign cultures so much that when they return to their own country, they feel alienated. For this reason, there must be a balance between understanding culture without leaving our identity as Indonesian people (Tariq & Anshori, 2017: 164-165).

Figure 2.2.2. U-Curve Kim and Gudykunst Adaptation Process Stage



### Factors in Performing Cultural Adaptation

There are several factors in carrying out cultural adaptation such as personal communication, host social communication, ethnic social communication, environment, and predisposition. The following explanation:

1. Personal Communication occurs when someone feels something in their environment, then gives meaning and reacts to objects and other people contained in the environment.
2. Host Social Communication is interpersonal communication and mass communication. Interpersonal communication refers to the interaction between individuals with one another at the interpersonal level. Host social communication occurs between individual migrants and individuals from the local culture so that there are cultural differences between the two.
3. Ethnic Social Communication is as same sa Host social communication originating from interpersonal communication and mass communication. However, ethnic social communication occurs between individuals with the same cultural background, for example migrant individuals interact with individuals who have the same origin and culture. The mass communication is related with the means used in distributing and perpetuating culture. This includes both media such as radio, television, newspapers and the internet; and also non-media based institutions such as schools, religions or any public place where communication takes place in the form of cultural rituals. This mass communication functions as a power in the process of adaptation by transmitting topics of events, social values, norms of behavior, perspectives of traditional environmental interpretations. Mass communication means the interaction between individuals and the masses both through the media and non-media.
4. Environment is divided into host acceptance, pressure for conformity from host, and strength of ethnic groups. Host acceptance refers to the willingness of the local culture to accept and accommodate migrants through the opportunity to participate in social communication. From a migrant perspective, this can be considered access to entry, or an opportunity to get in contact. Pressure on conformity from the host is a combination of conscious and unconscious pressure on

migrants to adopt local cultural practices, and host tolerance in respecting cultural practices that are different from their culture.

5. Predisposition, which refers to the personal situation of migrants when they arrive at the local cultural group, the type of background they have, and the experiences that they have before joining the local culture (Soemantri, 2019: 49-50).

### Anxiety and Uncertainty Management Theory

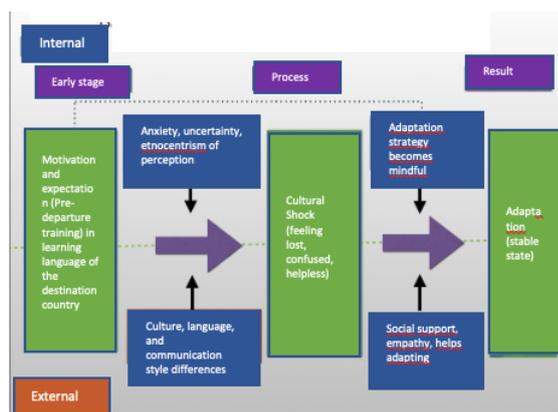
Anxiety and Uncertainty Management Theory (AUM) is a theory developed by William Gudykunst through his research in 1985 using existing theories as a starting point. The theory used specifically in Gudykunst's research is the Uncertainty Reduction Theory by Charles Berger and Richard Calabrese. Gudykunst is a professor of communication from California University (Utami, 2015: 185-186).

Stephan & Stephan (1985) defines anxiety as feeling uncomfortable, tense, worried, anxious that someone feels about what will happen to them. Anxiety is an affective response, not cognitive such an uncertainty. This anxiety can create motivation to communicate and if managed properly, it can create an effective communication. In the intergroup communication, anxiety tends to be higher compared to the condition of interpersonal communication. However, anxiety is dynamic and tends to decrease when we feel comfortable with the person (Utami, 2015: 186).

Uncertainty occurs when we are between two conditions: on the one hand, we strongly believe in our predictions, while on the other hand, what will happen can be very unpredictable. This uncertainty is cognitive and reduces the effectiveness of communication so it must be managed properly. If the situation cannot reduce the uncertainty, then we must be able to reduce it ourselves. Uncertainty will be felt even greater when communicating with strangers compared to members of our own ingroup.

According to Gudykunst, effective communication is caused by mindfulness and uncertainty / anxiety management. Mindfulness is a cognitive state that is needed as a moderation process in managing anxiety and uncertainty in order to create effective communication. Mindfulness makes our prediction of someone's behavior better than using prejudice and stereotypes. When dealing with strangers and we feel the presence of uncertainty and anxiety, both must be managed properly to be within the threshold. One way is to be mindful so that we can provide the right response and create effective communication (Utami, 2015: 186).

**Figure 2.2.3. The Structure of Student Adaptation Communication who is studying in other countries**



### Culture Shock

There is still no clear definition of Culture Shock which is usually associated with the anthropologist, Oberg (1960) more than 40 years ago. Various attempts have been made to "dismantle" the definition (Ward et al. 2001): 1) Tension due to the efforts needed to make the necessary psychological adaptations, 2) Feelings of loss and feelings of friends, status, profession, and wealth, 3) Rejected by / and or rejecting members of new cultures, 4) Confusion in expectations, values. role 5) Shock, anxiety, even disgust and anger after realizing cultural differences, 6) Feelings of impotence because they are unable to overcome the new environment (Furham, 2012: 11). Then Guanipa (1998) states that Culture Shock is a term that describes the anxiety when someone moves into a completely new environment. This term expresses a lack of direction, a feeling of not knowing what to do or how to do something in a new environment, and not knowing what is appropriate or inappropriate. Milton (2005) states that culture shocks occur in different environments. The most severe and expensive cases of culture shocks occur in individuals who live in other country for a long time such as international students (Ernofalina, 2017: 87-88)

Culture shock is a term used to describe the feeling of shock, anxiety, and error that is felt when someone comes into contact with a different culture, such as when in a foreign country. These feelings arise due to differences and difficulties in adapting to new cultures. Culture shock can cover aspects of daily life such as food, how to dress, price of goods, etc. The more different the culture, the more severe the effects. Culture shock involves (1) the feeling of loss of identity and deprivation of status, values, profession, and friends. (2) Identity pressure, as a result of efforts to adapt psychology (3) rejection of that identity by members of the new culture. (4) Confusion of identity, ambiguous and unpredictable. (5) failure of identity as a result of the inability to cooperate with new environments (Field at all, 2018: 127).

### Student Exchange

Student exchanges are colleges that travel abroad to live in a new country as part of a scientific exchange program. While they are in this program, exchange students usually live with local host families and attend classes at local schools, while immersing themselves in new cultures, potentially learning new languages, and experiencing the world from different perspectives, they are not only just living together with the host families, they usually settle in dorms and apartments. Some universities and colleges have

agreements with other universities in various countries that allow students to live abroad while studying for a short time, commonly known as "student exchange" (Crislip, 2019).

Student exchanges can take anywhere from two weeks to one year depending on the program. Exchange students in college students usually spend one semester to one year abroad, but there are also short-term programs that last several weeks during summer or winter holidays during the academic year. Following the student exchange program abroad has its own advantages and experiences. Students who are placed in foreign countries often greatly improve their language skills while implementing the program. Improving language skills is very important because it can be one of the best ways to learn a new language, so living with a host family, attending classes, and having to communicate most of the time in different languages can greatly improve one's vocabulary.

Being a student exchange student can also build self-confidence. Students often learn how to communicate in new languages, overcome loneliness and longing, make new friends, and maybe even find new found independence. Many exchange students gain a new level of maturity after participating the student exchange programs, and can also develop international friendships (expanding networking networking). In addition to personal growth, skills developed during student exchange programs are also a great selling point for prospective employers once students graduate and enter the workforce. In addition to the several benefits to be gained in participating in a student exchange program, losses can also be found by students. Homesickness is the most common thing that happens to students doing student exchanges. Students move to a foreign country, away from friends and family, for long periods of time, often experiencing this. This is natural and often happens so as to feel homesick from time to time. Cultural shock is another thing that exchange students must face when they are in their programs.

## METHODOLOGY

This study used a qualitative approach in which the researcher made complex descriptions, examined words, detailed reports from the viewpoint of respondents, and conducted a study as it was (Creswell, 1998: 15). The research method in this study was the phenomenology of Alfred Schutz, who focused on inter-subjectivity. Schutz views that the understanding of actions, speech, and interactions is a prerequisite for any social existence (Cresswell, 1998: 53). Then the research subject chosen purposively which referred to participants who can explore and articulate their experiences consciously.

In data collection techniques, primary data was obtained based on the results of depth interviews with the participants who had relevance to the data needed. In addition, this study used observation. Observations were made on the activities carried out by members of the Indopinups community. In addition, it was supported through a search of existing data in a number of documents, both within the environment of the research object and other institutions related to the research material. In this study, the data analysis used was an interactive model, which included three components: data reduction, data display and drawing and verifying conclusions. The conclusion was then verified so that it could be accounted for (Hamid & Nurcifera, 2019: 1014-1015).

Research subjects taken by researchers were students of Mercu Buana University who participated the student exchange programs. Mercu Buana students who took part in student exchange were taken as research subjects because they were relevant to the research title used. There were seven students of Mercu Buana University who were used as research subjects, including 3 (three) male students and 4 female students, they were students who had attended student exchange programs abroad such as in Malaysia, Korea and China.

In this study, the researcher carried out the process of data validity checking by interpreting the technique of comparing and checking back the degree of information confidence obtained by: (1) comparing observational data with interview data (2) comparing the consistency of the respondent's answers, namely by comparing what the resource person said in public for example, with what was said privately (3) comparing one's perspective, with others in his work team (Irawan, 2019: 19).

## DISCUSSION

### Factors in Cultural Adaptation

The results show that the purpose of adaptation is to be able to adjust to which finally can get comfortable in a new environment. Based on the results of research data that has been outlined above, it can be seen that research data in the form of interviews above are categorized into five factors of cultural adaptation including:

1. Personal communication that occurs when someone feels the things that are in their environment, then gives meaning and reacts to objects and other people contained in the environment. Some Indonesian students such as Jovita and Indah, for example, who took part in this program were already familiar with the culture and language of their destination country. This might happen as a result of exposure to Korean pop culture or Korean wave which was quite shocking in Indonesia for Jovita. Likewise with Indah, the presence of cartoon series from Malaysia such as Upin and Ipin that aired on one of the private TV stations in Indonesia made Indah feel familiar with some of the vocabulary of the Malay language that is often heard. quite familiar with Korean culture and language is included in the factor of personal communication. This personal communication is related to individual personal communication competence which consists of cognitive and affective aspects. These aspects bring individuals to increase their communication competencies by understanding or increasing their knowledge of the local culture and language.
2. Host social communication, namely, interpersonal communication and mass communication. Interpersonal communication refers to the interaction between individuals with one another at the interpersonal level. Host social communication occurs between individual migrants and individuals from the local culture so that there are cultural differences between the two. Although the student exchange and double degree program only lasts a penny and two years, the process of adaptation is still needed, especially because students also have to interact with many people with different

cultural backgrounds. If possible in the campus and hostel environment, participants are still facilitated because there may be some who understand English as the language of instruction, but this is not the case with the off-campus environment. Most local residents such as Chinese and Korean were lack of English, so it is foreign students who have to adapt to know and understand their language. The individual communication competence becomes very useful if it is used in this level of social communication, especially if we have to interact with the local cultural community. This is included in the interpersonal communication factor in the host social communication. Interaction with the local community also increases the level of the adaptation process for migrants. For example, the more often Indonesian students interact with local residents the more they become accustomed to these different cultures. For example, there are participants who only understand a little of Korean and Chinese, the more often these participants interact with local residents (especially those who do not speak English) as experienced by participants who go to Korea and China. The participants increasingly understood what they said even though they could only catch a few of the words spoken by the local population.

3. Ethnic social communication, which occurs between individuals with the same cultural background, for example migrant individuals interact with individuals who have the same origin and culture. The mass communication is related with the means used in distributing and perpetuating culture. Of course, students who come from Indonesia, besides they meet new fellow friends from Indonesia with the same cultural background, this can be made easy for some students in carrying out the adaptation process because they feel there are other individuals who are with him, this can be said as an ethical factor social communication. As experienced by Resty, Yanuar and Sandy who said that it turns out that when they were conducting a student exchange and double degree program, they also met with a number of students from Indonesia who also had different campuses. This makes them feel that they have people who can help each other in the process of adapting, for example, being able to exchange new information that is known relating to their country both language, culture etc., so that they can complement and help one another.
4. Environment is divided into host acceptance, pressure for conformity from host, and strength of ethnic groups. Host acceptance refers to the willingness of the local culture to accept and accommodate migrants through the opportunity to participate in social communication. Various activities carried out in the environment make the participants get information about their new environment to help them in the adaptation process such as orientation periods, seminars on culture, and language classes. This is an environmental factor which is an important factor in the adaptation process. How the culture and the local community accept migrants, pressure migrants to quickly adjust to the local culture, also the strength of groups that are cultured with migrants is very influential on the motivation of migrant adaptation (Utami, 2015: 195). Jovita, Indah and Yanuar before joining the lecture process were given a number of orientation activities they conducted such as seminars on cultural introduction, out bound, campus introductions to language classes that were followed. This is done to introduce and inform them about the environment and the prevailing social system. Being able to recognize an environment that has never been met can give our vigilance in acting in a social environment.
5. Predisposition, which refers to the personal migrants circumstances when they arrive in different cultural groups, the type of background they have, and what kind of experience they have before joining the local culture. In addition, the participants met with friends from various other countries with very different cultures. It must also face cultural and linguistic differences with the indigenous peoples of the visiting country. These different cultural backgrounds were brought by each student participating in a student exchange and double degree program, this is called by the predisposition factor as Kim said. As experienced by Faza as one of the participants, during in Korea in conducting student exchange programs, they did not only meet with Koreans, but also with Danish and Spaniards until he became close friends with people from the country. The process of predisposition made Faza felt able to adapt there.

Factors in making adaptations felt by individuals can prove the ability or not of an individual through the process of cultural adaptation. The following describes the discussion of what researchers get. from the results of research from resource persons using in-depth interviews. The concept of discussion that researchers do is based on the theory of U-curve cultural adaptation.

Culture shock is a term used in the discussion of intercultural communication processes. In intercultural communication, cultural adaptation is needed so that communication can run well and smoothly. Culture shock is an emotional phenomenon that is caused by a disorientation in one's cognitive, causing interference with identity. Cultural differences become its own obstacles for individuals in running a new life. This is a new task for someone to understand the cultural differences. Socio-cultural factors become one of the causes of various symptoms caused. This factor becomes an important factor for individuals in adjusting themselves to new cultures and social life. Individual interaction with culture is needed to get comfort in interacting to avoid social disparity and culture shock. The importance of interaction is as a forum for thinking about the mind, self, and society in establishing communication and adaptation between individuals and society, the environment and culture in adjusting to differences.

### **Culture Adaptation Phase**

1. Honeymoon phase. The honeymoon phase is the first phase in the concept of cultural adaptation. Ruben and Stewart in their book explain that this is a phase where someone has just moved to a new territory, who has high expectations and

curiosities, great curiosities and a willingness to know something new (Nihayatinisa, 2018). When the participants arrived at their destination such as Malaysia, South Korea and China, some of them felt various feelings such as feeling happy, scared and exited. Because this is the first time they have visited a country they had never visited before, so everything they will experience will be something new such what was experienced by several participants. For example, Resty and Jovita, when they arrived at their destination country they felt fear for their own reasons. The fear were not being able to adapt and survive in an environment they have never visited is one example of depicting feelings when individuals come to a new place. In contrast to other participants such as Yanuar, Indah, Sandi and Faza, they felt exited when they arrived at their destination.

2. **Crisis Phase.** The crisis phase is the phase where individuals who carry out cultural adaptation will experience various obstacles in the new environment. This phase is also called the disappointment phase and individuals begin to have difficulty adapting and communicating. The phase where we feel the difference between our country and the country we visit, both in terms of food, environment and language that may be difficult to understand so that it can make us feel alienated from the environment. In the crisis phase due to differences between the country of origin and the destination country both in terms of food, social and cultural environment, language, and lifestyle, the participants began to compare these things with those in their home countries. Feelings of home sickness and anxiety began to come, this is the phase of "Culture Shock" that makes migrants feel alienated from the environment. But this phase will be passed if it is able to adjust well. Some participants such as Faza, Jovita and Sandy who live in Korea and China said that language and communication were one of the problems faced. Because in Korea and China, they have their own language in everyday life even speaking with foreigners. And also at campus there are many Chinese and South Korean students who cannot speak English well and also they find it difficult to mingle with outsiders. For them English is their big capital when leaving for Korea and China. Jovita and Faza had difficulty because they did not speak Korean fluently, but Sandy, who had followed the double degree program for two years, had not had too much difficulty, because when she was still in vocational high school she had learned Mandarin and added language learning facilities. mandarin at the campus before leaving for China, so having the capital of mandarin makes Sandy less difficult to communicate. For Sandy, Faza and Jovita, if they join an exchange or double degree program to Korea and China, students from abroad are required to take the country's language classes. The aim is to help students be able to communicate with local people. In contrast to students who do student exchange programs to Malaysia such as Indah, Yanuar and Resty. For the language and communication problem is not the biggest obstacle for them, because Indonesia and Malaysia have a common culture including language, namely Malay.
3. **Adjustment Phase.** Adjustment phase is a situation which is identified with the start of the adjustment process for individuals in a new environment. Each individual begins to develop ways to overcome their frustration and face the challenges of new situations. This phase is also called the initial resolution. People gradually make some adjustments and modifications in how they deal with the new culture. In this phase, interacting with the new environment is already done. For the communication aspect, Sandy finally tried to push herself to control her friends to speak English. Sandy realized that as a way to survive, she had to accept differences and try to draw closer by putting in a little humor. The two participants who went to Korea made different decisions from each other. Although they had said that communicating in Korean is very difficult. Faza took the decision to only communicate with people who could use English, even though there was actually a desire to communicate. Meanwhile, Jovita tried his best to communicate using Korean which he learned from class and also Korean drama which he often watched. Korean and Chinese are indeed difficult to understand and learn. During the adaptation process, the participants learned several new things such as learning languages, etc. The do not only learn new things, they may also need to change or adjust their behavior.
4. **Bi-cultural phase.** The ongoing or continuous adjustment phase is the stage when someone starts to understand the key elements of a new culture (values, special habits, beliefs, communication patterns and others). At this stage, you feel comfortable living with two cultures at the same time. This is a good indication or progress because indirectly we feel comfortable and can blend in with the new environment. During this phase individuals begin to adapt to new cultures, embrace their differences and accept what is offered. This phase is characterized by individual success in building social relationships. In a certain period of time, it might not be enough to prove the success or achievement of the objectives of intercultural adaptation and the effectiveness of communication that occurs with people who have different cultures. However, in that time period, the process of intercultural adaptation has also been going on, because basically every individual will definitely adapt when dealing with a new environment. As Kim and Gudykunts said, the process of adaptation is something that is naturally owned by each individual naturally and universally. The most important thing in adapting is openness, strength and positive thinking ability of migrants and the local environment. For Yanuar, Indah and Resty to adapt and to communication in Malaysia is very easy, because the languages of Malaysia and Indonesia are not much different from using Malay. As experienced by Resty, to communicate there there is no difficulty for her because in everyday life Resty uses Malay language with her parents, as well as Indah and Yanuar for them the Malay language used

by the local people there is still easy to understand and is still within the reach of the brain. For Sandy, doing communication adaptation in China at first was difficult because most of the people there could not speak English well, but by doing various ways such as taking Mandarin language classes for one year, and there was preparation before departure and finally ventured to communicate in Mandarin. For Jovita and Faza, it is difficult to interact and communicate with people there, because just like in China, people in Korea do not really understand English well. The lack of preparation and the short time, it made Jovita and Faza interact more with other foreigners compared to interacting and communicating with local people.

Based on the results of research data that has been done by researchers, the researchers found that the factors of cultural adaptation and cultural adaptation phases help the participants in the process of cultural adaptation. Cultural adaptation factors experienced by participants occurred in the honeymoon phase and the crisis phase in the u-curve adaptation process. Cultural adaptation factors such as personal communication, ethnic social communication, environmental and predisposition, researchers found in the honeymoon phase, while cultural adaptation factors, host social communication occurred in the crisis phase of cultural adaptation.

When an individual is in a new place or a new environment, to initiate interaction in this case is to communicate, Individuals will face uncertainty and anxiety because for the first time interacting with people with different cultures. Individual communication competence also influences the individual in controlling his feelings of discomfort (anxiety) and his uncertainty (uncertainty) in interacting with strangers or people with different cultures with him. By understanding and knowing about the culture of the country visited, naturally most Indonesian students can control the discomfort and uncertainty they feel when communicating with local residents. For example, they do not need to be confused and feel uncomfortable anymore because they already know that communicating with older people in Korea must use formal language, it is different when communicating with people of the same age or younger. This can also be called mindfulness in which we become able to categorize someone more specifically, think more about what behavioral responses are appropriate for that person, and be more aware that other people can have different perspectives from us.

According to Gudykunst, effective communication is caused by mindfulness and uncertainty / anxiety management. Mindfulness is a cognitive state that is needed as a moderation process in managing anxiety and uncertainty in order to create effective communication. Mindfulness makes our prediction of someone's behavior better than using prejudice and stereotypes. When dealing with strangers and we feel the presence of uncertainty and anxiety, both must be managed properly to be within the threshold. One way is to be mindful so that we can provide the right response and create effective communication.

The uncertainty and anxiety of individuals in a new environment and new culture needs a further research. This further research is important because as the purpose of the investment itself, the individual's communication competence also influences the individual in controlling feelings of discomfort (anxiety) and uncertainty in interacting with strangers or people of different cultures so that the purpose of adaptation is needed to be able to adjust yourself with a new environment and finally can get comfort, effectiveness of communication and minimize uncertainty and anxiety with the new environment and individuals with different cultures.

Assuming the importance of interaction because the purpose of communication is to reduce uncertainty about the other person. The essence of the theory of reducing uncertainty is to reduce uncertainty between strangers when first meeting and having a conversation. According to Berger and Calabrese when foreigners first meet, they will increase their ability to predict what others will do. Therefore, it is important for further research on reducing uncertainty.

## CONCLUSION

Based on the results of research and discussion data, it can be concluded that adaptation is an adjustment process that must be done to learn a new culture contained in a new environment, so that the process of social interaction in a place can run. Adaptation was carried out in order to be able to follow and be able to balance social life in the destination. To achieve it all, there were several factors and phases of cultural adaptation experienced in the process of cultural adaptation that is carried out by student exchange program students.

From the phases of the cultural adaptation process experienced, some participants reached the final phase and there were also participants who did not experience. Four of the six participants arrived at the bi-cultural phase, and two of the participants only reached the adjustment phase which means that rarely anyone going abroad and meeting a new culture did not adapt and would also arrive at the bi-cultural phase or could be said to be successful adaptation in which they are able to understand the local culture and also do not eliminate the culture that they have from the cultural roots.

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# Human Rights Conditions of IDPs in Kenya: The Case of 2007/8 Post Election Violence Victims in Kenya

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**Abstract-** Population displacement has been a global issue in the contemporary world. In Africa, Electoral violence has become one of the major cause of inter-state conflicts and the resultant internal displacements in the contemporary society. This paper seeks to examine the Government policy on population displacement; the current human-rights conditions of post-election violence as a result of 2007/8 electoral violence; and finally to find out the challenges facing the applicability of the available legal instruments in Kenya in alleviating the plight of IDPs. The used survey researches design. This paper found that although legal mechanisms are in place, they remain in paper and its implementation is wanting, the human rights conditions of IDPs are deplorable and finally, most of them are largely un-resettled.

**Index Terms-** internally displaced persons, policy, electoral violence, human rights

## I. INTRODUCTION

There has been a drastic increase in the numbers of internally displaced persons since the end of the Cold War, with a 50-percent rise in the number of IDPs since 1989 (Internal Displacement Monitoring Center Quarterly Report, July-September 2013). The ebb and flow of conflict has resulted in some new names appearing on the list of countries facing major displacement (including Algeria, Côte d'Ivoire, DRC, Uganda, and Zimbabwe), increases in already heavily affected countries (especially Sudan, where about 2 million people have been displaced in the Darfur region, Colombia, Iraq, Somalia, and Nepal), and some improvements with the restoration of stability and resettlement of IDPs in others (Global IDP project, 2005). Since 1998, the Norwegian refugee council's internal displacement monitoring center has monitored internal displacement resulting from conflict and violence across the world. In 2011, the number of people internally displaced by these causes stood at 26.4 million (Forced migration supplement, 2012). In 2011, Internal Displacement Monitoring Center (IDCM) monitored internal displacement in 21 Sub-Saharan African countries. There were an estimated 9.7 million IDPs in these countries, representing over a third of the world's total population of internal displacement. Sudan, the Democratic Republic of Congo (DRC) and Somalia continued to be the countries with the largest internally displaced person in Africa. While governments

or associated armed groups were the main agents of displacement in the majority of situations, the role of armed opposition groups in forcing people to flee was significant. Armed criminal groups also caused displacement especially in areas where government security forces had little capacity to combat banditry.

In West Africa, disputed elections accasioned massive displacement in 2011. In Cote d'voire, after both Alessane Outtara and Laurent Gbagbo claimed victory in December 2010, a battle for national control between their respective supporters caused a four months wave of new displacement. In Nigeria, violence which broke out after the results of the presidential elections were released led to the displacement of some 65,000 people across the northern states ((UN refugee agency for internally displaced persons figures 2010-2013). In both countries, internal displacement also followed inter-communal disputes over land and access to economic and political power, and attacks by non-state armed groups.

Sudan was Africa's largest country until July 2011, when it divided into two with the independence of Southern Sudan. While the separation itself was relatively peaceful, subsequent outbreaks of violence in the South Sudan states of unity, upper Nile and Joglei, in the disputed border area of Abyei, and in Somalia 's southern kordofa and Blue Nile states, all led to large-scale displacement. Although the citizenship status of 700,000 Southerners living in Khartoum remained to be determined, the combined internally displaced population of the two still made for the largest internal displacement situation in Africa at the end of 2011 ([www.unhcr.org](http://www.unhcr.org)).

DRC remained the country with most IDPs on the continent after Sudan. In Eastern Congo, attacks by armed groups and military operations against them continued to cause the displacement of tens of thousands of people in 2011.

In the 1992 and 1997 general elections respectively, Kenya witnessed violence though in lower intensity compared with 2007/2008 post-election violence. It is estimated that during the violence that ensued in 2007/8, 1,133 lives were lost, 78,254 houses were destroyed country wide and some 663,921 people were displaced. Out of the 663,921, it is estimated that about 350,000 people sought refuge in 118 camps, 313,921 were integrated amongst various communities in the country while 640 households fled to Uganda (KNHRC, 2008). It is also estimated that economic and business losses were in excess of Kshs. 100 billion. Population displacement always leaves the victims

vulnerable to human-rights abuses. It is, therefore, against the foregoing background that this study set out to examine the human rights condition of the Internally Displaced Persons as a result of 2007/8 post-election violence in Kenya.

**II. STATEMENT OF THE PROBLEM**

Violent conflicts in developing countries like Kenya have led to serious loss in lives, loss of properties, intercommunity squabbles, and in the end leading to IDPs and other forms of human immigrations.

The majority of IDPs resulting from the numerous displacements in Kenya have not been resettled and their lives restored. The lack of a mechanism to ensure a durable solution to protect IDPs and to restore their lives ensuring that they do not suffer any discrimination has been at the root of the failure by the government to fully resettle victims of the many cycles of displacement in Kenya since independence. The primary responsibility for protecting IDPs and all persons within their own country rests with the national authorities of the country. Moreover, it is sometimes the very governments responsible for protecting and assisting the internally displaced persons that are unable or even unwilling to do so, and in some cases, may even be directly involved in forcibly uprooting civilians. Due to inability or unwillingness of the states to contain political violence, the number of IDPs is increasing at an alarming rate in Africa. It is from this understanding that the researcher sought to find out if there are government policies in Kenya towards the plight of internally displaced persons.

**III. JUSTIFICATION OF THE STUDY**

The number of internally displaced persons facing humanitarian crisis is increasing at an alarming rate in sub-Saharan

Africa (IDMC, 2009), consequently affecting socio-economic development. Human rights principles are supposed to be observed and protected regardless of the situation by the governments however seem this is not the case in developing countries. The study is expected to form the basis for further research on human rights conditions of IDPs and other relevant agencies in safeguarding the human rights and alleviating the plight of the internally displaced and the emerging issues in both forced migration and international relations. The results of the study will be used by the international, regional and local actors concerned with population displacement.

**IV. GOVERNMENT POLICY ON INTERNAL DISPLACEMENT**

The study sought to examine the human rights conditions of the internally displaced persons as a result of 2007/8 post-election violence. In order to address this objective effectively the researcher started the inquiry by asking whether there is a government policy on internally displaced persons. Since the issue of internal displacement of the population is the responsibility State/National government (United Nations Guiding Principles on Internal Displacement).

The National Government officials from the Ministry of Interior and National Coordination, departments of County administration, and Kenya Police were required to answer the following questions: does the government have a policy on internally displaced persons?, are there still IDPs as a result of 2007/8 post-election violence?, and why has it taken such a long time before resettling them?, what is the government mandate on internally displaced, and finally do you consider to have succeeded in your mandate? The responses highlighting the issues above are presented below:

**Table 15: Government policy on IDPs**

	Frequency	Percentage	Valid percentage	Cumulative percentage
	GoK	GOK	GOK	GOK
Valid				100
Yes	12	100	100	100
No	00	00	00	00

**Source: Research Data, 2014**

From the above table, government official agree that there is a government policy on internal displacement. The IDP Act, which received Presidential assent on 31 December 2012. However the policy was enacted five years after displacement, it

is an important step of the Government to implement its obligations assumed under international and regional law [assumed with the ratification of the Great Lakes Protocol on the Protection and Assistance of Internally Displaced Persons, including the adoption and implementation of the UN Guiding Principles on Internal Displacement as well as the African Union’s Convention for the Protection and Assistance to Internally

Displaced Persons in Africa (the Kampala Convention)]. The policy builds on efforts and experiences of the Government and other stakeholders in addressing the rights and needs of internally displaced persons in its attempts to prevent future displacement.

The IDP Act largely reflects key protection principles throughout the displacement process and establishes an institutional framework for IDPs’ protection and assistance. However, little progress has been made towards its implementation – in particular the establishment of its inclusive implementation committee, the National Consultative Coordination Committee (NCCC). There has been little awareness raising or publicity about the Act with responsible authorities, the general public or IDPs.

Apart from implementation, it was opined by some that the draft IDP policy which was ratified into Act in 2012 would add less value though it certainly facilitates implementation. In this case however both instruments are essential to improve the government’s response to the needs of IDPs and the affected communities. On the other hand, (TJRC, 2013) adds by pointing the fast-tracking of the operationalization of the IDP Act and policy and the ratification of the KC are some of the recommendations on forced displacement that the TJRC included in its final report.

The Parliamentary Select Committee on IDPs, 2008 noted that the Government approach to IDPs (and resettlement in general) has been wanting. Since 2007 while the resettlement program received support from different humanitarian and civil society organizations, the program faced operational and administrative challenges, mostly owing to the government’s unwillingness and lack of political will. Government action has been characterized by political manipulation, allegations of corruption, mismanagement of IDPs funds and exclusion.

The question that this research puts to rest is that policies touching on IDPs should not be dormant. They should be implemented or else it be passed by the likely unfolding events surrounding IDPs like deaths, voluntary relocations due to neglect by government, and even being caught in another violence. The slowness of implementation may in future create room for policy reviews even before they are applied, a situation which becomes true because some policies are time bound.

In the table below, 58.3% of GOK respondents agree that there are still Internally Displaced Persons in the region under study as a result of post-election violence 2007/8 whereas 41.7% from the same source dispute such existence.

**Table 16: Response on Presence of IDPs by GoK Officials**

		Frequency	Percent	Valid Percent	Cumulative Percent
		Gok	Gok	GoK	GoK
Valid	Yes	7	58.3	58.3	58.3
	No	5	41.7	41.7	100.0
	Total	12	100.0	100.0	100.0

Source: Research Data, 2015

The responses from the government affirm the presence of internally displaced persons in the area under study, conforming to the Parliamentary Select Committee on the Resettlement of the Internally Displaced Persons in Kenya (PSC Report, 2012) which

affirms that there are still internally displaced persons at Yamumbi and Kamwingi camps. The researcher also visited the site and the image below depicts the presence of internally displaced persons.

**Picture 5: Showing the Presence of IDPs at Kamwingi Camp 20/09/14**



### Source: Research Data, 2014

#### V. HUMAN RIGHTS CONDITION OF IDPS

Although, there is no international legal regime regulating the affairs of internally displaced persons, but the Guiding Principles on Internal Displacement identify rights and guarantees rights of IDPs during displacement and resettlement (OCHA, 1998). Just like every other human being, internally displaced people have fundamental human rights and besides, it is the responsibility of the Kenyan government to take care of her citizens.

Unlike the refugees that have fundamental rights guaranteed under international law under the 1951 Convention, 1967 Protocols and OAU 1969 Convention, there is no regime or Convention such legal regime protecting IDPs. The closest they come to that is the United Nations High Commissioner for Refugees (UNHCR) which has been given the mandate to extend humanitarian assistance to IDPs mostly on request of the country involved. But the intervention from international community could be less or absent where political violence is the cause of displacement in the country. This is due to the principle of non-intervention in Article 2(7) of the UN Charter that upholds the principle of territorial integrity of countries over human rights concerns (Barnett, 2002; Mackintosh, 2000).

As a result, the rights of IDPs can be subjected or open to abuse since there is no law or convention binding on the government or any institution involved in the case of IDPs. Hence, it has been stated that: "The importance of rapid and timely action by the government to reduce vulnerability of IDPs to rape and other forms of sexual and gender-based violence cannot be overstated. A June 2007 report by the Internal Displacement Monitoring Centre of the Norwegian Refugee Council to the Committee on the Elimination of Discrimination against Women noted that the rights of Kenya's women and girl IDPs were being violated, although they are protected under CEDAW- which Kenya ratified in 1984. And a UN-NGO report released in March 2008 highlighted the dramatic increase in rape and sexual abuse during and since post-election violence" (Otieno, 2008).

This objective endeavored to find out the current Human Rights situations of IDPs. The data of this objective was gathered through an interview schedule and observation on the site and complimented by taking photos.

#### **Interview Schedule for Internally Displaced Persons on Human Rights Issues**

The researcher interviewed internally displaced persons in two camps i.e Kamwingi and Yamumbi camps which have 68 and 23 households respectively. According to the report of the Select Committee on the Resettlement of Internally Displaced Persons, April 17, 2012 Kamwingi IDPs owned land in Keiyo but they had refused to go back to their farms owing to security concerns. They had requested for alternative settlement. Saka saka IDPs who are now at the Kenya police post plot at Yamumbi are 33 households (not recognized by Government) were squatters evicted from plot 10, the prisons farm. The interview schedule was majorly dealing with the current human rights condition, the main concern was on the following variables:

#### **Shelter**

Article 43(1) (b) of the Kenyan constitution (2010), and Article 9 (2b) Kampala Convention on refugees and internally displaced provides for the right to accessible and adequate housing. However, despite of the above legal instruments, internally displaced persons are still living on tents/ camps which are worn out. These tents were distributed to them by the Red Cross society during the emergency period in 2007/2008 which was intended to serve for a short time but they have continued using them for almost seven years after displacement. The entire respondents lamented that their condition is worse than that of animals as the tent can no longer protect them from adverse weather conditions and are surviving under the grace of God. They also reported that the tents are small in size compared to the number of persons in the households.

Most IDPs admitted that they were businessmen who were renting premises for their businesses before post-election violence. That is why they did not benefit from government programme of Operation Rudi Nyumbani since they had nowhere to call home, they were not also considered in house construction programme since they didn't own land. This issue was one of the recommendations by the parliamentary select committee on IDPs (2012) requiring the Government to ensure the provision of humanitarian assistance to all IDPs and ensure that each IDP has shelter and the current food rations cover all of them on a regular monthly basis until they are all resettled.

**Picture showing Shelter Status of IDPs at Kamwingi Camp**



**Source: Researcher Data 29/10/2014**

The shelter situations in both camps are the same. The internally displaced in these two camps have been renamed fake IDPs by the government.

### **Health and sanitation**

Article 43(1) (a and b) of the Constitution of Kenya provides for the right to the highest attainable standard of health (which includes the right to health care services including reproductive care) and reasonable standards of sanitation. Article 42 provides for the right to a clean and healthy environment. Article 7(5c) Kampala Convention, Principle 18 of the UN Guiding Principles on Internal Displacement of 1998, pg 34 of the IDP Policy Framework.

Article 43(1)(d) of the Constitution of Kenya provides for clean and safe water in adequate quantities. Respondent X claimed that the piped water which was connected by Red Cross society to serve them during hostilities was disconnected by the government. In addition the IDPs live in Kenya police land where there is piped water but they can't access, they are forced to depend on neighbors and boreholes whose water are not safe for use.

### **Health facilities**

Due to harsh environment the IDPs are exposed to health risks. Most of the respondents cited malaria, typhoid and pneumonia as the most common diseases affecting them. When they visit the health facilities they are required to pay for the services irrespective of their IDP status. They have been depending on well-wishers and herbal medicine for treatment.

### **Water**

Water is an essential commodity in human life therefore, an important basic need. Among the essentials for IDPs would include food, shelter, and clothing where water is a necessity. In relation to this, the chairperson of Yamumbi camp noted that the piped water was cut off immediately after resettlement exercise (Operation Rudi Nyumbani) way back in 2010. Since then they have been relying on neighbours for piped water for drinking which some time they have been denied. The access to piped water at the Yamumbi Police Post has been denied by the officers.

**Picture showing the Living Environment of the IDPs at Yamumbi Camp.**



**Source: Research Data, 2014**

**Security**

Security provision is the mandate the government. IDP Policy Framework Pg 22,24,31 and Article 29 of the Constitution of Kenya provides for freedom and security of the person. Physical security was confirmed by those interviewed that there is calmness in the area. The government after post-election violence beefed-up security in the region by constructing more police posts in the area. For instance, Yamumbi, Kiambaa, Kesses, Langas police posts among others.

**Education**

Article 43(1)(f) of the Constitution of Kenya enshrines the right to education. Same to Principle 23 of the UN Guiding Principles on Internal Displacement of 1998. Though the government has provided free and compulsory primary education, most IDPs children cannot access. Out of the 12 interviewed IDPs only 17% have been able to educate their children to standard eight while non-had been able to take their children to secondary schools. This means that 83% of the IDPs children cannot access primary education. The parents cited that though there’s free primary education, they can’t basic needs not only for their children but also for themselves. This means that the constitutional rights of these children have been infringed.

**Food**

Pursuant to Article 43(1)(c) of the Constitution of Kenya which guarantees the right to be free from hunger, and to adequate food of acceptable quality. The IDPs in both camps confirmed that they last received food rations from the government in 2010 when the main camp at the show ground was officially closed. Thereafter they have been surviving on their own. Their means for survival has been manual labour. Those living in Yamumbi camp have cultivated maize on Kenya police plot where they are residing but yield are not forthcoming since the plated uncertified seeds and lack of fertilizer.

**Table 13: Challenges faced by GOK in securing HR for IDPs**

	Responses		Percent of Cases	
	N	Percent		
Challenges HR. observance	Insufficient funds	4	33.3%	44.4%
	In genuine IDPs	5	41.7%	55.6%
	Lack of political will	1	8.3%	11.1%
	Poor road transport	1	8.3%	11.1%
	Shortage of N.P.I.G	1	8.3%	11.1%
Total		12	100.0%	133.3%

**Source: Research data, 2014**

Of the respondents, 4(33.3%) cited that the challenge was insufficient funds, 5(41.7) ghost IDPs, lack of political will, poor road transport and shortage of N.P.I.G each had one response (8.7%).

From the respondents, the research concurs with the challenge that the funds were insufficient. It has been cited in this work that there was mismanagement of funds by the then provincial administration even though the allocation was inadequate.

### **Insufficient funds**

This challenge is supported by the parliamentary report on IDPs which states that, “The National Humanitarian Fund for mitigation of effects and resettlement of victims of 2007 violence was allocated only Kshs.419.28 million in 2011/2012 which is not sufficient. The Committee felt that failure to implement and fully operationalize the Department of Mitigation and Resettlement and the National Humanitarian Fund for mitigation of effects and resettlement of victims of 2007 violence in the Ministry of Special Programmes were the main reason why the Government’s response to the plight of IDPs was haphazard and unstructured”.

### **Ghost IDPs**

This problem originates from initial profiling of IDPs which was done by the then provincial administration which was blamed as having played a significant role in registering fake IDPs to the disadvantage of the genuine IDPs (Parliamentary Select Committee on IDPs, 2012). In most cases, the IDPs recommended the removal of District Commissioners (DCs), District Officers (Dos) and Chiefs in the vetting of IDPs (Kamungi and M.Kilop, 2008).

The researcher tends to differ with this issue in that seven years since the PEV there are still IDPs living in tents as observed. In the normal situations no one is willing to live in such conditions.

### **Lack of political will**

This challenge is supported by the fact there are internally displaced persons who are still in camps seven years after PEV. Despite the enactment of the various policies to address the plight of internally displaced population, the policies are just on papers. Even those accused of embezzlement of funds meant for resettlement and compensation have not yet been brought to book. If the government was serious about the issue the suspects could have been brought to book.

## **VI. POOR ROAD TRANSPORT**

The problem of transportation is supported other non- governmental organizations and confirmed by Kenya Red Cross preliminary report of 2008 January which states that, “the KRCS will conduct emergency distribution of relief items once the road network is accessible”. This shows that there were other areas which were not assessable. This problem was the least and could have been prompted by the agency of delivering the assistance.

In conclusion the human rights condition of IDPs in the camps is wanting. This is supported by the office of the High Commissioner for Human Rights (OHCHR) which found that the protection and assistance provided to be “largely inadequate”, compromising IDP’s basic rights to shelter, food, water and sanitation and their access to basic services such as schools or medical clinics (OHCHR, February 2012). The delivery of essentials to the victims was also hampered to a larger extent by lack of political will-inadequate funding and profiling of the victims.

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# The Influence of Economic Hardship On Violent Crimes in Kenya

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**Abstract-** Violent crimes are amongst the serious offenses and are characterized by the fact that it entails the use of force or threat of force resulting in an injury to a person(s). This study seeks to unearth the influence of economic hardship on violent crimes in Kenya. In order to answer the objective under the study the researcher used the following income variable: education level, occupation status and house hold income. A purposive sampling technique was used to find the area understudy, the population and the sample. A descriptive analysis was used in the study. The study found that there is a close relationship between economic hardship and violent crimes in Kenya as most of the criminals came from low income households, low education level and low occupational status. Finally the study recommends that the government should provide favorable conditions to create employment opportunities, and education for the entire population.

**Index Terms-** violent crime, criminals, economic hardship, unemployment,

## I. INTRODUCTION

Violent crimes still persists, it has been demonstrated by scholarly writings that criminality has increased significantly in both rural and large cities in the recent past (Goertzel and Khan, 2009). Globally, violent occurrences continue unrestrained and in essence, it is currently a worrying problem in both rural and urban areas of both developed and developing nations (Farrington, 2000). In Brazil, a survey conducted showed that almost 23% of Brazilians cited urban violence as the major social problem they wished tackled, followed by the problem of drugs (21%), and unemployment (19%) in that order (CNT/SENSUS, 2010). In South Africa, the South African Police Service (SAPS, 2012) figures also show an alarming rise in violent crimes with 27% of men indicating they had committed rape (Britto, 2006). Whatever the accuracy of crime statistics, the perception of growing danger has generated widespread anxiety in most African countries. For instance, in Lagos, Nigeria 70% of respondents in a city-wide survey were fearful of being victims of crime caused by a couple of factors one of which is economic hardship (Ogbonnaya, 2013). In Kenya, data and literature on violent crimes are becoming interesting area for many researchers. As violent crimes continue to swell, so is there an array of evidence in the scholarly sources and media that affect the huge allocation of resources in the budget to improve security in the country is made (Statistical Abstracts,

2007). As reported by the Kenya police Annual Crimes Reports, people in the country are faced with violent crimes associated with many factors; this crimes includes robberies, serial and mass murders, child abuse, assaults, terrorism and rape cases among many others (Kenya Police Crime Report, 2011).

Elsewhere scholars have asked; do changes in macroeconomic conditions over time influence the rate of street crime? A common-sense answer is “yes.” As economic conditions deteriorate, people are thrown out of work, and their incomes fall, some of them will turn to income-generating criminal activity in response. As conditions improve and incomes rise, the same logic holds that crime rates will fall. So goes a common view. That view is elaborated in well-known economic and sociological theories, but it is far from the consensus position in contemporary social science. Some analysts predict that crime will drop as deteriorating economic conditions reduce the value or availability of crime targets (Rosenfield & Fornango, 2007).

The unemployment rate is by far the economic indicator of choice in research on the impact of economic conditions on crime rates. A generation of research on the impact of unemployment on crime has produced mixed results and has led some researchers to question the validity of the unemployment rate as an indicator of the full range of economic conditions that may influence crime rates. The idea that crime rates rises and falls with changing economic conditions has a long pedigree in criminology. Early studies sought to connect crime rates to the changing prices of staple commodities such as wheat or rye. More recent research has used the unemployment rate to measure economic performance or outcomes (Arvanites & Defina, 2006). The latter effect, rooted in the more traditional sociological notions of legitimate and illegitimate opportunities, is reflected in increased crime when unemployment blocks access to legitimate income-producing opportunities. The results of Cantor and Land’s annual time-series analysis offered support for both effects (Cantor & Land, 2001). Kenya’s economy (Hall, 2017) has presented volatile yet comparably high growth rates in the last two decades. However, this generally positive macro-economic development has not translated into benefits for its youth. While annual GDP growth of more than 5 percent has been regularly recorded, Kenya’s youth unemployment rate has shown little to no positive development and stands at a staggering 22 percent for 2016 (according to ILO estimates). With 500,000 to 800,000 young Kenyans entering the job market each year, its economy has not been able to provide the necessary amount of employment opportunities formal and

informal alike. Economic progress has primarily benefitted the older generation; young females in rural locations constitute the largest share of unemployed Kenyan youth (in absolute numbers), while their counterparts in urban areas are most likely to be unemployed (in relative terms). Gender and living location are defining factors, but youth unemployment is rampant throughout Kenya.

Locally, indeed criminals and crime rate committed in Kenya are dominated by persons coming from the extremely poor and disrupted families, the unemployed and less educated youth (Kasina, 2004). Reports indicate that gender-based violence particularly against women and children is on the rise and having a link with the state of the economy (Brieve and Jordan, 2004). For example, Gender Violence Recovery Centre, (2012) showed that of all the cases reported, 2,532 were sexual and 422 were physical violence whose rise has an associational link to rising in economic hardship of the people. The Kenya Demographic and Health Survey (KDHS) 2008-09, points out that about 45% of women aged 15-49 have experienced either physical or sexual violence revealing an increase of 8%, 19%, and 22% in rape, defilement and incest cases respectively.

Globally and Kenya in general, an indication of violent crimes have been on increase in the last ten years, a closer observation attributes this to existing livelihood trends. Many communities in the countryside are becoming more violent today than in the past and yet little is known about why this is happening. Police records indicate that among violent crimes that are swelling include homicide, offenses against persons, robbery, breakings, thefts, in particular theft of vehicles, theft by servants and other thefts, criminal damage, economic crimes, corruption, offenses involving police officers and other penal offenses. The Kenya police connect these crimes in the country to abundance of small arms and light weapons, unequal distribution of resources, extreme poverty among sections of the population, protracted drought in pastoralist areas, organized criminal gangs, a high rate of unemployment and the use of Information and Communication Technology (ICT) to perpetrate criminal activities (Kenya Police Crime Report, 2011).

## II. STATEMENT OF THE PROBLEM

The influence of economic hardship on violent crimes among in Kenya is an interesting area to study among sociologists and criminologists as a way of finding solutions to ameliorate the effects. This would need the thorough establishment of the level of violent crimes much more in counties. For this study, prisoners in Uasin Gishu County became a focal point of the study. Data on the correlation between economic hardship and violent crimes are elaborate across jurisdictions, especially on the specific pointers of economic hardship that amplify violent crimes (Fajnzylber, Lederman & Loayza, 2002). In addition, data, in particular, reveal the types of violent crimes that intensify in times of economic hardship. In Kenya, violent crimes have increased in recent days and range from assault to severe cases of murder. This has been impelled by a sharp increase in death and injuries occurring as a result of violent crimes. Traditionally, according to Reid, Herzog, and Patterson; crime has been thought of as a lower-class phenomenon in which the poor who are unable to obtain their desired goods and services through the conventional means resort

to illegal means to obtain them or engage in expressive crimes as a means of articulating their frustrations and annoyance against society (Reid, 2007).

Further, close empirical relationships have been reported between crime and human capital acquisition (Lonnie, 2002), accessibility of firearms (Lafree, 2009), economic inequality (Lafree, 2009), ineffective families, substance abuse and regional values (Siegel, 2007). Vold and Snipes, (2002) emphasized the association between economic hardship which places individuals on various social classes and the likelihood of violent offending. Indeed, levels of violent crimes and levels of development of any nation are linked. Moreover, economic success cannot be realized if the wellbeing of Kenyans and their material goods are in jeopardy. Yet, these relations are complex and vary from country to country and also from one region to another even within the same country. Therefore, there is a need to comprehend why economic hardship boosts violent crimes more than other crime typologies, principally during periods of economic hardship.

Economic prosperity cannot be realized if the safety of Kenyans and their properties are in jeopardy. The causes of crime are as complex as society itself (Neal, 2012). This study found it important in this background a real need to identify types of violent crimes and establish whether they are linked to economic hardship and how they can be addressed. East Africa region as a whole is a region of high crime rates due to a number of factors. Currently, Kenya is rated by the U.S Department of state as critical in terms of both terrorism and crime hence making the U.S Embassy in Nairobi the fourth largest in the world. United Nations (2002) surveys in Kenya revealed that over half of the population worries about crime constantly and roughly 75% feel unsafe while at home (Aronson, 2010).

There is a strong connection between economic inequality and homicide rates (Lafree, 2009, Akers, 2000). In 2011, the Kenya police noted an increase in reported cases of crimes in the following categories; breakings, robbery, homicide, and other offenses at 14%, 15%, 18%, and 1% respectively (Kenya Police Annual Crime Report, 2011). The current economic hardship in Kenya such as difficulties in making ends meet, unemployment and underemployment, low wages and salaries, high cost of living among others may be linked to the many incidences of violent crimes such as murder and non-negligent manslaughter, rape, robbery, and aggravated assault. These violent crimes are ever-increasing. The Kenya Police Annual Crime Report, (2014) ranks Uasin Gishu County at 12 out of 47 Counties with 1872 incidents (cases) with a 209 crime index per 100,000 people. A few guidelines or frameworks exist to guide policymakers and program managers in developing and implementing the comprehensive response necessary to address criminal justice consequences of violence and to reduce the determinants of violent behavior within communities. Crime plays a negative role as far as the development of a nation is concerned (Cullen, Wright and Belvins, 2006).

## III. JUSTIFICATION OF THE STUDY

The study was carried out on the background that economic hardship are realities in many countries given that population census across the world among developing states reveals that a great populace faces survival hardship. The 1990 "wind of

change" (Zorigbaatar, 1995) brought political pluralism and economic liberalization, but it also resulted in an outbreak of social ills such as poverty, unemployment, social disintegration and erosion of societal fabric. Young people had been forced into the web of crime, and becoming street children, school dropouts and illiterates, unemployed and under-employed, and tobacco and alcohol addicts. The Government of Mongolia, in cooperation with relevant non-governmental organizations, was taking energetic measures to redress and improve the situation.

According to Hussain (2014), the economy is one of the most volatile conditions in Asia. What once was thought of being a promising economy has recently been in distress. Vietnam's macro economy was relatively stable in the 1997-2006 period, with low inflation, a 7 to 9 percent total output expansion annually and a moderate level of trade deficit. But Vietnam could not weather the adverse impact from the 1997-98 Asian financial turmoil, which partly curbed the FDI flow into its economy. Starting in late 2006, both public and private sector firms began to experience structural problems, rising inefficiency, and waste of resources. The daunting problem of inflation recurred, peaking at an annualized 23 percent level for that year.

The economic hardship vis a vis its influence is an interesting area for scholars of criminal justice and sociology in different parts of the world. Again, while Kenyans are generally optimistic about the future, they still say a range of development issues pose serious challenges for their country today. At the top of the list, with at least eight-in-ten Kenyans saying each is a very big problem, are government corruption (91%), economic issues such as a lack of employment opportunities (87%) and poverty (86%), and crime (82%) according to (Wike, Simmons, Vice, & Bishop, 2016).

Several studies conducted by various Sociologists and Criminologists such as Vold *et al.*, (2002) and Gould, Mustard and Weinberg, (2002) focused on the impact of economic decline on other factors such as infrastructure, healthcare, education and the overall impact of poverty on citizens, some have linked it to insecurity yet a few have attempted to study its impact on the levels of violent crimes. Violent crime data, particularly in Kenya, is relatively minimal leave alone literature concerning its root causes (Statistical Abstracts, 2007). There is a need to gather information on this since violent crimes continue to take place unexplained as evidenced in the media and the fact that a lot of resources through budgetary allocation are reserved for the safety of the Kenyan people.

#### IV. SCOPE OF THE STUDY

The study entailed the economic hardship factors that influenced violent crimes in which the respondents were drawn from violent crime offenders at Eldoret G.K. and Ngeria Farm G.K Prisons in Uasin Gishu County. Uasin Gishu County is one of the newly created 47 counties in Kenya (Constitution of Kenya, 2010).

#### V. METHODOLOGY

The descriptive research design was employed in which violent crime offenders formed the basis of analysis. According to Gay *et al.*, (2006), a descriptive research design entails the collection of the quantitative data so as to test the hypothesis or to answer questions regarding the subjects of the study. This design was appropriate because it is used when collecting information about people's attitudes, opinions, habits or any of the variety of social issues (Kombo and Tromp, 2009). The sample technique used in the study to choose respondents was purposive in which a sample of 25 convicts and 25 officers in criminal justice system. The study focused on adult violent crime offenders at Eldoret Main G.K and Ngeria Farm G.K Prisons in Uasin Gishu County of Kenya Key informants including magistrates, prosecutors, and officers in charge of the prison facilities were used to support the responses given by the violent crime offenders. The population was suitable for the study since it comprised of violent offenders who provided the most relevant information for the study. Data analysis in the study relied on descriptive statistics such as frequencies and percentages presented in tables and cross-tabulations.

#### VI. THE INFLUENCE OF ECONOMIC HARDSHIP ON VIOLENT CRIMES

The study sought to investigate whether difficulties in making ends meet is linked to the types of violent crimes. Difficulties to make ends meet was measured by the educational status, occupation and level of household income. These variables were cross tabulated and tested against types of violent crimes to evaluate their relationships. The study results were presented as follows;

**Table 4.9: Cross tabulation of Education Status and Types of Violent Crimes**

#### Education Level \* Type of Crime Cross tabulation

			Type of Crime					Total
			Murder	Robbery	Rape	Assault	Domestic violence	
<b>Education Level</b>	Primary	Count	41	0	11	37	22	111
		% within Education Level	36.90%	0.00%	9.90%	33.30%	19.80%	100.00%
	Secondary	Count	0	54	0	24	0	78

	% within Education Level	0.00%	69.20%	0.00%	30.80%	0.00%	100.00%
College	Count	0	0	9	10	0	19
	% within Education Level	0.00%	0.00%	47.40%	52.60%	0.00%	100.00%
University	Count	0	0	0	6	1	7
	% within Education Level	0.00%	0.00%	0.00%	85.70%	14.30%	100.00%
None	Count	0	0	0	0	2	2
	% within Education Level	0.00%	0.00%	0.00%	0.00%	100.00%	100.00%
<b>Total</b>	Count	41	54	20	77	25	217
	% within Education Level	18.90%	24.90%	9.20%	35.50%	11.50%	100.00%

The study results on the relationship between education status and type of violent crimes revealed that 100.0% of those who had no education committed domestic violence; majority of those who had primary education committed almost all types of violent crimes. This shows that as the education levels increases, there is

less tendency of an individual to commit violent crimes. This may be attributed to the fact that with better education one might secure a job that might lessen the burden of difficulties in making the ends meet through wages and salaries earned.

**Table 4.10: Relationship between Education Status and Types of Violent Crimes**

**Chi-Square Tests**

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.128E2 <sup>a</sup>	16	0.000
Likelihood Ratio	236.48	16	0.000
Linear-by-Linear Association	4.667	1	0.031
N of Valid Cases	217		

a. 14 cells (56.0%) have expected count less than 5. The minimum expected count is .18.

The study findings indicated that there was a significant relationship between educational status and types of violent crimes (p=0.000). This implies that education is one of the influencers of violent crimes. Economic growth requires a strong social structure where all age groups should have free access to low-cost education to improve their skills and knowledge. Improving skills and

knowledge for all age groups opens doors to employment opportunities; however, employment opportunities should provide a wage rate that is sufficient for individuals to survive (Mulok *et al.*, 2017). Above all, this will help reduce violent crimes within these areas because individuals have few motives to carry out such crimes.

**Table 4.11: Cross tabulation of Occupational Status and Types of Violent Crimes**

Occupation Status * Types of Violent Crimes Cross tabulation			Types of Violent Crimes					Total
			Murder	Robbery	Rape	Assault	Domestic violence	
<b>Occupational Status</b>	Employed	Count	28	34	12	44	18	136
		% within Occupation Status	20.60%	25.00%	8.80%	32.40%	13.20%	100.00%
	Self-employed	Count	13	20	8	33	7	81
		% within Occupation Status	16.00%	24.70%	9.90%	40.70%	8.60%	100.00%
<b>Total</b>		Count	41	54	20	77	25	217
		% within Occupation Status	18.90%	24.90%	9.20%	35.50%	11.50%	100.00%

The study findings on the relationship between occupational status and types of violent crimes indicated that both those who were employed and those who were self-employed committed violent crimes. Cantor and Land, (1985) argued that unemployment creates an economic downturn which increases

motivation for crime through economic hardship and also unemployment decreases crime through a decrease in opportunities associated with economic hardship

**Table 4.12: Relationship between Occupational Status and Types of Violent crimes**

**Chi-Square Tests**

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.553 <sup>a</sup>	4	0.004
Likelihood Ratio	2.587	4	0.002
Linear-by-Linear Association	0.205	1	0.001
N of Valid Cases	217		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.47.

The study results indicated that there was a significant relationship between occupational status and type of violent crimes (p=0.004). This implies that occupational status influences the types of violent crimes. Employment constitutes the major legitimate opportunity structure for achieving conventional social aims; blocking access to employment will increase economic hardship and frustration and consequently the chances of involvement in crime (Agnew, 2009). High levels of socio-economic inequality including economic hardship may lead some individuals both employed and unemployed to experience strain or frustration which may bring them to greater involvement in

crime. Because employment is perceived as conventional behavior and serves to reinforce social bonds and activate social control, it also acts to reduce involvement in criminal behavior. Unemployment leads to economic hardship which leads to the breakdown of positive social bonds. This, in turn, may increase the probability of people resorting to criminal activity in areas with high rates of economic hardship and unemployment, social and community systems and especially formal and informal normative control systems collapse leading to higher crime rates (Agnew, 2009, Neuman, 2009; Rand, 2007).

**Table 4.13: Cross Tabulation of Household Income and Type of Violent Crime**

Income * Type of Crime Crosstabulation			Type of Crime					Total
			Murder	Robbery	Rape	Assault	Domestic violence	
<b>Income</b>	Less than 10000	Count	41	20	11	41	22	135
		% within Income	30.40%	14.80%	8.10%	30.40%	16.30%	100.00%
	10001-20000	Count	0	34	0	23	0	57
		% within Income	0.00%	59.60%	0.00%	40.40%	0.00%	100.00%
	20001-30000	Count	0	0	8	6	0	14
		% within Income	0.00%	0.00%	57.10%	42.90%	0.00%	100.00%
	30001-40000	Count	0	0	0	4	0	4
		% within Income	0.00%	0.00%	0.00%	100.00%	0.00%	100.00%
	40001-50000	Count	0	0	1	1	2	4
		% within Income	0.00%	0.00%	25.00%	25.00%	50.00%	100.00%
	50001-100000	Count	0	0	0	2	1	3
		% within Income	0.00%	0.00%	0.00%	66.70%	33.30%	100.00%
<b>Total</b>		Count	41	54	20	77	25	217
		% within Income	18.90%	24.90%	9.20%	35.50%	11.50%	100.00%

Source: Research Data (2015)

The study results revealed that 62.0% of those who earned less than 10,000 committed all types of violent crimes; 26.0% of those who earned between 10,001-20,000 committed violent crimes and that only 6.0% of those who earned between 20,001 and 30,000 committed violent crimes. This indicates that the lower the household income, the higher the chances of committing violent crimes. This is further evident by the fact that with an increase in income, the tendency to commit any crime reduces. These findings imply that economic stress and strain are more likely to increase the levels of violent crimes. Those with lower incomes are more likely to be frustrated and to offend when faced with economic stress. Low incomes increase economic strain and people are likely to resort to any means to survive, such people are likely to steal or rob those who have the needed resources.

These findings confirm that during periods of difficulties in making ends meet, those households whose members loss employment, are poor and whose living standards decline feel more hopeless and strained and are therefore more likely to be

those experiencing difficulties in the purchase of foodstuffs, medical bills and in the payment of school fees. Offenders who experience these difficulties are more likely to be violent and to be imprisoned time and again. Offending may increase in situations in which people are hopeless and have unclear prospects for their future. It also means that regardless of whatever programs, these offenders repeat their offenses if the economic situation in their homes has not improved and their lifestyles have not changed. There is, therefore, need to assess the programs in prisons and also ensure that the economic situation of offenders in their home has changed for the better. For example, some offenders stated that they end up committing murder and robbery as they fight over scarce resources such as land and this happened mostly when the offenders were under the influence of alcohol or drugs. Thus, a positive relationship exists between the level of household income and the likelihood of committing a violent crime.

**Table 4.14: Relationship between Household Income and Types of Violent Crimes**

**Chi-Square Tests**

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.313E2 <sup>a</sup>	20	0.000
Likelihood Ratio	134.883	20	0.000

Linear-by-Linear Association	8.758	1	0.003
N of Valid Cases	217		
a. 20 cells (66.7%) have expected count less than 5. The minimum expected count is .28.			

The study findings indicated that there was a significant relationship between household income and types of violent of crimes ( $p=0.000$ ). This implies that household income influenced the type of violent crime. This implies that there is greater complicatedness in the attainment of basic needs; there is additional frustration, anger, antagonism and consequently further violence in such homes. Members in such homes are therefore more likely to resort to various means including theft and deviant and illegal means to cope with the devastating impact of economic hardship, hopelessness, and despair. But it may be that during periods of economic downturns, others are experiencing intricacies while others may find these as simple. It may be this variation that heightens anger and resentment among those who distress that may be responsible for intensified aggravation, anger and enmity that increase violent offending during adversity. These findings further revealed that worsening economic situation may lead to high-interest rates, unemployment and loss of employment, inflation, all of which may, in turn, erode living standards that may increase difficulties in making ends meet in households. Households that may experience the greatest difficulties are those whose members have lost employment, unemployed or earning low wages. Hence, such households are more likely to experience difficulties in the purchase of foodstuffs, medical bills, school fees, and other expenses. This could be because low household income causes strain on the budget and the people affected could seek other means of raising income or acquiring their basic needs. People with low household income experienced high stress since they have to meet the huge needs with a little income. This may lead people to opt for crimes such as stealing, killing or burglary in order to gain their daily needs. Low-income people could also commit serious crimes because their needs are many and they could be motivated to commit more violent crimes to get high returns. Studies by Farrington, (2000) found that income inequality has a significant and positive effect on the incidence of crime and that violent crime rates decrease when economic growth improves. Brookman, (2005) concur with the findings that income levels positively affects the probability of committing the crime. Overall, the results suggest that relative income affects criminal behavior.

Fajnzylber *et al.*, (2002) assert that income inequality is an important factor that drives violent crime rates across countries and overtime and that there is an important correlation between the incidence of crime and the rate of poverty alleviation. According to him, the level of poverty in a country is measured as the percentage of the population that receives income below the threshold level and it is usually determined by the necessary calorific intake and the local monetary cost of purchasing the corresponding food basket. On inequality and violent crime, he found that violent crime rates decrease when economic growth improves. Since violent crime is jointly determined by the pattern of income distribution and by the rate of change of the national income then faster poverty reduction leads to a decline in national crime rates (Block & Block, 2003).

## VII. FINDINGS

The study endeavored to find out the influence of economic hardship on the types of violent crimes in Uasin Gishu County by identifying and investigated whether economic hardship is linked violent crimes. The objectives of the study included; to investigate whether difficulties in making ends meet is linked to violent crimes, in order to adequately answer this objective the following sources of income variables were used: education level, occupation status and household income.

The violent crimes committed by the offenders in both prisons were found to be robbery, stealing, assault, grievous harm, housebreaking, murder, rape, manslaughter, stock theft among others. These findings indicated a similarity with those collected by the interview schedules from the inmates. This could be interpreted to mean that a number of violent crimes are committed and most of them involve injuries to other persons. Indicators of economic hardship included unemployment and underemployment, inflation and low household incomes. Respondents also revealed having received high economic support from close relatives, their spouses, and religious denominations. Study findings further indicated that those who had less household income had been sentenced for a long period of time while those with high household income were serving the current sentence for a short period of time. The level of household income had an effect on the types of violent crimes committed by the offenders.

Chi-square test of hypothesis revealed that there was a significant relationship between difficulties in making ends meet and the types of violent crimes. Difficulties in making ends meet included the inability to provide food, clothing, housing, settling of medical bills, school fees, and other basic commodities. These difficulties compounded with drug and alcohol abuse triggered most of the violent crimes. According to the officers In charge of Eldoret Main and Ngeria Farm G.K prisons, other difficulties in making ends meet that could have led to commission of violent crimes were noted as unemployment, scarce economic resources that could be used to foster economic growth, limited entrepreneurial skills among the youths, poor government policies which do not underscore the youths economic empowerment and complete reliance on cash crops at the expense of food crops which spark lack of basic necessities particularly food. This concurred well with the sentiments of the magistrate and prosecutor at the Eldoret law courts who noted that there were other factors that contributed to difficulties in making the ends meet hence triggered violent crimes among the offenders. These factors included drug abuse, peer pressure, societal stratification where property ownership gives a class, cultural factors where a particular community believes in certain ways of earning a living for example cattle rustling, political party affiliations, and religious extremism. This implies that besides the economic hardship other factors contribute to the levels of violent crimes in the County.

## VIII. CONCLUSIONS

The study concluded that economic hardship leads to violence and crime. Economic hardship creates feelings of hopelessness and anger, which may increase aggression and hostility. Economic deprivation also reduces social trust and facilitates frustration- aggression, which in turn leads to violence and crime. The above indicates that economic deprivation may affect community and family processes in such a way that violence increases.

Economic hardship and the associated socio economic inequalities may lead some individuals both employed and unemployed to experience strain or frustration which may bring them to greater involvement in violent crimes. Because employment is perceived as conventional behavior and serves to reinforce social bonds and activate social control, it also acts to reduce involvement in criminal behavior. Unemployment leads to economic hardship which leads to the breakdown of positive social bonds. This, in turn, may increase the probability of people resorting to criminal activity due to difficulties in making the ends meet.

## IX. RECOMMENDATIONS

The study found out that there are mechanisms that can be put in place to help minimize the number of violent crimes among offenders. These include compulsory education for children and youths, creation of job opportunities by the government and private sectors, expansion of economic activities and guidance and counseling services to the youths. Others include enactment of strict laws on drug peddling and use, improving the rehabilitation skills among correctional officers through capacity building and setting up of rehabilitation centers within the penal institutions. Specifically, the following recommendations were made;

The government through its agencies should focus on improving the economy and create more job opportunities for the youths to enable them to meet their needs and abstain from criminal related activities. The government could do this by establishing community projects which can take in youths as workers that can enable them to earn their daily living.

The youths and the unemployed population need skills in entrepreneurship and other income-generating activities through community groups such as self-help groups to enable them to support themselves and find means of earning their daily living.

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# MANET: Evaluation of Optimum Routing Protocol

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**Abstract-** A mobile Ad hoc network is a dynamic, infrastructure-less, self-configuring and self-healing network of mobile. A MANET is a multi-hop peer-to-peer wireless network. In Ad hoc network there is no central control or Administration. Each node is free to move arbitrarily as the network topology changes regularly. As per need of new applications new research aspects related to energy consumption, mobility management of node, minimize packet loss ratio, increase throughput has been appeared. In MANET one major task is a link failure due to movement of a nodes. So, there is always need of better utilization of network with different routing protocol. This paper most discuss Table-driven (Proactive) e.g. DSDV and On-demand (Reactive) routing protocol e.g. AODV, DSR protocol. These three protocols performance is analyzed and compared on performance measuring metrics Packet Delivery Ratio, Average Throughput, Residual Energy, Mobility of node using NS-2.

**Index Terms-** AODV, DSR, DSDV Protocol, MANET, Residual Energy.

## I. INTRODUCTION

Ad hoc network is a short-range temporary network. This network without the support of any recognized structure or centralized control. The ad hoc network contains of set of mobile nodes connected wirelessly in a self-configured, self-healing network without fixed infrastructure. In this each node free to move randomly as the network topology alteration frequently [1]. The node behaves as a route as they packet forward traffic to another specified node in a network. Basically Ad hoc network design some specific purpose or task. In MANET forwarding a message has to be taken care by mobile node, alive in the network. Therefore, each node behaves like host as well as a router in this network. To providing the dynamic topology special routing protocol or algorithm are needed. For small network the flat routing protocol are sufficient. But in larger network either hierarchical or geographical routing protocol are used [2] [3]. All the nodes are also located different location like airplanes, cars, industries, offices or with people having small electronic devices etc. These nodes can connect randomly each other and forms topologies. And also, these nodes communicate each other and send message neighbor nodes as a router. So, these nodes make them more suitable for instant network connection [4]. Today one of the main areas of researcher is routing technology. Which will route message from source to sink. In this research we have evaluated performance of AODV, DSR, and DSDV routing protocols based on average throughput, packet delivery ratio, residual energy, by using NS-2 simulator. The rest of paper is organized as follows: Section 2 presents brief overview of MANET routing protocols that we evaluate. Section 3 present overview of working protocols. Section 4 describes simulation environment. Simulation results are shown in Section 5 Result analysis is done in Section 6 and finally, conclusions are drawn in section 7.

## II. MANET ROUTING PROTOCOLS

Routing is a process of finding a path from source to destination among randomly distributed routes. The broadcasting is indispensable and a common operation in ad hoc network. It consists of spread a packet from a source node to all the nodes in the network. It is also used for route discovery protocols in MANET. Routing Protocol in Mobile Ad hoc Network (MANET) are categorized such as Proactive protocol, Reactive protocol and Hybrid protocol. In this paper, the table-driven and the on-demand protocols are explained and then compared with different parameters [1][5].

### A. Proactive Routing Protocol or Table-Driven

Proactive protocol also called a table-driven routing protocol. Proactive routing protocol try to preserve reliable, update routing information from each node to the network. This protocol requires each node to preserve one or more routing tables to store routing information and they respond to change in network topology by spread route updates throughout the network to maintain a consistent network view. These are Proactive routing protocols: DSDV, WRP etc. [1] [2] [4] [6].

### B. Reactive Routing Protocol or On Demand

Reactive protocol also called a on demand routing protocol. Reactive protocol is kind of query-reply dialog. This type routing protocol creates route only when desired by the source node. When a source wants to send a message to destination, it asks the route discovery mechanisms to find the path to the destination. This procedure is finished once a route is determined after all possible measures have been examined. Once a route has been recognized, it is preserved by a route maintenance procedure until either the sink becomes inaccessible along each path from the source or until the route is no longer want. In on demand schemes, nodes keep the routes to active sink. So, route search is significant for every unknown sink. These are Reactive protocols: AODV, DSR, TORA etc. [4] [6].

### C. Hybrid Protocol

Hybrid protocol is using best features of both the proactive and reactive routing protocols. This routing protocol is originally established with some proactively inspected routes and then serves the demand in addition activated nodes through reactive flooding. The choice of one or the other method requires an antecedent for different cases. Hybrid Protocol: Zone Routing Protocol (ZRP) [4] [7].

So, these category of routing protocols are described but choosing best one is very difficult. Because, one protocol best for one scenario and other one is best for another scenario. In this paper we observed with simulation of AODV, DSR and DSDV routing protocols. These three protocols briefly described below. figure 1 represents categorization of Mobile Ad hoc Network Routing Protocols.

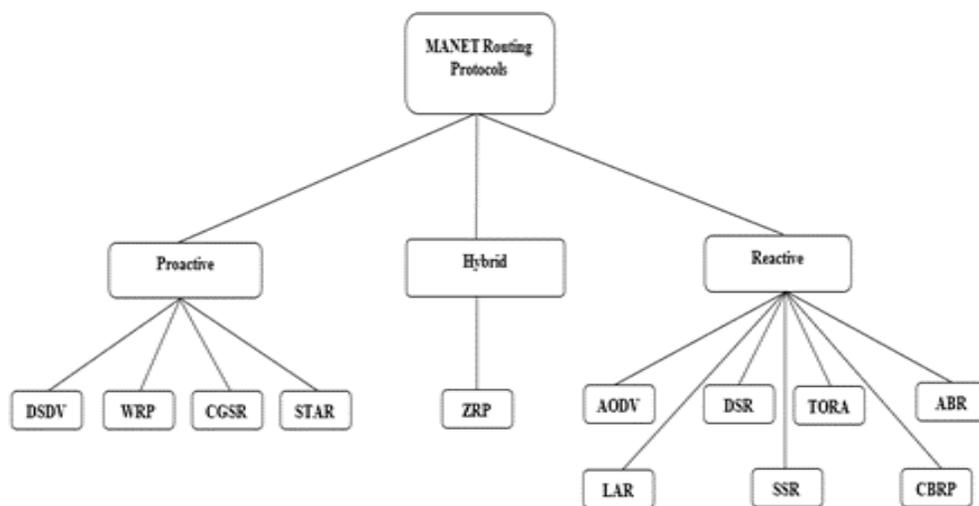


Fig 1. Categorization of a MANET Routing Protocols

## III. OVERVIEW OF AODV, DSR AND DSDV PROTOCOL

### A. Ad hoc On-Demand Distance Vector (AODV)

AODV is a distance vector on-demand MANET routing protocol, i.e. there is no periodical route information exchange. AODV is responsive routing protocol which does not find or establish a route until or unless requested by nodes. AODV use destination sequence number to make sure that all route is loop free and also contains the information of most recent route is used. AODV give fast revision to active topology situations, fewer processing and memory overhead, improved network utilization, and offer unicast route to sink with in the mobile ad-hoc network [2] [3] [8].

This protocol consists two major phases:

3.1.1 Route Discovery.

3.1.2 Route Maintenance.

#### 3.1.1 Route Discovery

In this phase when a source node wants to transfer data with sink node and does not have a predefined or legal route to that sink it starts route discovery method to find the other node of the sink. In this source node sends a route request message (RREQ), which is broadcasted. If all those nearest nodes do have any information about the destination node then they will further send the message to its nearest nodes and so on until the destination node is found. If any node has a valid route to the destination, it responds to the route - request with a route-reply (RREP) message. After RREP message is received by nodes then intermediate nodes recorded the path in the routing table and this path identified the route from source to destination then nodes start sending packets [9].

### 3.1.2 Route Maintenance

The second phase of AODV is route maintenance it is performed by source node. Basically, it is divided into two parts:

1. Source node moves.
2. Destination or Intermediate node move.

A node sends route error message (RERR) to its source. When the link is broken with the next hop. Intermediate nodes receiving a Route error message and after they update their routing table by deciding the distance of the destination to infinity. When the message (RERR) is reached to source, then it starts new route discovery process.[9][10].

#### *B. Dynamic Source Routing (DSR)*

DSR is an on-demand routing protocol, which uses essentially a source routing concept. In source routing the sender knows complete hop-by-hop route to the destination. The route information is stored in the route cache. When a node needs to transfer a data packet to a sink node for which it does not already know the route. Then DSR protocol is used. DSR each hop or node preserves a route cache with route entries which are continually updated. So, this way node recognizes new routes. The sender of the packets selects and controls the route used for its own packets, which also supports features such as load balancing. All routes used are definite to be free of loops as the sender can avoid matching hops in the designated routes. DSR has the capacity to handle unidirectional links. Like other protocols DSR does not require periodic packets within the network [10][11][12].

It is composed of two parts:

- 3.2.1 Route Discovery
- 3.2.2 Route Maintenance.

#### 3.2.1 Route Discovery

In this phase when a node in the network attempts to send a data packet to a sink node for which route is not recognized, it uses a route discovery procedure to discover a route. Route discovery uses simple flooding technique in the network by RREQ packets. Each node getting an RREQ rebroadcasts it further, without knowing the destination or when it has a route to the sink node then store route in its route cache. Such a node replies to the RREQ with RREP message to its original source [13][14].

#### 3.2.2 Route Maintenance [15]

The periodic routing updates are sent to all the nodes. Uncertainty in any connection on a source node is cracked, the source node is notified using a RERR packet. The source removes any route using this link. A new route discovery method must be announced by the source if this route is still wanted. Also, any forwarding node caches the source route in a packet it forwards for possible future use.

Some of the techniques that are advanced to improve it are:

- a). **Salvaging:** A central node can use a different route from its own cache, once a data packet encounters an unsuccessful link on its source route.
- b) **Gratuitous route reparation:** A source node receiving a RERR packet loops back the RERR in the succeeding RREQ. This supports cleaning up the caches of other nodes in the network.

#### *C. Destination Sequenced Distance Vector (DSDV)*

DSDV is a proactive routing protocol based on the distance vector algorithm. In proactive or table-driven routing protocols, each node endlessly preserves update routes to every other node in the network. Routing information is repeatedly transmitted all over the network in order to uphold routing table steadiness. The routing table is updated at each node by discovering the change in routing data about all the accessible destinations with the number of nodes to that specific sink.

## IV. PREVIOUS WORK DONE

Several works have been done in past few years to find which protocol is efficient and good for MANET in different parameters.

**Charles E. Perkins et al. [2]** have studied AODV Vector Routing. This paper described how AODV protocol works how RREQ sends how RREP replies source request, how route table or path manages. In this paper simulation can be described different parameters like Hello Interval, Route Discovery Timeout, Route Expiration, Reverse Route Life Maximum of Retransmissions and also varying the no. of nodes.

**David B. Johnson et al. [11]** presented the DSR Protocol for Multi-Hop Wireless Ad Hoc Networks. This paper classifies the process of DSR through simulation on a variety of measurement and communication designs. In this paper described the principle mechanisms of Route Discovery and Route Maintenance used by DSR, and have shown they enable wireless mobile nodes to automatically form a completely self-organizing and self-configuring network among themselves.

**Guoyou He et al. [13]** reviews the DSDV protocol, and analyses the properties of DSDV when it is used for ad hoc networks routing. In this DSDV arises route variation because of its principles of route information.

**Ammar Odeh et al. [15]** described the evaluation of AODV and DSR routing protocol in MANET. The performance metrics are Sending time, accessing time, Transmission time, Propagation time, Reception time, receive time, Aggregate throughput, Drop packet, Efficiency

of routing protocol. In this paper different performance metrics were investigated with respect to packets' size. In this experiment, DSR has shown better performance in terms of efficiency for a packet size less than 700 bytes.

**Abdul Hadi Abd Rahman et al. [19]** described the evaluation of AODV, DSDV and I-DSDV Routing Protocols in MANET. In this paper, all the three-routing protocol are evaluated based on the three-performance metric which are Packet Delivery ratio, End-to-End Delay and the Routing Overhead. The results indicate that the performance of I-DSDV is superior to regular DSDV. It is also observed that I-DSDV is even better than AODV protocol in PDR but lower than AODV in E2E delay and Routing Overhead.

## V. SIMULATION ENVIRONMENT

NS2.35 Network Simulator is used for the simulation of routing protocol in MANET. NS2 is an open source distinct event network simulator is performed under Linux (Ubuntu 18.04) environment. It is used for the simulation of network protocols with different network topologies. Network animator (NAM) is used for the graphical view of the network. Other Tools don't have all the modules that ns-2 has [20]. NS use two language: Object oriented Tool Command Language (OTcl) and Object-oriented language C++.

**Table1:** Simulation Parameters

Parameters	Values
Protocol Studied	AODV, DSR, DSDV
Channel Type	Wireless
Mobility Model	Random waypoint mobility model
Propagation Model	Two Ray Ground
Antenna Type	Omni Directional Antenna
Simulation Area (meters)	900m * 900m
Simulation Time (second)	30,60,90,120,150 sec
Traffic Type	FTP
No. of Nodes	50
No. of Packet	50
Energy (joules)	50 unit
Packet size (bytes) for 1st Simulation	750
Packet size (bytes) for 2nd Simulation	1500
Packet size (bytes) for 3rd Simulation	3000
Packet size (bytes) for 4th Simulation	4500
Packet size (bytes) for 5th Simulation	6000

### A. Performance Evaluation Parameters

AODV, DSR and DSDV routing protocol are compared on the basis of three performance metrics. For simulating these protocol awk script are written for all these performance metrics.

#### 1. Average Throughput.

Average Throughput of a network is the average rate of positively message transported over a communication channel. The system throughput or average throughput is the sum of the data rates that are delivered to all terminals in a network[17][18][24].

Average Throughput = (No. of received packets / (Finish time – Start time)) \* (8/1000) kbps

#### 2. Packet Delivery Ratio

Packet delivery ratio is defined as the ratio of the entire number of packets received by sink node to the entire number of packets sent by the starting node [24]. It is calculated as:

$$PDR = (\text{Received packets} / \text{Sent packets}) * 100$$

### 3. Residual Energy

Residual Energy = Total Energy - Used Energy. It is observed that with every simulation whether a node takes part in communication process or not, if it is in active state some amount of energy is being dissipated [21][25].

#### B. Scenario of Different Protocols

The scenario represents figures showing running simulation for Random waypoint mobility model with AODV, DSR and DSDV routing protocol

##### 1. Random Waypoint mobility model with AODV, DSR, DSDV

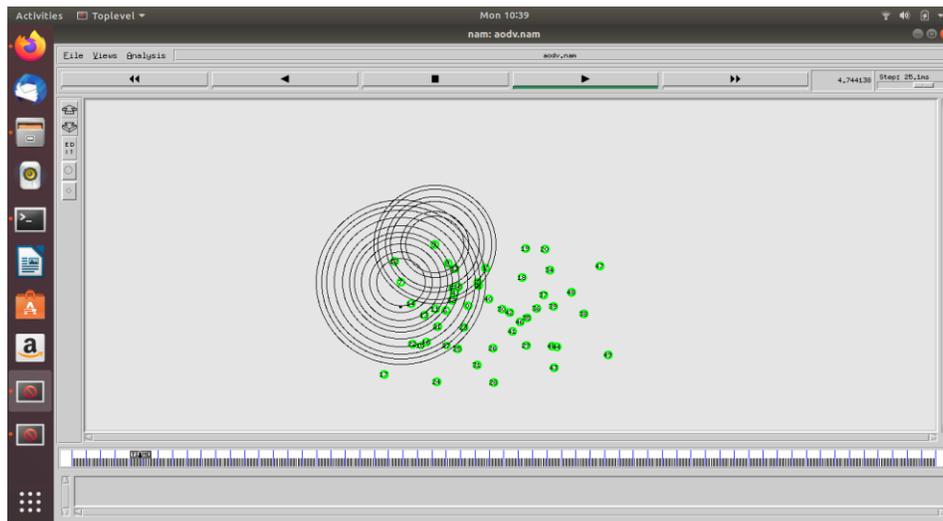


Figure 2: AODV

With figure 2 AODV and figure 3 DSR random waypoint mobility model was implemented for 50 nodes.

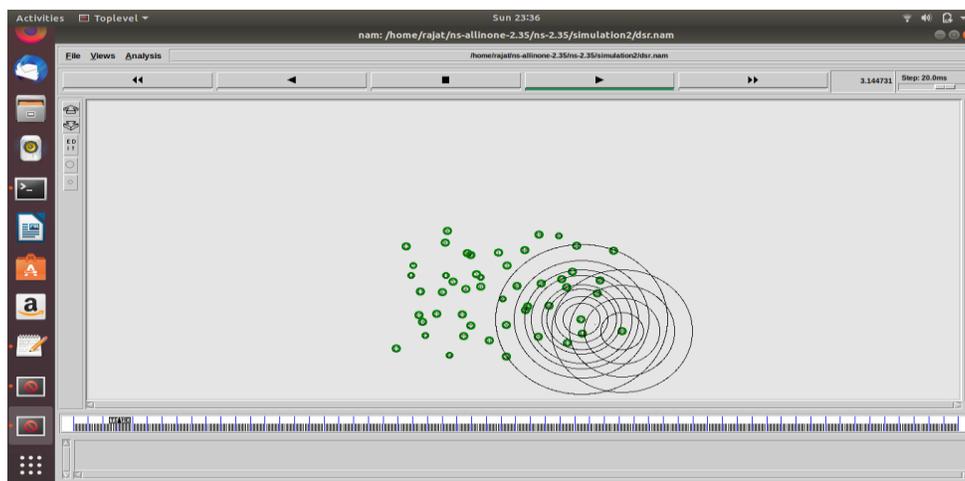
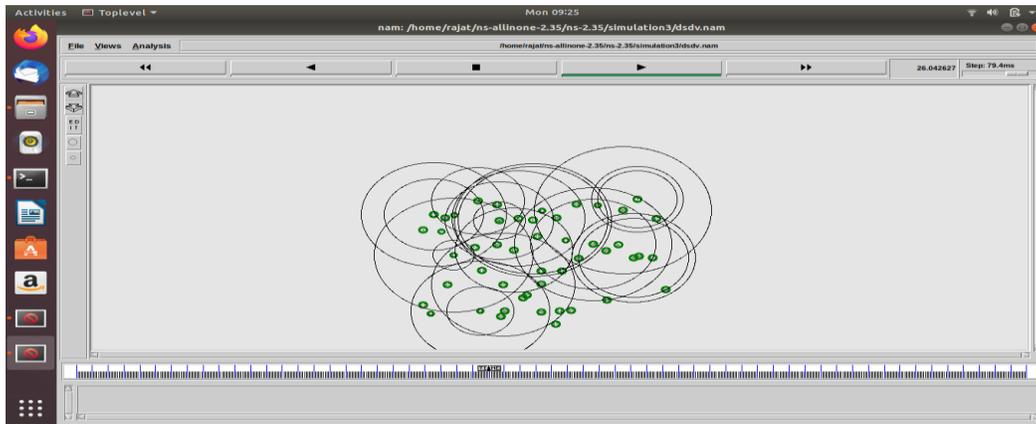


Figure 3: DSR

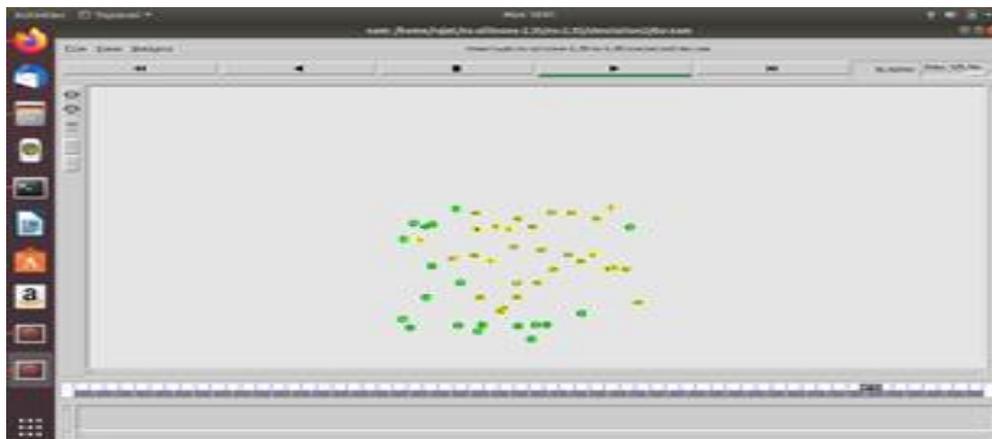
Netanim is the tool showing running simulation. Green dots defined node is active or fully energy in AODV and DSR. In this Figure black circle defined the communication done one node to other in a particular range.



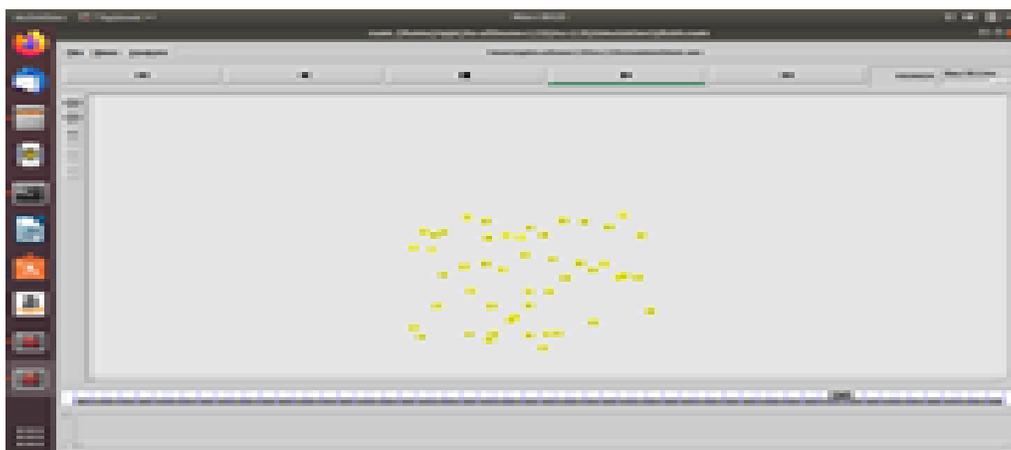
**Figure 4: DSDV**

With figure 4 random waypoint mobility model was implemented for 50 nodes. Netanim is the tool showing running simulation. Green dots defined node is active or fully energy in DSDV. In this Figure black circle defined the communication done one node to other in a particular range.

## 2. Energy Loss in DSR and DSDV:



**Figure 5: Energy Loss in DSR**



**Figure 6: Energy Loss in DSDV**

In figure 5 and Figure 6 yellow color(dots) defined the less energy in the node and communication may be affected any time.

## VI. RESULTS AND ANALYSIS

To obtain the mobility model Random waypoint mobility model are implemented with AODV, DSR and DSDV for simulation time 30,60,90,120,150sec with 50 nodes. To obtain the reading in operating system Ubuntu 18.04 the tool and trace metric and gnuplot are used for graph.

### A. Average Throughput

Figure 7 represent Average Throughput With AODV, DSR and DSDV in simulator NS-2.

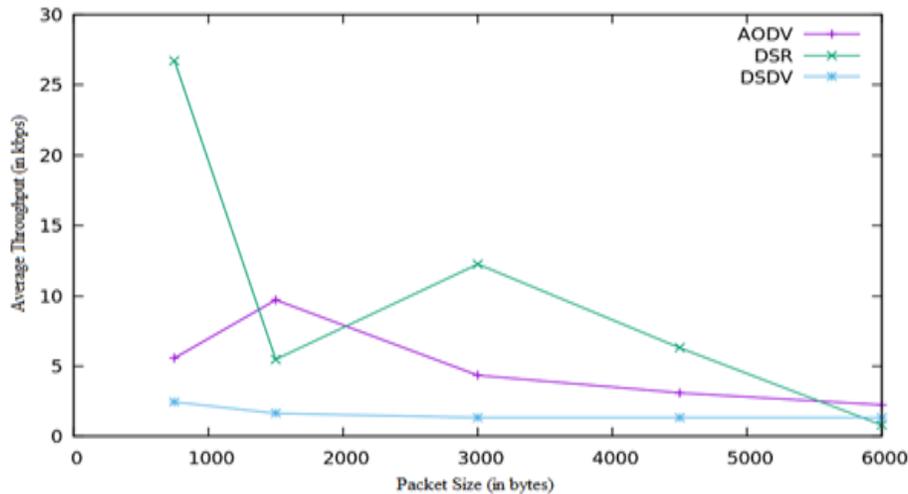


Figure 7: Average Throughput in AODV, DSR and DSDV

Figure 7 Average Throughput of AODV, DSR and DSDV routing protocol for MANET environment is measured for the varying packet size. It is obvious from the graph that average throughput is 5.5%, 27% and 2.4% packet size 750 bytes for AODV, DSR and DSDV respectively. It is clearly observed in the graph that average throughput decreases as the packet size increases. If packet size is large then fewer packets are sent source to destination. It is clearly shown in graph DSR routing protocol better than AODV and DSDV routing protocol in MANET.

### B. Packet Delivery Ratio (PDR)

Figure 8 represent Packet Delivery Ratio with AODV, DSR and DSDV in simulator NS-2.

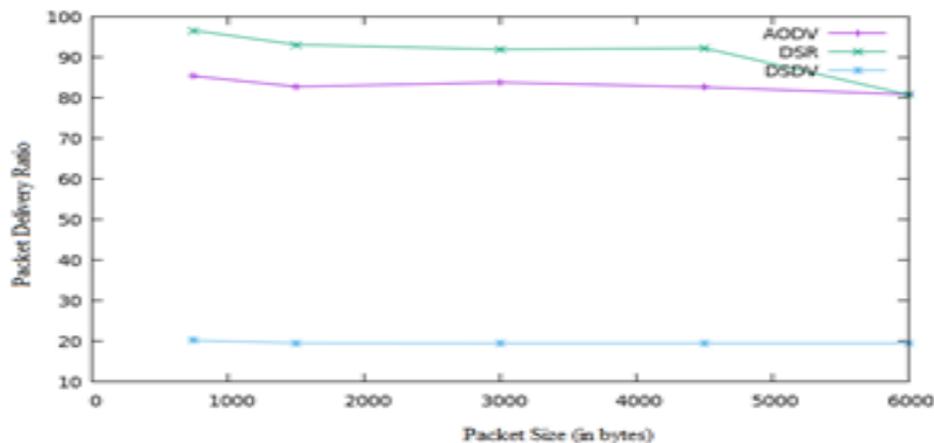
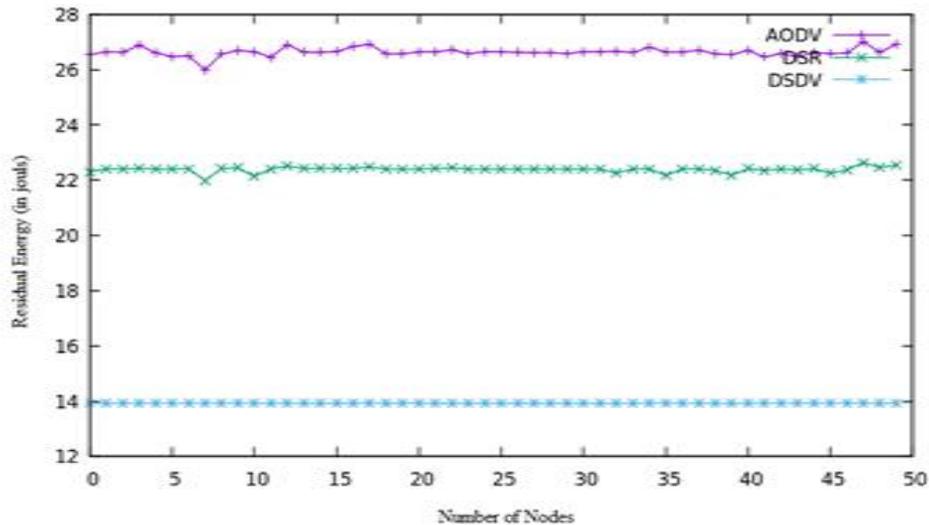


Figure 8: Packet Delivery Ratio in AODV, DSR and DSDV

Packet delivery ratio in AODV, DSR and DSDV are shown in figure 8 PDR measured the varying packet size. When packet size is 750 bytes, PDR of DSR is nearly 100% and PDR of AODV is 87% and PDR of DSDV is 20%. It is shown in graph that on increasing the packet size, PDR of AODV, DSR and DSDV routing protocol decreases. It is clearly shown in graph DSR routing protocol better than AODV and DSDV routing protocol in terms of PDR.

### C. Residual Energy

Figure 9 represent Residual Energy with AODV, DSR and DSDV in simulator NS-2.



**Figure 9:** Residual Energy in AODV, DSR and DSDV

Residual Energy in AODV, DSR and DSDV (50 joules) are shown in figure 9 measured the fixed packet size 1500 bytes. It is obvious from the graph that Residual Energy is 26.3 joules for AODV 22.1 joules for DSR and 14 joules energy remaining for DSDV routing protocol. In this graph shown clearly AODV routing protocol better then DSR and DSDV routing protocol in term of Residual Energy.

## VII. CONCLUSIONS AND FUTURE WORK

A detail study of routing protocols is done in this paper which focused on the energy conserving schemes used by protocols and their real time support towards application like scrutiny, monitoring etc. It is concluded that DSR performs better than AODV and DSDV in Average Throughput, Packet delivery ratio. But AODV performs better in case of energy. AODV is more energy efficient as compared to the DSR and DSDV.

Extensive research work is going on in field of routing in MANET to provide efficient data transfer from source node to destination node. It has been found that the research regarding multicasting in MANET is still to go a long way. This work can be further enhanced to support routing protocol in Grid Environment. Possible topics of the future research directions on multicast routing protocols include the following: Multiple paths and load balancing, Security, Designed new Hybrid Protocol.

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# Communication Activities of the National Unity and Politics Agency (Kesbangpol) of DKI Jakarta in Conducting Guidance to Community Organization

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**Abstract-** This research entitled "communication activities of National Unity and Politics Agency (Kesbangpol) of DKI Jakarta in providing guidance to Community Organization". The purpose of this study is to analyze what communication activities are carried out by National Unity and Politics Agency (Kesbangpol) of DKI Jakarta in the process of coaching Community Organization, so their existence is in accordance with applicable laws and regulations. The concepts that support this research are the concept of organizational communication, the concept of political participation, and the concept of coaching. The method used in this research was descriptive qualitative. Data obtained through interviews and field observations. The results showed that the communication activities carried out by the National Unity and Political Unity Agency (Kesbangpol) of DKI Jakarta were workshops with themes, topics, and status quo cases that were being discussed in the community, Seminars on national insight held in Jakarta and in Puncak, West Java, FGD, Group Discussion Forum with competent speakers, Ceremonial activities on major holidays commemorating hero days, ceremonial events on August 17 and other public events, *Silahturahmi* or Greetings to all community organizations in DKI Jakarta and its surroundings, conducting creative competition in making advertorial, and various other activities that have values and functions to strengthen the awareness of community organizations in maintaining harmony and national unity.

**Index Terms-** National Unity and Politics Agency, organizational communication, coaching, community organization

## I. INTRODUCTION

Currently, there are many cases of social conflict that are motivated due to differences and diversity in race, ethnicity, religion, and political choices that often occur in Indonesia. Maybe this is due to the decrease of nationalism and tolerance values among society. Even though Jakarta is the national capital, the potential for SARA conflicts and other social conflicts is still very large. The socialization and the development of knowledge in educational institutions is one of the solution, but because education institutions are more focused on theory rather than directly practiced and implemented in the field, the government has formed another government agency that is focused on dealing with the development of nationalism in Indonesia, namely the

National Unity and Politics Agency. These institutions are located in all provinces, districts and cities in Indonesia.

The National Unity and Politics Agency of DKI Jakarta has a big role in minimizing the occurrence of radical movements, terrorism, conflicts between citizens, conflicts between ethnic / races, increasing the comfort and peace of residents in each village / district. In addition, the task of the DKI Jakarta National Unity and Politics Agency is increasingly complex, considering that DKI Jakarta Province as an autonomous region is not only faced with social problems in Jakarta but also more problems that arise on national scale are carried out by elites, individuals, or groups which certainly affects the dynamics of the lives of Jakarta society, so facilitation is needed to achieve harmony in realizing the unity and integrity of Jakarta society.

The current complex multi-dimensional crisis has implication for the condition of the Jakarta society who are vulnerable to the emergence of social turmoil marked by violence, so society tend to look for shortcut in solving various problems faced. These social conditions often provoke in occurring violation outside of existing legal corridors, both those committed by individuals and community groups. Therefore, efforts to tackle these problems require handling method through the institutional appropriately and well planned (<http://bakesbangpoljakarta.com>).

The diversity of Ethnic, religious, racial, and interfaith (SARA) in Indonesia is one of the uniqueness of the Indonesian society. On the other hand, diversity has a positive impact because it shows the cultural richness of the Indonesian society, but on the other hand it can be one of the potential reasons for intercultural conflicts. Diversity also brings multicultural society in Indonesia (Kharisma, 2017:108).

In multicultural society, it is inevitable that members of a group exchange messages or information with other group members. In this process, intercultural communication is inevitable. Intercultural communication occurs when someone from one culture produces message for consumption by members of another cultural group (Samovar, L. A., Porter, R. E. and McDaniel, 2014). In other words, intercultural communication involves interactions between people who have significant differences in cultural perception and symbol system to change their communication activities. This communication occurs either directly (face to face) or through a medium (Kharisma, 2017:108).

Referring to the conditions above, the researcher is interested to study about Communication Activities of the National Unity and Politics Agency (Kesbangpol) of DKI Jakarta

in conducting Community Organization development. Through this research, it is expected to be able to contribute in the form of knowledge in the study of communication science, particularly in the field of public relation, which is related to the concept of the Role of National Unity and Politics Agency and Community Organization. This research is expected to be a reference to further research related to the role of the National Unity and Politics Agency (Kesbangpol) and community organization. In addition, this research is also expected to be able to contribute in the form of suggestion to the activities of the Kesbangpol and community organization.

## II. LITERATURE REVIEW

### Organizational communication

Organizational communication is the sending and receiving of various organizational messages in formal and informal groups of an organization (Wiryanto, 2005). The contents are about how to work in the organization, productivity, and various jobs that must be done in the organization where organizational communication is a network of communication between people who are interdependent with each other in the organizational context.

Community organization can function according to their function as social control and can take more professional attitude when engaging in the community, so they are no longer community organization that violates regulation in accordance with the Law of Community Organization. While community organization must be neutral in dealing with various conflicts that arise in a variety of countries. In maintaining organizational harmony with government, community organizations are not politicized, because of the role of CSOs as the media of government control.

Doing communication is one of way to support the synergy between the Kesbangpol and community organization while Soemarno stated that the essence of political communication is the effort of human groups who have a certain political or ideological orientation in order to control or gain power and with that power, the purpose of political thought and ideology can be realized (Nora, 2014:46).

The purpose of organizational communication is: The purpose of communication in the organizational process is certainly in the context of forming mutual understanding in order equality can occur within the frame of reference, as well as in experience. Robert Bonnington in the book *Modern Business: A Systems Approach* (2007) defines organization as a media which management coordinates material resources and human resources through formal structural pattern of task and authority. The correlation between the science of communication with the organization lies in its observation focused on the humans involved in achieving the goal of the organization.

### Political Participation

Political communication, political socialization, political image, ultimately lead to goal and objective, namely the achievement of political participation and participation in the process of determining political policy. Political participation or public participation in the political agenda is very important in democracy (the foundation of democracy), especially in

representative democracy (Rahman, 2019: 134). Then to realize a mature democratic system, high public participation is needed but the level of youth participation in politics is often a matter of debate. The younger generation is often seen as a group of people who are least concerned with political issues, who often experience separation from their communities, who are not interested in the political process and political issues, who have a low level of trust in politicians and are cynical about various political institutions and government (Haste & Hogan, 2006).

Political human activity in the political arena is basically a political act or political participation that is developed through the experience or application of political socialization. In general, political participation is explained by Miriam Budiardjo as the activity of a person or group of people to actively participate in political life such as electing a country leader, and directly or indirectly influencing government policy (public policy) (Arifin, 2011:235-266).

Participation is an important part of democracy, Huntington & Nelson (1976: 3) argue their views as follows: " political participation that the activities of citizens are designed to influence government decision making." Based on this definition, political participation is interpreted as a private activity of citizens carried out to influence government decisions. Then Dahrendorf (2003) states "Political participation gives citizens the opportunity to communicate the information to government officials about their concerns, preferences and pressure on them to respond." This definition emphasizes that everyone who lives in a democratic country has the right to express their views and attitudes towards everything that happens in the public domain or matters related to their interests so the government is known and then the government respond.

Political participation according to Herbert McCloky is the voluntary activities of the citizens through they take part in the process of electing the authorities, and directly or indirectly in the process of forming public policy. Activities include political actions such as voting in election, attending campaign, lobbying with politician or the government (Purboningsih, 2015:108).

### The Definition of Coaching

Seeing from the term, coaching comes from the basic word "bina", which comes from Arabic language, which is to wake up (General Indonesian dictionary). Coaching means renewal or efforts, actions or activities carried out efficiently and effectively in order to obtain better result. (Gauzali Syadam, 2000:408).

Coaching is a formal or non-formal educational effort that is carried out consciously, planned, directed, organized, and responsibly in order to introduce, to grow, to guide, and to develop the foundations of a balanced, whole and harmonious personality, knowledge and skill according to talent, tendency / desire and abilities as a provision, henceforth on their own to increase, to improve and develop each other, themselves, and their environment towards the achievement of dignity, quality and optimal human ability and independent individual (Simanjuntak, 1990:48).

Guidance and national education can also be formulated, which is also related as the effort to improve the quality of human, namely humans who believe and have faith in God Almighty, virtuous character, personality, independent, advanced, tough, intelligent, creative, skilled, discipline, work ethic, professional,

responsible and proactive as well as physically and mentally healthy (Hendriani & Nulhaqim, 2008 : 157).

### III. METHODOLOGY

The paradigm of this research is constructivism. Constructivists believe that knowledge exist in someone who is knowing. In the process of communication, messages cannot be transferred from one person's brain to another person's head. The recipient of the message must interpret what has been taught by adjusting to their experiences. The importance of experience in this knowledge process makes the construction process requires the ability to recall and express experience, the ability to compare and make decision, and the ability to prefer one experience to another experience. (Ardianto & Bambang, 2007:154-155).

This research used descriptive qualitative method, where researcher describes how the communication activities of the DKI Jakarta National Unity and Politics Agency (Kesbangpol) in developing community organization. In this study, researchers only act as observers who only create behavioral categories, observe symptoms and record them in observation book. Researchers will act as observers and go directly to the field to obtain the necessary data by interviewing the parties concerned. Then the results of this study only describe the situation, not seek or explain the relationship that exist.

The subject in this study was the National Unity and Politics Agency of DKI Jakarta Province as Data Source. Then the data in qualitative research generally take the form of description, narrative, data, image or statement obtained from research subject, both directly and indirectly related to how the role of the National Unity and Politics Agency of DKI Jakarta Province. The main data sources in qualitative research are words and actions, and the rest are additional data such as document and others. In this section, the types of data are divided into words and actions, written data sources, photographs and statistics. Then the data collection techniques were by interview, observation, and document study. Qualitative data analysis technique id carried out together with the data collection process. Data analysis techniques according to Miles and Huberman include three concurrent activities: 1) Reduction of data to remove data that is not important, 2) Display data that is doing the process of presentation (displayed) in the form of a comprehensive description, 3) Verification of data that is interpreting and concluding data that has been compiled. Based on the interpretation above, researcher can draw a conclusion, where this conclusion is the result of the research that can answer research questions that have been formulated previously (Irawan, 2018: 118).

Then to determine the validity of the data, the researcher conducted a triangulation technique. This is a data checking technique that uses something other than research data to examine or compare the objective. Denzin distinguishes four types of triangulation as an examination technique that utilizes the use of resource, method, researcher and theory (Yuliawati, 2019: 82).

### IV. DISCUSSION

The results of the research at the National Unity and Politics Agency (Kesbangpol) of DKI Jakarta explained that every

Indonesian citizen may establish or have community organization maximally 3. Then the existence of the community organization must have AD/ART, flag symbol, secretariat office, and building domicile in accordance with the Regulation of the Ministry of Home Affairs (Permendagri) number 57 year 2017 about procedures for the community organization system. Therefore, community organization must register to the National Unity and Politics Agency (Kesbangpol).

Data showed that the number of community organization registered in the National Unity and Politics Agency (Kesbangpol) of DKI Jakarta amounted around 550 SKT, based on SK Ministry of Justice and Human Rights in the 2014 - 2018 period. Until now, there will still be more new community organizations, until the social services are unable to gather data. Registered community organization will receive services from the Kesbangpol, enter into a collaborative group to provide guidance and direction in some training on Pancasila, and national insight for the Republic of Indonesia. Then the scope of activities will be adjusted to the role of the organization.

To ensure the role and function of community organization in accordance with the regulations, the government has a National Unity and Politics Agency (Kesbangpol). The National Unity and Politics Agency (Kesbangpol) functions to provide guidance to community organizations that have a good track record, diligently participate in activities, diligently play a role in society, so they are the ones who will always be involved in the activities of the National Unity and Politics Agency of DKI Jakarta.

The below explanation will explain the various types of activities carried out by the Kesbangpol DKI Jakarta in carrying out the fostering function of all community organizations registered in DKI Jakarta, as follows:

1. Workshop on themes and topics as well as status quo cases that are discussed among the society
2. Seminar on nationalism insight held in Jakarta and in Puncak, West Java
3. FGD, Forum Group Discussion with several competent speakers
4. Ceremonial activities on major holidays commemorating Heroes' Day, ceremonial events on August 17 and other ceremonial events
5. Greetings or *Silahturahmi* to all community organizations in DKI Jakarta and surrounding areas
6. Conducting creativity competition in making advertorial.

Various activities above were part of the organization communication activities. In this context, the DKI Jakarta National Unity and politics Agency (Kesbangpol) sent and received various organizational messages in formal and informal groups to community organizations in DKI Jakarta. The content of the communication message was about how to work within the organization, productivity, and various jobs that must be done in the organization where organizational communication is a network of communication between people who are interdependent with each other in the organizational context.

Through this coaching activity, it is hoped that community organizations could operate according to their function as social control and could take a more professional attitude when engaged in the community, so they were no longer community organizations that violated regulations in accordance with the Law

of Community Organization while community organization should be neutral in responding to various conflicts that arose in a variety of countries and states. In maintaining organizational harmony with government, community organizations were not politicized, because of the role of community organization as the media of government control.

Nora (2014) explained that conducting communication is one of the way to support the synergy between the Kesbangpol and community organizations, while Soemarno stated that the essence of political communication is the efforts of human groups who have a certain political or ideological orientation in order to control or obtain power and with that power, then the goals of political thought and ideology can be realized (Nora, 2014:46).

To support the various programs that have been carried out by National Unity and Politics Agency (Kesbangpol), community organizations should do the following actions:

1. Having a healthy soul, physically and mentally / physically and spiritually
2. Every community organization should understand its function, understanding that it is not just a matter of taking care of and taking part without understanding the purpose of the organization
3. Each administrator and member often consolidate cadres to strengthen and to understand Pancasila, the 1945 Constitution and Nationalism for NKRI
4. Be aware of each other's cultural preservation
5. Have a high patriotism spirit
6. Having a good empathy for fellow management and the surrounding community.

Not only have the criteria above, members of community organization also needed to increase the understanding related to the duties and functions of community organization as well as understand and appreciate the basic values of the Indonesian state. For this reason, the guidance that has been carried out by the Jakarta national unity and political agency is the right effort. This is as explained by Fauzali (2000) which states that coaching means renewal or efforts, actions or activities carried out efficiently and effectively in order to obtain better results. (Gauzali Syadam 2000:408).

In addition, Simanjuntak (1990) also explained that coaching is a formal and non-formal educational effort carried out consciously, planned, directed, organized, and responsible in order to introduce, to grow, to guide, and to develop a basis for balanced and harmonious personality, knowledge and skills in accordance with talent, tendency / desire and abilities as provisions, henceforth on their own to add, to improve and develop themselves, other people and their environment towards the achievement of dignity, quality and optimal human abilities and independent individuals (Simanjuntak, 1990:48).

Guidance and national education can also be formulated, which is also related as efforts to improve the quality of human, namely humans who believe and have faith in God Almighty, virtuous character, good personality, independent, advanced, tough, intelligent, creative, skilled, disciplined, work ethic, professional, responsible and proactive as well as physically and mentally healthy (Oemar Hamalik, 2000 : 14).

## V. CONCLUSION

Based on the results of research related to communication activities of the National Unity and Politics Agency (Kesbangpol) of DKI Jakarta in conducting Community Organization development, the conclusions were:

Communication activities carried out by the national unity and politics agency (Kesbangpol) of DKI Jakarta , namely Workshops with themes, topics and status quo cases that were being discussed in the community, Seminars on national insight conducted in Jakarta and in Puncak, West Java, FGD, Group Discussion Forum with competent speakers, Ceremonial activities on major holidays commemorating Heroes' Day, ceremonial events on August 17 and other public events, Gathering or Silaturahmi to all community organizations in DKI Jakarta and surrounding areas, conducting creativity-making advertorial competition, and various other public events. other activities that have values and functions to strengthen the awareness of community organizations in maintaining harmony and national unity.

To ensure that community organization could carry out activities in accordance with applicable laws and regulations, the Jakarta National Unity and Politics Agency (Kesbangpol) required that all members of community organizations should 1) to understand their functions and not just became the administrator and joined without understanding the direction of the organization, 2) each administrator and member should consolidate the strengthening of cadres of the understanding of Pancasila, the 1945 Constitution and Nationalism for the Unitary State of the Republic of Indonesia, 3) aware of each other's cultural preservation, 4) Having high patriotism, and 4) Having a spirit of empathy both to fellow administrators and the surrounding community.

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# Development of learning devicesBased inquired guidelines to improve science processing science Elementary school students

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**Abstract-** This study aims to produce learning tools based on guided inquiry models that are feasible to improve the science process skills of elementary school students. This research is a development research, with ADDIE model. The research trial design uses one group pretest-posttest design with quantitative descriptive analysis techniques and qualitative descriptions. The subject of this study is a learning device consisting of a syllabus, learning implementation plan, student worksheets, student teaching materials, tests on learning outcomes of science process skills. The trial was carried out on 40 students of grade five in elementary school. Data collection methods use validation, observation, tests, and filling out the questionnaire. The results of the analysis of the research data show: (1) the device developed is valid; (2) legibility of Student Book and Student Work Sheet at the independent level; (3) learning takes place in either category; (4) students become active in learning; (5) students give positive responses in the excellent category to learning; (6) science process skills show a high category. Based on the results of the study, it can be concluded that the guided inquiry-based learning device that has been developed is feasible to improve students' science process skills.

**Index Terms-** learning tools, guided inquiry, science process skills.

## I. INTRODUCTION

Natural Sciences is one of the five subjects that must be mastered by Elementary School students. "Science is the study of events that occur in nature" (Sudana, et al, 2016: 2). Science learning is expected to be well understood by students so students can work and work to find things independently and meaningfully.

The most important thing in learning science is that students experience or feel what is taught with reality so that students will be convinced of what is taught and understood because they experience it directly, because in daily life there are many problems that can not be separated from the concept of science, therefore natural science learning quality requires a learning tool that can help students understand the science material well. The implication of the statement is that the teacher can teach well, the teacher must prepare a learning kit before teaching and learning activities begin. Thus, learning tools play an important role in the success of the learning process to support fluency in teaching and learning activities. Teachers are required to make effective and efficient teaching preparations. To make good planning and be able to carry out an ideal learning process, each teacher must know the elements of good planning, including: identifying student needs, learning objectives to be achieved, various relevant strategies and scenarios used to achieve goals, and criteria evaluation (Majid, 2014).

Learning will be more meaningful if students are given the opportunity to know and be actively involved in finding concepts from existing phenomena from the environment with the guidance of the teacher. One model of learning in order to achieve meaningful learning is guided inquiry learning. The use of guided inquiry is caused by the intellectual development of grade V elementary school students according to Piaget at a concrete operational level (Wood et al, 2011). That is, in this period children have been able to think logically, think with formal theoretical thinking based on propositions and hypotheses. To achieve these objectives requires the role of the teacher in learning.

The observations showed that most of the fifth grade students of Ujung XIII State Elementary School No.38, Semampir District, Surabaya City, in studying the natural sciences of hot material and the displacement had difficulty, learning outcomes showed 40 students got an average grade of students under the minimum completeness criteria (MCC) As for the MCC value in the school which is 78. This is due to learning that is not based on discovery so that in learning there is no set of natural processes such as the formulation of problems, making hypotheses, designing and conducting experiments, collecting and analyzing data and making conclusions. Then based on the results of the analysis of existing learning tools in schools including student teaching materials and student worksheets indicate if the discussion related to the material taught in student teaching materials has not been deep and has not

taught the science process skills, so it still needs to be developed so that the discussion becomes complete. To overcome these gaps, in learning researchers try to use guided inquiry learning models to improve students' science process skills. The tools developed include the Syllabus, Learning Implementation Plan, Student Teaching Materials, Student Worksheets, and science process skills tests.

The use of learning tools that have been developed can foster indicators of students' science process skills in predicting skills indicators students can interpret images or phenomena as initial hypotheses of research as revealed by Sheeba (2013) in her research.

Learning outcomes are the starting point used to monitor the level of achievement and intellectual power of students towards the learning process and material. The study of the achievement of learning outcomes will not be separated from the determination of the objectives of the learning indicators, so the learning objectives are a determining factor in determining the value of student learning outcomes. This relates to the opinion of Roesman (2012) which explains that learning outcomes are the indicated way to find out whether or not learning objectives have been achieved and also the learning process that has been carried out. Whereas the learning objectives of science develop process skills to investigate the natural environment, solve problems, and make decisions. Thus the relationship of learning outcomes is an increase in the science process skills.

Inquiry-based learning is very much needed to interpret the results of observations and convey information, because in the inquiry phase students are asked to analyze the results of experiments and submit conclusions, so the ability is needed. In addition, when students have the science process skills, students will be very easy and confident in conveying the information they know and conveying their arguments or opinions on a problem.

Science process skills are a set of skills used by scientists in conducting scientific investigations (Kemendikbud, 2013). Process skills need to be developed in science learning because they are able to bridge the achievement of science learning goals through inquiry learning models. According to Maria, et al (2015) the inquiry learning model proved to be very relevant and enjoyable, for elementary school students rather than learning science normally.

This guided inquiry learning model can improve the science process skills of students, because in the guided inquiry learning phase there are similarities with indicators of science process skills, ie students are required to find their own knowledge so that they can be absorbed well. In guided inquiry learning and science process skills students also teach this, so that both can be paired to obtain good learning.

Based on the description above, a study was conducted under the title "*Development of Guided Inquiry Based Learning Devices to Improve Science Process Skills of Elementary School Students*"

## II. IDENTIFY, RESEARCH AND COLLECT IDEA

This research is a research development of learning tools consisting of: learning syllabus, learning implementation plan, student teaching materials, student worksheets, and tests of learning outcomes of science process skills, which aim to develop products and product effectiveness (validity).

The development model uses ADDIE which was adapted from Mulyatiningsih (2012: 183). The trial design of learning tools developed in research uses one group pretest-posttest design. The assessment of science process skills was tested on 40 students of 5B Ujung XIII No.38 Elementary School in the even semester of the 2019-2020 academic year. The methods used to collect data are validation, observation, tests, and questionnaires. Quantitative descriptive and qualitative descriptive analysis techniques.

## III. WRITE DOWN YOUR STUDIES AND FINDINGS

### Research result

#### 1. Expert Validation

Expert validation is carried out by two validators. The assessment is focused on aspects of content, appearance and format. The validation results are presented in Table 1.

Table 1. Validation Results

No	Learning Media	Average (%)	Criteria
1	Learning Syllabus	82,22	Valid
2	Lesson plan	85,33	Valid
3	Student Book	80,68	Valid
4	Student Worksheet	80,87	Valid
5	Learning Outcomes Tests Scientific Process Skills	87,27	Valid

Source: processed secondary data of researchers, 2020

Based on Table 1, it is known that all validated learning tools are classified as valid. Nonetheless, learning tools can (properly) be used but with little revision before they are used in small group tests. The results of this validation are used to measure the validity of the learning device.

#### 2. Small Group Test

Small group tests use revised learning tools based on input from the validator and are tested on a limited number of students. Small group test results are presented in Table 2.

Tabel 2. Small Group Test Results

No	Assessment Aspects	Score / Average	Criteria
1	Legibility		
	a. Student Book	91%	Independent level
	b. Student Worksheet	90%	Independent level
2	Implementation		
	a. Implementation of Teaching and Learning Activities (Introduction, Core, Closing)	3.65	Well
	b. Class situation	3.75	Well
	c. Time Management	3.42	Pretty good
3	Student Activity	82.64%	High
4	Student Response	82.33%	Well (positive)
5	Learning Outcomes of Science Process Skills		
	a. Average value		
	1) <i>Pretest</i>	56.6	Not complete
	2) <i>Posttest</i>	87.9	Complete
	b. Individual completeness		
	1) <i>Pretest</i>	2 out of 12 students $\geq 78$	2 students complete
	2) <i>Posttest</i>	12 out of 12 students $\leq 78$	12 students complete
	c. Completeness of Scientific Process Skill Indicators		
	1) <i>Pretest</i>	IndicatorsSPS $\geq 78$	Not complete
	2) <i>Posttest</i>	IndicatorsSPS $\leq 78$	Complete

Source: processed secondary data of researchers, 2020

Based on Table 2. It is known that the learning tools used in small group tests are classified as good. These results become a reference for researchers in revising learning tools, so they can get better results in field tests.

### 3. Field Test

Field testing is a real class test and involves students in greater numbers using the learning tools that have been tested previously on a small group test. Field test results are presented in Table 3.

Tabel 3. Field Test Results

No	Assessment Aspects	Score / Average	Criteria
1	Legibility		
	a. Student Book	94%	Independent level
	b. Student Worksheet	96%	Independent level
2	Implementation		
	a. Implementation of Teaching and Learning Activities (Introduction, Core, Closing)	3.65	Well
	b. Class situation	3.75	Well
	c. Time Management	3.42	Pretty good
3	Student Activity	82.64%	High
4	Student Response	82.33%	Well (positive)
5	Learning Outcomes of Science Process Skills		
	a. Average value		
	1) <i>Pretest</i>	50.62	Not complete
	2) <i>Posttest</i>	81.11	Complete
	b. Individual completeness		
	1) <i>Pretest</i>	3 out of 40 students $\geq 78$	38 students complete
	2) <i>Posttest</i>	40 out of 40 students $\leq 78$	40 students complete
	c. Completeness of Scientific Process Skill Indicators		
	1) <i>Pretest</i>	IndicatorsSPS $\geq 78$	Not complete

2) <i>Posttest</i>	Indicators $SPS \leq 78$	Complete
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Source: processed secondary data of researchers, 2020

Based on Table 3, it is known that the learning tools used in the field test are classified as good. The results of this field test are the final data of the study and are used to measure the practicality and effectiveness of the learning tools.

## Discussion

Research has succeeded in developing guided inquiry-based learning tools. The results showed that the learning tools developed were classified as valid, practical, and effective. This was obtained from the results of evaluating the validity, practicality and effectiveness of learning tools. Descriptions of the three assessments are described as follows

### 1. Validity

Assessment of the validity of learning tools is measured based on the results of validation as stated by Nieveen (1999). Expert validation results show that all validated learning tools (learning syllabus, lesson plans, student teaching materials, student worksheets, and science process skills learning achievement test) are classified as valid criteria with a percentage of > 78% based on criteria established by Akbar (2013). The evaluation of the validator is focused on aspects of the content, appearance and format of the learning device, and is adjusted to the learning model used, in this case is a guided inquiry model. In the process of developing learning tools, the researcher seeks to establish a consistent linkage of each component of the learning device developed with the characteristics of the learning model applied as directed by Asikin & Cahyono (no years).

Many suggestions provided by the validator, including the preparation of a more systematic learning syllabus, adjusting between the indicators and learning objectives in the preparation of the lesson plan, providing sources and information for images on student book and student worksheet. These suggestions become input for researchers to make a few revisions, so that learning tools can be used in small group tests and field tests.

### 2. Practicality

Assessment of the practicality of learning tools is measured based on the results of the implementation of the lesson plan and student responses to the field test. The average value of the implementation of the lesson plan in the implementation of the Learning Activities (introduction, core and closing activities), class atmosphere and time management are classified as good with an average score > 3.61. These results indicate that learning has proceeded according to the plan as outlined in the lesson plan. According to Sudjana (2011), the ability required in the implementation of the teaching and learning process is the activeness of the teacher in creating and growing learning activities in accordance with the plans that have been prepared. While the results of the analysis of student response data showed that students gave positive responses (82.33%) towards learning activities and learning tools. Furthermore the reason students are because learning is done with a lot of practice, is fun and encourages them to find new ideas. Nur (2011) suggested that the use of guided inquiry models will make learning interesting, stimulating and enjoyable for students so that it will produce good responses.

### 3. Effectiveness

Assessment of the effectiveness of learning tools is measured based on the results of learning science process skills in the field test. Analysis of the results of learning science process skills shows that all students completed individually (40 out of 40 students completed) and indicator of science process skills has reached 92.67% completeness. Based on this, it is known that the use of instructional devices based on guided inquiry can help students achieve mastery of learning outcomes (individual and SPS indicators). Similar to Fitri's research (2011) which reports that the use of guided inquiry models can assist students in achieving mastery learning outcomes of science process skills.

Based on this, it can be concluded that the use of guided inquiry-based learning tools can improve science process skills. This finding is supported by Rizal's (2014) study that guided inquiry influences students' science process skills.

## IV. CONCLUSION

Based on the description above, it can be formulated that guided inquiry-based learning that is developed is determined to be feasible (valid, practical, and effective) to improve the science process skills of elementary school students on heat material and transfer it.

## ACKNOWLEDGMENT

The development of guided inquiry-based learning tools can improve students' science process skills so it needs to be developed more broadly in other science learning materials. The development of guided inquiry-based learning tools can be supplemented with lesson plan for remedial and enrichment activities aimed at further action for students who have not yet achieved mastery and have achieved mastery of process skills indicators.

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# Factors Affecting Socio Economic and Political Community Development in The Case of Aliyu Amba Town

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**Abstract-** *This study investigated factors that negatively affects socio economic and political community development in the case of aliyu amba town. The objective of the study was to explore and analyze the factors that affecting the social, economic and political community development. The researcher has employed qualitative research method with a descriptive aim. The primary data were collected from 65 participants of whom 10 of them were (civil servants), 30 of them were the community, 20 of them were from different sectors and the remaining 5 were from theatre experts and development workers and all of them were selected by using purposive sampling technique. Moreover, the study adopts referring books, the internet, various PhD dissertation and MA thesis and guiding principles and rules and regulations, as a source of secondary data. In addition to this, key informant interview, documentary review, observation checklist and in-depth interviews were also important sources of primary data. The researcher mainly employed thematic data analysis technique while dealing with the gathered qualitative data. The findings from the study revealed that, that there is a multifaceted problem in 'Aliyu Amba' town. In our assessment we have encountered social, economic, political, interpersonal, and intrapersonal problems in the society which are deep rooted and are negatively affecting the livelihoods of the society. Furthermore, the research is clearly contributes to the enhancement of the living standard of the society.*

**Index Terms-** community development, social change, economic and political development.

## I. BACKGROUND TO THE STUDY

Community development is the planned evolution of all aspects of community wellbeing (economic, social, Environmental and cultural). It is a process whereby community members come together to the collective action and generate solutions to common problems. The scope of community development can vary from small initiatives within all a small group. To large initiatives that involve the whole community. Regardless of the scope of the activity. Effective community development should be a long term endeavor, well planned, inclusive and equitable, holistic and integrated in to the bigger picture initiated and supported by community members, of benefit to the community and grounded in experience that leads to best practice.

The primary outcome of community development is improved quality of life. Effective community development results in mutual benefit and shared responsibility among community members and recognizes the connection between social, cultural, environmental and economic matter. (frank and smith 199:8)

Community development stems from the belief that the community itself becomes able to develop solutions to issues and opportunities within the communities. Rather than waiting someone else, community members believe in their own ability to take action. Although outside assistance may be needed, it should only be as a tool to develop community driven responses in a way which responds to the community. Discussion in the community may be needed to create the awareness that community members are the experts with respect to the needs, hopes and dreams of their community. It can be beneficial to act together to achieve results and all community members have skilled. Knowledge and abilities to contribute (frank and smith 199:15)

This short study will assess social, economic, Political, interpersonal, cultural and intrapersonal problems of " Aliyu Amba" town locality, located in some of 188km from the capital Addis Ababa. This town has a latitude and longitude of [09°32'N 39°48'E](#) [Coordinates](#) [09°32'N 39°48'E](#) with an elevation of 1805 meters above sea level.

There is a twice weekly market in Aliyu Amba, which is held on Thursday and Monday. Currently its educational facilities are included one secondary school, one primary and one junior secondary school.

Aliyu Amba " town locality members and the neighboring localities practice agricultural activities at large. Their agricultural products encompass teff, chat and sorghum. Most of " Aliyu Amba town" locality residents are merchants and civil servants. There are also a number of students.

### 1.1. STATEMENT OF THE PROBLEM

This study investigated the social, Economic, political, and intrapersonal problems of " Aliyu Amba" town. Again, a simple survey conducted by the researcher indicated that Residents of "Aliyu Amba " locality have registered fastest growing number through time. This has resulted in complex problems among residents of the town.

The concern is that if this growing number of residents would continue with the current less infrastructure and poor

performance of the town, the quality of life standards of residents would be more affected.

## 1.2. OBJECTIVES OF THE STUDY

This study specifically seeks to:

1. Examine socio- economic characteristics of the society;
2. Assess political situation of the town
3. Identify major problems of the society which tackles their development endeavors.

## 1.3. SIGNIFICANCE OF THE STUDY

It is hoped that the statistical information, recommendations and the conclusions drawn from finding of this study will be a valuable resource to prospective researchers, development workers and relevant stakeholders. The finding of this study will reveal critical problems of “ Aliyu Amba” Town residents.

Again, residents. Of “ Aliyu Amba” town in all age groups from both sexes who are the main target of this study will benefit from any positive developments that may accrue from the study in the long or short term. The government, development workers and all concerned bodies, will appreciate the significance of this study and relate the study and to their developmental undertakings in general and to their responsibilities to boost the life standards of Ethiopian citizen. The study also it gives a better understanding on socio- economic, cultural, political, interpersonal characteristics of “ Aliyu Amba” town residents. In general, the study will contribute towards improved life standard in the selected town.

## 1.4. SCOPE OF THE STUDY

Even though there are 27 localities and one town in the woreda. The study focused on one town in the form of quasi experimental. The town was chosen because it has diverse population and potential problems which tackle the town from development. To this end the study focused on analyzing the socio- economic, political and interpersonal characteristics of “ Aliyu Amba” town residents

context of this research development is linked with community development, thus the meaning and context of community development in this research is presented in the following section.

**2.3. Community development:** According to Oketch (2006:111), comments that, the concept of community development is founded on the premise that changes in the living conditions of people are best effected by the people themselves. Thus, development in this sense consists of processes in which various groups are stimulated to improve aspects of their lives particularly by people from outside of their community. Ibid(2006:76) goes on to say” *Community development refers to the long- term process whereby people who are marginalized or living in poverty work together to identify their needs, exert more influence in the decisions which affect their lives and work to improve the quality of their lives, the communities in which they live, and the society of which they are a part.* The primary outcome of community development is improved quality of life. Effective community development results in mutual benefit and shared responsibility among community members and recognizes the connection between social, cultural, and economic matters (Frank and Smith, 1999:8).

Community development stems from the belief that the community itself becomes able to develop solutions to issues and opportunities within the communities. Rather than waiting someone else community members believe in their own ability to take action.

### 2.3.1 SOCIAL CHANGE

Social change refers to an alteration in the social order of a society. Social change may include changes in nature, social institution, and social behavioral, or social relations.

Social change may refer to the notion of social progress or sociocultural evolution, the philosophical idea that society moves forward by dialectical or evolutionary means. It may refer to a paradigmatic change in the socio- economic structure, for instance a shift away from feudalism and towards capitalism. Accordingly it may also refer to social revolution, such as women’s suffrage or the Civil rights movement. Social change may be driven by cultural, religious, economic, scientific or technological forces.

### 2.3.3. Economic development

Political development has been defined in many ways that reflect the passage of societies ‘and analysts’ preoccupations. One formulation dwells on the emergence of national sovereignty and the integrity of the state, demanding respect and upholding commitments in the international system. Others identify the domestic attributes of constitutional order and political stability, attained through the formation of a settled framework of government, reliable procedures for leadership succession, and a consolidation of the territorial administrative reach of government institutions. This conspectus owes to the fascination exerted by nation-building and state-building in new states of Africa and Asia. It also relates to earlier studies of legal-rational authority: an endowment of coercive powers and the ability to labor and functional specialization, hierarchy and chain of command, and merit- based recruitment, it connected.

Linkages between economic progress and political development are much debated. The former has traditionally been seen as a begetter or facilitator of the latter. Through the agency of intervening variables like the spread of literacy and rise of plural

## II. LITERATURE REVIEW

### 2.1. INTRODUCTION

This section reviewed related literature of earlier studies conducted on development. The literature was reviewed from research articles and journals, on various aspects of development.

### 2.2. DEVELOPMENT

Development is a complex issue with much different and sometimes continuous definition. The Collins English Dictionary - Complete and unabridged ( 2003) gives three definitions of development as the act or process of growing, progressing, or developing; the product or result of developing and a fact, event, or happening, especially one that changes a situation. Development involves change, new ways of doing things. It can mean growth of ideas, methods and positive change in circumstances. These are no doubt considerable and significant definitions of development. Common to all these definitions however are the desire for changes that will affect citizens welfare positively and or liberate them from poverty and inequality. This makes development an act of freedom, just like the theatre. In the

interest groups, the accumulation of independent financial power and economic strength in society. Cross-cutting cleavages created by economic specialization and differentiation moderate social conflict.

### 2.3.5 Political development

Political development enhances the state's capacity to mobilize and allocate resources, to process policy inputs into implementable outputs. This assists with problem-solving and adaptation to environmental changes and goal realization. The contemporary notion of good governance also dwells on efficient, effective, and non-corrupt public administration.

Many Marxists define political development in advanced industrial societies in terms of the growth of the class consciousness and political organization of the proletariat, leading, ultimately, to the overthrow of capitalism and the approach of communism. A more common (though ethnocentric) view is progress towards liberal democracy, involving accountable government, and opportunities for participation (also seen by some as an aspect of modernization, rather than development), through the exercise of freedoms of association and expression.

More recently democratization and good governance have been portrayed as constitutive of political development and as conditions for sustained economic development in developing areas and post-communist societies. The rule of law (and thus respect for property rights) and the development of civil society are also included. The embedding of human rights is another central plank.

The enduring problem of political development for some divided societies like in former Yugoslavia and especially in the third world remains how to combine political stability with political liberalization and democratization. Another challenge is safeguarding democratic transition and consolidation in the midst of drastic economic restructuring (see structural adjustment) that engender popular dissatisfaction and can breed political extremism. Political development means not just institutional reform but changes in attitudes and the political culture. That places limits on how far political development can be imported or imposed from without.

Political development is neither linear nor irreversible, not all countries experiencing it and some endure periods of political decline and decay, while a few suffer terminal political breakdown, like the former USSR.

## III. METHODOLOGY

### 3.1. Research Design

As most research believed that there is no one single scientific method for scientists to carry out their investigation. How over accuracy of observation and the qualities of creativity and objectivity are some ingredients in all scientific research? This research adopts referring books, the internet, questionnaire and having oral interview with some personalities who are living and working in the town

### 3.2. Population

The population of the study involved one selected district located in the north shewa zone some 188km in the north east of the capital Addis Ababa. Key participants of this study are residents of "Aliyu Amba" town. Other participants drawn from

the Debrebirhan University and other locality members were also involved in the study. Participants were selected from all age groups, sexes and walks of life. They were chosen in line with their direct relationship for the assessment project. Residents of "Aliyu Amba" town are believed to give honest and reliable information and other Participants are expected to provide professional explanation. Estimated total population was 65.

### 3.3. INSTRUMENTS

The main data collection tool was based on primary sources, which is interviewing responsible personalities. In addition the research group prepares questionnaire for residents and administrators of "Aliyu Amba" district. The research group also uses internet, some articles and creates some informal discussions with residents of the town, theatre practitioners and fellow students.

### 3.4. VALIDITY AND RELIABILITY OF INSTRUMENTS

To ensure the validity of the information from World Wide Web, the research group tries to refer various web sites. Along with the internet, the research group interviews selected personalities and experts who have direct relationships with development and "Aliyu Amba" town, and provides questionnaire for some of "Aliyu Amba" town residents from different walks of life.

### 3.5. ACCESS AND ETHICAL CONSIDERATIONS

Regarding to the research ethics in this paper the researcher mentions all reference the references section of the study. As the research group conducted interviews and questionnaire, they ask and get permissions of the participants. But in the informal discussions, which the research group believes is enough for this short term paper, any name of participants of the discussion is not named in the study.

## IV. ANALYSIS OF DATA AND TECHNIQUES

In this part, the data were analyzed to reflect the socio-economic and cultural community problems in the town. The data that were obtained from participants were analyzed using qualitative data analysis techniques, which are going to be presented later on these sections in the process the researcher has followed every data collection by analyzing concurrently. That is, the researcher has started data analysis imminently after data is collected. The researcher has reflected on the respondent response through interpreting every word of them. Here the intention is to look at the existing situation and try to make sense by analyzing themes and patterns since qualitative data analysis is well suited to analyze complex relatives that beneficiaries experience in their natural setting. The researcher has planned to use digital recorder and hence has followed special procedure so as to transcribe and to interpret the body language and symbols properly. In order to get the general idea of what part experience in their time, then researcher has read and reread the data carefully.

### 4.2. Findings

#### 4.2.1. Factors that negatively affecting the social life of the residents.

Outcomes of our informal discussions, interviews and questionnaire revealed that the social life of residents in the district have been negatively affected due to plenty of reasons. According to the questionnaire, which is filled by youths and elderly people from

both sexes, the social of the community has been lacking trust and unity through time.

According to our survey, the main problem that affects the social lives of “Aliyu Amba” residents was the high rise of living. This reason forces the society to close its door and face the hard times alone. Every one’s focus turns out for his daily meal. Therefore, their participation in social activity become less. Elders the community told as that in previous time every neighborhood used to drink coffee together, invite to each other’s home during the festivities of Christian and Muslim, have monthly social meeting with plenty of food, drink and fun, but now no one could afford to prepare coffee and invite its neighbors. It became hard to host monthly social gathering with that all food and drink. Now the only means that gather our community together would be someone’s birth, death, or marriage. When our neighbors fight, some of us will get together to make peace. Otherwise the well-known the district people’s celebration Fasika should come. They told us that they have rare opportunities of social gathering because of the high rise of living.

We have found political difference as another major threat for the strong social life of “Aliyu Amba” locality residents. Some residents who labeled themselves as politicians are affecting the social manner of the society. Our survey indicates that these people run day and night to secure their individual benefits when they were supposed to bring change the society; hence they are discriminated from the society. All developmental undertaking of the government were supposed to come to the locality within those politically involved personalities but they lack social responsibility and run for only one bread to feed them. This corrupts the social lives of the locality.

Extreme thinking, gossip, lack of cooperation for development and lack of confidentiality were also cited as threats that negatively affect the social lives of residents of the town.

#### **4.2.2. Economic problem of the town that hinders the society from having better living standard.**

As per sources, that the researcher used to analyze this problem, there is a critical economic problem among residents of the town. Among multifaceted economic problem in the locality, the most common problem with in my experiment group was lack of infrastructure. The researcher also witnessed a lot of troubling way across the town and suffered from shortage of water and electricity. I have found youths working in their wood working site. The youths started this job after they were organized as a union. They told us that they are suffering a lot from shortage of electricity and the road problem is creating them a huge market barrier. They couldn’t complete with order wood working union in the town because of their location. And they are looking forward to change their location. They strongly think through that, lack of infrastructure negatively affects their economic development. Other participants of the research also said that no one will be brave enough to start any business with this loosely infrastructure. The researcher observes small dress shops. This is because no one is willing to open a shop with the available infrastructure in the area. Residents are not comfortable by the infrastructure and they argue that their economic power declines through time due to lack of infrastructure. They said no one is able to work up until late night in the center of the town because there is no adequate light back in their village. So in order to secure themselves and their family,

they will get back home early. On the other hand some merchants who have the ability to create jobs for the community couldn’t do anything because of lack of infrastructure.

The other critical factor for “Aliyu Amba” economic problem would be maladministration. The research reveals that the locality administration won’t allow residents to have various opportunities to secure better economic status. For instance unlike other town in the north showa district, government’s offer jobless youths have never addressed “Aliyu Amba” youths. There is no empowerment activity in the town which is supposed to come towards locality administrator. Our source also believed that school facility. Youth center and religious places are not well located in the town adequately. The division of these institution is unfair other localities got the access of these institution because of their strong administration. Missing all this social institution resulted economic inadequacy in the locality. The government officials in the locality are no more than puppets of the government. They become political missionaries instead of being public service provider. In addition they lack inadequate knowledge and experience to lead the community. The locality administrators are also accused of corruption. Some of our experiment group raised land issue. He said in “Aliyu Amba” town land has been sold against the new governmental law. The locality has deficiency in collecting taxes. Therefore, according to our resources, administrators of the town are aforementioned for the low income of the community residing in “Aliyu Amba” Town

Coming to the public itself, our resource admitted that the community has lack of every one prefer to struggle by him/ herself and sharing become out of choice for living. Nobody cares for other’s problems. They believe such inhuman traditions have emerged since the past 10 years. On the other hand the community seems to be satisfied by what it has already. Most of the residents are merchants and government employees and they have arranged their monthly life with their income for so many years. They are not asking for more. They have adapted the problem and it became no more problem until someone from a family get sick or dead or married or some natural or manmade disaster emanates. Their interest for change, new technology, and new way of life has been vanished. The community’s major concern is now its three dishes. Fathers and mothers of the community advise their kids to finish his/her school and be employed in one of government offices. Instead of searching for new opportunities and ways of defeating life threatening matters, they remain discussing about casual happenings, gossips and irrelevant things. Some family heads spend their time drinking alcohol and in the middle of the night they disturb their family and neighbors. More over the society has a mentality of expecting everything from others. For example, instead of opening the drainage they expect the government to come to his house and maintain his flood problems. They think that they have no power of changing their lives. As per our finding most of the times many of the locality members spend their time in accusing the government for their low salary not themselves for having less educational qualification “Aliyu Amba” locality members lack saving and entrepreneurial skills and also have no working culture. Some female informants of the research group said that being dependent on their husband negatively affects their economic status and power in the household. They are uneducated and the locality administration couldn’t provide them any empowerment program so, they remained dependent on their

husbands. There is no inspiring environment in the locality. Every one's life seems inert. Therefore because of those factors there is a critical economic problems within the residents of the town.

#### 4.2.3. Political community problems of the town

The questioner and interview result shows that most of "Alyu Amba" town residents agree on the biasness of race and religion among politicians, many of our respondents said there is a race and religion politics i.e. there is high discrimination up on race between the society and administrators. Our resource indicates that when the administrator is elected from Muslim and Argoba people, the rest races become undermined and when Orthodox and Amhara people took the power Argoba and other races become corrupted, there are also few people from Oromo, Guraghe and Tigray region and these peoples always remain under political pressure of the administrators. This has resulted disrespect between all races residing in the locality. Adding to this when development workers enter in to the community they ended up in fighting insulting disrespecting and sometimes rejecting by political. If they didn't follow the political stream development activity and workers are not acceptable among "Aliyu Amba" town political leaders.

Our survey revealed that political in the town have no any idea about politics and community development so they waste everyone's time. Most of the times residents attend meetings with no information about the topic surprisingly the meeting chair person was also new for the agenda. They simply labeled it as a political assignment and at the end of the day they will report the meeting as a public mobilizing event there is nothing understandable to the community and the politicians themselves. This politicians are branded as persistent individuals who only want to pressure someone by their thoughts. They have no room for any other political views or thoughts, so there is high ideological pressure in the community of "Alyu Amba" locality which is created by those politicians.

The boundary demarcation issue between the Amhara and Argoba people was still raised as a political pressure. It is believed in the community that politicians want to divide the people in order to create political and international nations, human right issues, and extra facilities and so forth therefore, administrators of our sources, the locality lead the society in wrong way and mark one race against to the other. According to our sources, the locality and the city administration couldn't provide accurate answer for the questions raised in different times, in the meantime the society becomes opponent to each other. The youth also claims that it has been bribed by silly benefits like mobile card and per dime to vote for the governing party. They were also forced to organize in one to five organizations, which are considered as an instrument for the government to spy the society. Be frightened of political measurements, most of the youth and elderly people in the locality are participants of one to five organizations. Therefore, the residents of the town still under development in politics.

#### 4.2.4. Interpersonal problem which affects socio- economic and political relationships of residents of "Aliyu Amba" Town

According to our findings, interpersonal relationships of 'Aliyu Amba' Town members have been decreasing as time passes through. This is due to many reasons; the increasing number of resident was labeled as a major threat for their

weakening interpersonal relationships. As a number of resident's increases, the diversity of culture, knowledge, attitude, religion and so forth will also increases. There will be different interests among neighbors. Mr. Begashaw, one of new comer to the town said:

I have been residing in this town since the past six years. I can say the society has good interpersonal relationship I have witnessed their gatherings for different religious and cultural celebrations. But I have been spending hard time with my neighbor. He always wants to attack me even in very silly thing. Primarily I told to elderly people and they gathered together and gave him advise and warning, at that time he ask for apologies, but on the next day he came drunk and insult my wife. This time I have reported the case for the town administration but they couldn't give me a solution. My interpersonal relationship with my neighbor is as bad as hell.

The researcher found a number of neighborhoods who have problems in their interpersonal relationships. Mr Sintayehu Gobeze on his part said:

Previously there was a sense of unity and good relationship among Ethiopian citizens. Our culture of respect and unity was exemplary for the rest of the world, but now a day due to various silly reasons our culture become eroded. I myself have very limited relationships with my friends, neighbors and colleagues. I started to develop doubts in every single activity of my neighbor. In line with the increasing number of residents in my locality, I reduced my activities in the neighborhood because I know nothing about my neighbor.

Some youths admitted that their attention has been diverted to Facebook, smoking, chat and other addictions. This has resulted loosely interpersonal relationships in the town. The conflict between two dominant races (Amhara and Argoba) in the town forced everyone residing in "Aliyu Amba" to close its door and live by itself. Therefore, this interpersonal communication problem negatively affects their socio economic and political developments.

#### 4.2.5. There exists intrapersonal problem among the residents of "Aliyu Amba" town

All of our key informants expressed their concern about the town. As per their expectations, the town should develop much way than its current status. The society demands all rounded sustainable development. They told us that they want their town to shine; indeed the town was awarded by the Woreda Administration for its success contrary to all localities in the district .but there is a lot to be done, we have found a lot of economic, social and political issues that always triggers the minds of "Aliyu Amba" town residents. Some of them could be:

- ✓ Less participation of "Idirs" in development endeavors of the society and the government;
- ✓ The absence of dry wastage;
- ✓ The existence of extremists;
- ✓ Lack of infrastructure (electricity, water, road);
- ✓ Less environmental protection among the locality officials;
- ✓ Absence of individuals in social and developmental meetings;
- ✓ Maladministration;

- ✓ Lack of awareness about the benefits of culture, unity, respect to one another and so forth among the society;
- ✓ Euro centric pressure on Ethiopian culture;
- ✓ The expansion of illegal housing development;
- ✓ Minimum chances for new comers to take part in social affairs and institutions;
- ✓ The increasing number of useless meetings which are prepared by political missionaries;

#### 4.3. DISCUSSION OF FINDINGS

Societal change, which takes a variety of directions and forms and in no way can be assimilated or reduced to a single dimension is often accompanied by a perception of insufficient understanding and lack of control. There is a frustrated need for mastering complexity and instability, separating the voluntary from the involuntary, the intended from the unintended, and opportunities from risks, getting to the real causes and dominating the uncertain implications of social change. In this study though; the research group used primary and secondary sources in order to identify the roots of all problems in 'Aliyu Amba' town. Our findings are believed to be accurate and reliable and are expected to bring societal change.

Residents of the town have no any welfare. Considering all problems indicated above, there should be some sort of program designed by a government, private institutions or publicly funded organizations which can enable the people to be more functional in the society. Regarding welfare in 'Aliyu Amba' town, Miss Aregash shared us her view:

Our town encompassed many youths who are seeking for jobs and suffering from the high rise of living. There are also so many women who are dependent on their husbands. Those women have been abused by their husbands and the community. They were considered as one of household materials. They couldn't be self-reliable and show their capability to the society. If some sort of social welfare exists in the town, I believe it could be changed. The researcher also witnessed a number of illiterate women and family heads in 'Aliyu Amba' town. The groups are having difficult times with the price rise and job opportunities.

Some personalities couldn't get job because they don't have references. In fact these problems remain endemic in every part of Ethiopia but in 'Aliyu Amba' Town, it creates a massive problem because the town is not developed well and there is no choice in the area. Choices in the town are highly limited. When they raise their children residents of the town provide limited scope of the world. They orient their kids as their standards and limits of life. As we discussed above. Many of the town residents lack motivation and creativity for their better world. Instead they are easily satisfied and lead the common hand to mouth life. If there would exist some sort of social welfare program, the society could open its eyes and be able to work and engage in various societal activities.

The government or any developmental non-governmental organization in 'Aliyu Amba' town lacks the establishment of structures which encourage national consensus between conflicting interests. They lack to emphasize unity and integration among the society. As we have seen in our data analysis section, the two dominant races of the locality, Amhara and Argoba are in conflict, cultural and language issues.

Lack of national consensus has been seen in other parts of the country as well. We have been exposed to various nationwide issues which emerge from conflicts of different races and the government itself. But this Amhara and Argoba people used to live together share a number of culture and norms. They used to know each other's languages and way of life but now it is weakening dramatically. The younger generation of the two people is fighting against each other's belongingness.

Throughout history, there have been different institutions and mechanisms for the meeting of human needs. The tribe, the village, the extended family, the church, the market and state were sources of support for the fulfillment of human needs. All these had played critical roles in meeting societal need at different times. However as society change, each has institution of the contemporary family; a more useful direction is rather to seek for an alternative form of social provision, a new form which is consistent with the newly emerging social and economic order the government in 'Aliyu Amba' town specifically and in Ethiopia generally provides 'basic needs' through different unions. Those provisions of 'basic needs' are contradictory with these modern people. It's really difficult to conclude that basic needs of 'Aliyu Amba' town residents are not only sugar and oil. They rather require so many things as basic needs in order to achieve minimum standards of living in the area. Our experiment group revealed that basic needs of the community encompasses the provision of potable water, road, consistent electricity, mobile network, internet access, social institutions, cultural/ indigenous knowledge institution, good governance, national consensus, and religious tolerance among others. The society need these basic needs to lead at least minimum standards of living but currently the government is providing only sugar and oil supplies which couldn't meet minimum demands of the society. Therefore, public service schemes of the government in 'Aliyu Amba' results extra burdens on family members, especially on women. This inconsistent provision with the contemporary context leads the society to extra problems because the provider believed that it is doing its level best to achieve the societal needs of the locality which is concluded without any research or community centered discussion. According to our findings, the less provision of basic necessities in the near future will enforce the society to travel distances in order to meet their needs for social interaction, education, entertainment, social services and so forth.

Residents of the town feel they are disadvantageous due to lesser social services provisions in the area. Unlike 'Aliyu Amba' other towns of north showa zone with more resources would be able to provide higher level of services. The existing social institutions like 'Idir' have failed to achieve long lasting development and social consensus among the society. Our respondents urge the government to back existing social institutional and create additional welfare services.

As industrialization and capitalism destructed traditional community structures, it is difficult to find the traditional sense of community structure in the modern society. The development society which is led by capitalism required mobile labor force, increasing levels of individual and household consumption, increased personal mobility and the dominance of individualist

ideology among others. These requirements of the 'modern society' should be tackled by either the community or any other development worker including the government. The traditional society of the town has been assimilated by the newer generation and new comers. It has been negatively affected by the capitalist ideology. The impacts of euro centrism are affecting the society at large. Religious diversification, which leads the society to be narrow minded are affecting the social structure of the society.

The questioner and interview, which the research group conducted, revealed that residents of Aliyu Amba town strongly feel sad about the destruction of their community and loss of identity due to multifaceted reasons. They strongly condemn the government for its loosely accomplishments on the development of societal structure. Hence, the societal interaction in the town has been shifted from *gemeinschaft* to *gesellschaft*. Our respondent concern of this change is believed to trickle various developmental endeavors of the locality residents agree that their interactions are becoming limited to specific instrumental activities.

Referring to our focus group discussion and responses given from experiment groups, Aliyu Amba has lack the 'needs of stingers' model in order to secure all rounded long lasting development. Our finding expose inadequate standards for all residents of the locality, unfair ways of administration and judgment, inequality, fear to speak and work freely between neighbors, lack of confidentiality and lack of environmental protection .

Our findings in line with environmental development reveal lack in improvement of the community's environment in the broadest sense. Our informants told us that the community has been ignored in decision makings about the physical features of the locality. They have no part in local planning activities. Administrator and political leaders make every decision and take measures of their interests. This has resulted in a deep rooted racial and religious conflict which lasts since the past 10. Conflicts emerged in the locality has negatively affected social development at large. According to residents, these conflicts are believed to happen after personal identities of the society were eroded due to various reasons.

#### 4.4. CONCLUSION

Our experiment group agrees that there is a multifaceted problem in 'Aliyu Amba' town. In our assessment we have encountered social, economic, political, interpersonal, and intrapersonal problems in the society which are deep rooted and are negatively affecting the livelihoods of the society. For how many years and generations shall these problems exist in the town? In fact there should be much more effort and we are left with a lot to be done. But we all need to work hand in glove to overcome the problems. All stakeholders should pour in to create away that resident acquire at list the minimum standard of living as per the country's magnitude.

As it has broad categories, no one can bring change alone. There is no Amharic saying, *ande ij bechawen ayachbchebem( andu enchetem bechawen ayined )* meanings, one hand can't clap alone and a piece of wood couldn't bring enough power/ heat. Therefore a team work is required if sustainable development is targeted as a goal to be achieved in the near future. These wide ranged societal problems are difficult to manage, it is really hard

to makeup humans mined and it is also difficult to change one's attitude.

We conclude that as political leaders and locality administrator have the responsibility to preserve a community's indigenous knowledge, social structure, economic status, political feature, interpersonal and intrapersonal activities they should know the entire culture and history of the society. And it is not fair to expect residents of 'the town to be guardians of the district in particular and wills. Therefore, the society, development works, the north showa zone, the district and 'the town administrations should considered their immense role in the history and development of the locality and the country.

#### 4.5. RECOMMENDATIONS

This study clearly shows that residents of 'Aliyu amba town have social, economic, political, interpersonal and intrapersonal problems. In order to overcome social problems of the society, government should create a platform for discussion and awareness creation. In addition to this the government should open social services institution empowerment packages at different levels. The society on its part should think beyond its personal interests and learn to communicate each other successfully.

Regarding to economic problems the researcher recommends that the society should learn from its neighboring localities. Argoba and amhara people are well known for its entrepreneurial skills. The people have good working culture, they have strength to challenge various problems at a time and achieve success. Therefore they create strong trade relation and others economical activities to each other's.

Politically'' Aliyu Amba ''town residents appear with fear and lack of confidence. They should learn to speak freely no matter what happens. On the government side, political leaders should be reevaluated for the sake of good governance and acceptance of the ruling party in the community. Political leaders and officials should learn to work with the society for the society. They should learn equity, honesty, locality, and be provisional. They should learn about the importance of interaction social, cultural development, unity and team work.

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# Community Consultation and Post-Harvest Handling Agribusiness Project Sustainability in Rwanda

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**Abstract-** The main objective of the study was to assess the effects of community consultation in project sustainability in Rwanda. Community consultation involves a proactive process in which the beneficiaries influenced the development and management of development projects, rather than receiving a share benefit. Community consultation creates an enabling environment for sustainability by allowing users to select the level of services for which they are willing to pay, to guide key investment and management decision and commit resources in support of these choices. This study was to assess the effects of community consultation in project sustainability in Rwanda. The research used descriptive research design by considering both quantitative and qualitative. The targeted population was 155,518 targeted beneficiaries of PASP project, cooperative managers (35) under the support of PASP, Cooperative support officers (68) from Rwanda Youth in Agribusiness Forum (RYAF) who are under the support of PASP grant also PASP field staff (12) from which a sample size of 416 respondents was selected. The research used structured questionnaires to collect data from the targeted beneficiaries and other related stakeholders of PASP project. Both Primary and secondary data were collected by using open ended questionnaire for primary data. Results show that community consultation influences the Project Sustainability of Post-harvest agriculture Project. This means that during the period of project implementation; Post-Harvest and Agri-Business Support Project accommodated its beneficiaries suggestions at 85.8% and this contributed to the performance of Post-Harvest and Agri-Business Support Project. The PASP Project has been successfully achieved its goal. The results shown in chapter four, shows that the majority of beneficiaries have been participated on community consultation and community awareness. PASP Project stakeholders and government should continue and improve on working closely with beneficiaries because, working together with beneficiaries have a significant impact in project sustainability.

**Index Terms-** Community, Project, community Participation, community consultation and Sustainability:

**Research area:** Community consultation and Project sustainability

## I. INTRODUCTION

Many projects have been identified and developed for the benefits of the community, but after their completion period they collapse. Sustainability of community projects, and of the benefits they deliver, has been a major concern of the sector. In Rwanda, Project sustainability has always been a serious issue and there is no much documented knowledge on community consultation and Post-harvest handling Agriculture project sustainability that community members to participate in development in the community driven development approach specifically in Rwandan context. Passive consultation of project beneficiaries allows the community members to assume a full role of looking for solutions to their own problems before project development and implementation.

Many projects have been developed and implemented without necessarily the community consultation and having no full control over decision making and sources. Their tasks are reduced to teaching the community members appropriate ways to look for solutions to their own problems.

Community consultation in a very sustainable project has the following factors or determinants; Geographical factors which may include natural resources, environments, climate Cultural beliefs and norms, Shared commitment, People centered, Clarity objectives, Effective governance, Leadership, Flexibility and responsiveness, Consistency of purpose, Maintaining members. All these factors may be considered during community consultation in order to mitigate their negative impact on the sustainability of agriculture project.

## II. LITERATURE REVIEW

### Decision making theory

Decision making theory is the study of the reasoning underlying an agent's choices. Decision making theory can be broken into two branches: **normative** decision theory, which gives advice on how to make the **best decisions**, given a set of uncertain beliefs and a set of **values**; and **descriptive** decision theory, which analyzes how existing, possibly irrational agents actually make decisions. Decision theory in economics, psychology, philosophy, mathematics, and statistics is concerned with identifying the values, uncertainties and other issues relevant in a given decision,

its rationality, and the resulting optimal decision. As (Pinnington, 2014) stated “Normative and descriptive decision theory most of decision theory is normative or prescriptive”. It is concerned with identifying the best decision to take, assuming an ideal decision maker who is fully informed able to compute with perfect with accuracy and fully rational.

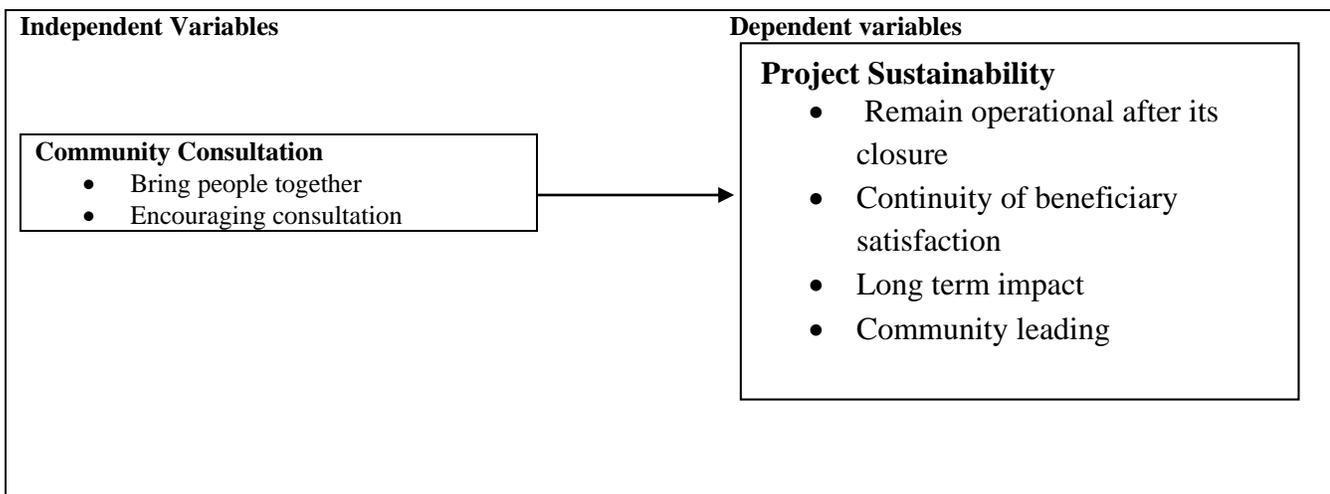
### III. CONTINGENCY THEORY

The contingency theory is that best practices depend on the contingencies of the situation. Contingency theory is often called the “it all depends” theory because when you ask a contingency theorist for an answer the typical response is that it all depends. While this may sound simplistic, assessing the contingencies on which decisions depend can be a very complex. Contingency theorists try to identify and measure the conditions under which things will likely occur. Since human service practice varies substantially. The term contingency as used in contingency theory is similar to its use in direct practice. A contingency is a relationship between two phenomena. If one phenomenon exists, then a conclusion can be drawn about another phenomenon. For example, if a job is highly structured, then a person with a freewheeling disposition will have problems with the job. Contingencies can sometimes be considered conditions. Contingency theory attempts to relate research on many management variables for example research on professionalism and centralized decision making or worker education and task complexity. According to Kumar, (2010), has been analyzed a situation and determine what variables influence the decision which you are concerned.

### Goal and system based theory of performance

The goal based approach is a traditional model that relies on visualizing the project as a rational set of arrangements oriented towards the achievement of project goals. Thus performance is measured in terms of accomplishments of outcomes. The focused is exclusively on the ends achievement of goals, objectives and targets. The goal approach directs the project owners to focus their attention on the financial measures. Financial measures are objective, simplified and easy to understand and compute. As a result, goal approach is the most commonly used method due to its focus, understandability and simplicity. Information is effortlessly accessible by the project managers for assessment process. However, (Harvey, 2012) projects have diverse and occasionally contradictory goals, making of cross project difficult. Sustainability is the capacity of the project or programs to continuously respond to the community issues. A sustained program or project maintains a focus with its original goals and objectives. This includes; the individuals, families and communities it was originally intended to serve, programs can vary in intensity and frequency, actual program or project activities can change. Sustainability has several factors which include: Leadership competence, understanding the community, strategic finding, staff involvement and integration, effective collaboration, demonstrating program results and program responsivity. Community consultation is of more importance due to the following; It may improve coordination and integration of project’s activities, It may lead to the reduced complexity in the community, There is better communication and consultation, May lead to effective project implementation, There is the development of efficient process for plan making and review.

### Conceptual Frame work



### IV. STATEMENT OF THE PROBLEM (THE STUDY PROBLEM)

Rwanda hosts a large number of local and international Non-Governmental organizations which engage in local activities of uplifting the lives of the community where many projects have been identified and developed for the benefits of the community,

but after their completion period they collapsed without justifiable reasons. Project sustainability has always been a serious issue

in Rwanda and there is no much documented knowledge on community consultation in the development of their society in Rwandan context. The intended community on the other hand has little community consultation in project sustainability activities

and the projects ended up collapsing after closure. Therefore, the study was to assess the effects of community consultation in project sustainability in Rwanda after the implementation and closure of PASP project designed for reducing post-harvest losses during harvesting period. In this context, that there is a gap which formed a statement of the problem and necessitated need for this study.

## V. METHODOLOGY

This chapter provided the roadmap in the determination of the research design, location of the study, target population, sample selection, research instruments, data collection techniques, pilot study, data analysis, validity and reliability of the instruments of data collection that aided the study as well as the data analysis techniques and how eventually data was presented. Also, it provided guidelines to the methods that the researcher used in data analysis and presentation, and discussion of the findings of the study.

The research used descriptive analytical methodology, which consists of quantitative and qualitative approaches and this methodology involved collections of quantitative information.

A questionnaire with high reliability was received similar answers if it is done again and again or by other researchers (Bryman and Bell, 2010).

Questionnaire was used by the researcher to collect the data and five-point scales were used to measure responses ranged from strongly agree(5), agree (4), unsatisfactory(3), disagree (2) and strongly disagree (1). Research structured questionnaires were used to collect quantitative data.

Under this study, the research used a descriptive research design in the collection of data on the effects of motivating factors of community consultation in project sustainability in Rwanda.

The study was carried out in Nyagatare, Gatsibo, Kayonza, Ngoma, Kirehe Kamonyi, Muhanga, Ruhango, Nyanza Musanze, Nyabihu and Rubavu Districts from which PASP project is operating.

The target population was the beneficiary of PASP project who are the residents of PASP intervention Districts who have benefited from PASP grant under post-harvest infrastructures out of the targeted beneficiaries from which sample size was selected. Therefore, the sample size was derived from population of **155,518** targeted beneficiaries of PASP project, cooperative managers (35) under the support of PASP, Cooperative support

officers (68) from Rwanda Youth in Agribusiness Forum (RYAF) who are under the support of PASP grant also PASP field staff (12) was contacted during this research study.

During this research study, stratified random sampling method was used to select relevant respondents from the PASP beneficiaries in the Districts of intervention.

The total sample of participants came up with a sample of 399 respondents from beneficiaries and 17 employees and this gives a total of 416 respondents. Therefore, the sample size is the selecting of a group or subgroup that is representative of the whole and the result that may be obtained from the representative sample can then be applied to the whole set.

Data was collected by using primary data method for data collection. Where the researcher used mixed methods both qualitative and quantitative methods for data collection.

The research findings were analyzed by using the Statistical Package of Social Sciences (SPSS). The regressive analysis was used to test the research data.

## VI. RESULTS AND FINDINGS

The findings have been presented in form of tables and percentages and they were presented and analyzed using frequency tables and also percentages were used to assess the beneficiary consultation and agricultural projects performance in Rwanda.

The Table 4.4 below shows that the level of education of respondents, the majority of respondents have secondary level of education 148 (35.6%), followed by those who have University level, equal to 137 (32.9%) and those who have primary level are 131(31.5%). This means that PASP- IFAD-funded project deal with different people of academic back ground in order to promote community consultation in project sustainability. This indicates that every respondent involved in this study has the ability to read and write which is favorable to the research since every respondent completed the questionnaire on his/her own. Hazernberg, (2012), associated the education level of staff with findings that, those who can read and write are more successful because education provides them knowledge and modern managerial skills, making them more conscious of the reality of the life style of the world and thus in a position to use their learning capabilities to enhance project activities.

**Table 4.4: Level of education**

	<b>Frequency</b>	<b>Percentage</b>
Primary school	131	31.5
Secondary	148	35.6
University	137	32.9
<b>Total</b>	<b>416</b>	<b>100.0</b>

Source: Primary Data, 2019

### Descriptive analysis

The table below shows different agreements of respondents on statements related to the influence of Community Consultation in project sustainability.

The Findings in the Table 4.5 indicated that most of respondents agreed that Community Consultation influence the Project Sustainability of PASP Project. This means that during the

period of project implementation; Post-Harvest and Agri-Business Support Project accommodated its beneficiaries suggestions at 85.8% and this accommodation of beneficiaries' suggestions contributed to the performance of Post-Harvest and Agri-Business Support Project.

**Table 4.5: The influence of Community Consultation in promoting community consultation in project sustainability.**

Statements	SA	A	UN	D	SD
1. Consultation of community during project implementation influence the PASP Project Sustainability	(29.6%)	(56.2%)	(1.4%)	(12.7%)	-
2. During the closure of project life, the community consultation may influence the PASP project sustainability	(47.8%)	(43.0%)	(9.1%)	-	-
3. The activity of PASP influence the level of beneficiaries satisfaction	(94%)	(6%)	-	-	-
4. Encouraging community to be part of project implementation may influence the PASP project sustainability	(50.5%)	(27.4%)	(15.4%)	(6.7%)	-

**Source: Primary Data, 2019**

ANOVA results further show that community Consultation, community Awareness, community development interest and community involvement in planning and evaluation explains project sustainability funded by IFAD-project. The table above 4.10 shows the sig value (0.000) less than the level significance (0.05). The F-statistics (F=214.145) is far greater than the P-value (0.000) hence a further confirmation that aspects of community consultation, Community awareness, community development

interest and community involvement in planning and evaluation significantly influenced the project sustainability of Post-Harvest and Agribusiness Support Project. Further, Tables 4.10 indicates that the residual value (2.202) is less than the regression value (21.930) which means that all independent variables contributed to the sustainability of PASP project.

**Table 10 : ANOVA Test**

Model	Sum of Squares	df	Mean Square	F	Sig.		
1	Regression		21.930	4	5.483	214.145	.000 <sup>a</sup>
	Residual		2.202	394	.026		
	Total		24.132	398			

a. Predictors: (Constant), Community Consultation, Community Awareness, Community Development interest and Community involvement in planning and evaluation

b. Dependent Variable: project sustainability

Using linear regression analysis from SPSS data bases, shows that all sub-variables were significant with (sig=0.000 and 0.01). This means that all variables influence the project sustainability of PASP-funded project.  $Y=0.671+0.648x1+0.783x2+.0545x3+0.545+\epsilon$

This therefore reveals that, given a unit increase in the community Consultation would positively change by 0.648 times. Also, a unit increase of community awareness would result to 0.783 times increases in the PASP sustainability. Table 4.11: Regression Analysis

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	.671	.145		4.618	.000
Community Consultation	.648	.085	.505	5.264	.000
Community awareness	.783	.084	.329	3.361	.000
Community development interest	.545	.069	.057	.653	.001
Community involvement in planning and evaluation	.545	.069	.057	.653	.001

a. Dependent Variable: Project sustainability

## VII. DISCUSSIONS

95.2% of respondents appreciated the involvement of PASP (beneficiaries) about project consultation in matters related to project sustainability. The results reflect that the community consultation contributes to the project sustainability in Rwanda and the project brought many changes in the lives of the community during the project implementation and these changes should be kept documented and improving so that the community could continue develop themselves and the country in general.

## VIII. CONCLUSIONS AND RECOMMENDATIONS

### Conclusion

From the finding of the study, it was observed that, in order for every project to be successful with sustainability, there should be a need for community consultation by bringing the beneficiaries together and encouraging their consultation.

### Recommendations

PASP project involve community consultation in project planning which may influence the project sustainability. The following are the key recommendations.

PASP Project should consult its beneficiaries during project implementation activities by encouraging their involvement and ownership. This will ensure its sustainability. Project beneficiaries should be involved in project activities review and sharing the feedback of the ongoing and ended project's activities, because poor sharing of feedback between project team and beneficiaries (entire community) can affect negatively the project sustainability. Beneficiaries should keep the sense of project ownership developed since the beginning even after the closing of the project so that they could continue benefit from it to satisfy their needs. PASP project should organize trainings for beneficiaries of project in partnership with Districts which would help in providing advisory services on the good management and maintenance of the project implementation so that these can remain productive even beyond the closure of the existing project for their business plans to remain operational.

Community based organizations must be consulted and involved in every engagement initiative.

Community consultation should be considered to the interest of entire community.

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# Colour Characteristic of Architectural Buildings in Bandung City, Indonesia

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**Abstract-** This paper tries to identify the colours of 30 architectural buildings that become icons and can represent the character of Bandung city. The architecture buildings are classified into 7 groups according to their functions, namely, worship places, museums, hotels, schools, banks, offices, and cultural-social activities. This research was conducted with literature studies, field investigations, and analysis using Photoshop software to obtain the colour of Bandung city, the factors that influence colour formation and composition, and the challenges faced concerning the colour of Bandung city.

**Index Terms-** architectural building, Bandung, city colour.

## I. INTRODUCTION

Colour is one component in the identification of the character of an object or location. Colour is also an essential visual component related to the psychological needs of humans and their relationship with the surrounding environment [1]. Colour can give different meanings depending on geographical location, climate, country, and community (gender, age, culture, religion, etc.) [2].

Regarding the city, colour directly shows the character of the city and acts as a carrier of history, memory, and the direction of further city development [3]. Each city shows its unique style based on natural conditions, humans, and culture that develops in it. Increased urbanisation causes massive changes in natural conditions so that cities can lose their unique style. Also, the lack of understanding in the selection and application of colours in the city scale causes cities to lose their features and look similar to each other [4]. Therefore, the topic of city colour is significant in city development.

This paper tries to identify the colour characteristics of Bandung city that is influenced by various factor and to identify the city colour problem in Bandung so that it can be taken into consideration by the government of Bandung and other cities in Indonesia as a lesson learned.

## II. CITY COLOUR

The colour of the city becomes a marker of identity that can create public perception, beautify the city, as a facility to combine human-made forms with the natural surroundings, and can be an attraction in the city. The colour of the city is divided into four levels, from the largest to the smallest, namely the city or district

level, road or square, individual buildings (units), and building details [5].

### 2.1 Influencing Factors of City Colour

The colour of the city is influenced by several factors that can be grouped into two major groups, namely, dominant factors, and recessive factors. Dominant factors are vegetation, climate, hydrology, and morphology, while those related to social aspects are recessive factors [6]. However, the dominant factor will fade over time due to the influence of a more significant recessive factor in the development of the city.

The use of colour is influenced by the relationship between colour and shape, natural and climatic conditions, and the perception of the community formed by the surrounding cultural identity [7]. The natural colour in the city becomes the core of the location's identity. As a carrier of history and culture, the replacement of traditional colours in the city is also a result of history and culture that is not preserving. The colour of the city must be in harmony with nature, the culture of the population, and the orientation of the city itself because the colour of the city is the way we share information about the city in the past, present, and future.

Therefore, it can be concluded that essential factors in shaping the colour as a character of the city are geography and climate, history and culture, and development of technology [8]. In terms of geography and climate, cities located in the tropics and sub-tropics certainly have a different character, as well as cities that are located in coastal areas and mountains. In historical and cultural contexts, cities that have different religious, ethnic and racial backgrounds also have different characters. Besides, cities that have experienced colonialism also have a different character from those who have never experienced the colonialism era. And finally, but no less significant is the influence of rapid technological developments that can support the production of materials related to the colouring of cities and supporting the distribution of building materials. If in the past, the limitations of tools and materials made urban development take place traditionally, but in the present, almost everything can be done in a modern and machine-assisted manner.

### 2.2 Environmental Colour

Environmental colour is a combination of natural and artificial colour in an area. The elements of environmental colour are colour of natural features that consist of vegetation, natural landscape, geographical location, weather, climate, and seasons; artificial colour (built form) consist of material colour, painting, building

façade colour, building functional use, and the variation or unification of artificial colour in urban area [9]. In the past, the development of the city was not as fast as in the present because of the limited material and supporting technology. This condition causes most buildings to use local materials that are easily found around the location so that it is made harmonious with the colour of the surrounding environment. The colours produced during this period are referred to as traditional colours or historical colours [10].

Environmental colour mapping can be done with digital technology to identify and document the natural colour character and artificial elements as the indicators of the character of a particular area. The use of digital technology can simplify the process of colour mapping because of the ability to obtain and process more visual information when compared to the Lenclos manual method. However, the use of digital technology can also be influenced by daily or seasonal weather conditions so that it can produce colour differences in different weather conditions [11]. What is needed in colour mapping using digital technology is digital cameras and Photoshop software.

### 2.3 Colour and Architecture Works

In architecture, colour is considered as a decorative element that serves to beautify architectural forms. In other words, the shape produced is the main part while the colour is the accessories. Colour in an architectural context is not only limited to the results of painting the surface of a building but also includes the natural colour of building materials. Colour can make an architectural building contrast with the surrounding environment and make building details stand out compared to other parts [12]. Colour in architecture is closely related to what architectural style is the design inspiration and at the location where the architectural building is built, as well as other influences related to the subject that plays a role in the design process, for example, the architect or designer background.

Colour has a role that can be divided into 3 points, namely colour dynamics, colour tectonics, and colour imagery. Colour dynamics play a role in the conceptual phase, namely the purpose of colours that can represent a dynamic relationship between the primary and decorative parts of architectural buildings, especially the use of colour contrast and juxtaposition. In the phase of form-making, the role of colours is known as colour tectonics, namely the role of colours to define, clarify, and express shapes. Also, the colour tectonics can add complexity to architectural design and be able to combine architectural forms with the background colour or environment. And in the final phase, the role of colour is called colour imagery, which is the role of colours related to culture, symbols, emotional responses and perceptions of architectural design results. In other words, colour imagery has a direct impact on the visual environment and many parties, so this role becomes the focus of attention [13].

The colour in architecture works can change over time due to weather conditions, solar intensity, pollution, quality of building materials, and building maintenance processes. In the process of maintenance and restoration of architectural buildings, colour changes often occur as a result of the original colours that are

replaced with other colours used to attract the attention of tourists and other reasons. Also, changes in the colour of architectural buildings in the area with different functions have different rates of change, for example, in the trade and settlements area [14]. However, changes occur to not only the colours of architectural buildings but also the natural colours of the surrounding environment. Therefore, chromatic stability and harmonisation of the colours of architectural works and the natural colour are needed, coupled with the ability to adapt to changes that occur.

## III. METHOD

This study tries to investigate the colour characteristics of architectural buildings in Bandung city through literature and supporting documents review obtained from the local government. In addition, a field investigation was conducted to capture the photographs of architectural buildings that could represent the character of Bandung city. The selected buildings are managed by the local government, which have historical value, as well as being included in the cultural heritage buildings of Bandung city, and buildings that are personally owned are not included in the sample. Building photographs are taken during the daytime in the right weather conditions and use a camera to maintain colour accuracy. The data obtained were analyzed using Photoshop software.

## IV. RESULT AND DISCUSSION

### 4.1 Formation Factors of Bandung City Colour

The colour formation of Bandung city in the scope of architectural buildings is influenced by many factors which can be described as follows:

#### 1. Climate and Geographical Conditions

Bandung is an important city on the island of Java, Indonesia, which is included in a tropical climate. Bandung is located in the highlands and is at an altitude of 700 m above sea level, and the average temperature is 23.8 °C, lower than the temperature of other tropical cities. The natural Colour of Bandung city which is the background colour is divided into several parts, namely: (a) the colour of vegetation which tends not to change throughout the year because it only experiences two seasons (dry and rainy season) namely green for leaves and dark brown for the trunk, (b) colour rivers in the inland-city region which are brownish because Bandung is flowed by two large rivers namely Citarum and Cikapundung Rivers; and (c) the natural colour of the soil in the city of Bandung is a brownish yellow and grey as the typical alluvial soil as result of the eruption of the Tangkuban Perahu volcano which is located in the northern part of Bandung city.

#### 2. History

Most important buildings in Bandung city were built during the colonial period as facilities that support the lives of European communities in Bandung, and Dutch architects designed the buildings. Therefore, the architectural styles and tastes of Europeans who became

dominant were attached to these buildings. Even the development planning advisor named Herman Thomas Karsten from the Netherlands helped develop the city of Bandung as a residential city for the European community [15]. Twenty-nine of the buildings studied were built between 1867-1974, another building was built in 2003 is an Arabic-style mosque. The architectural style of Bandung city buildings varies, such as indische style, neo-classic, modern colonial, western traditional, and so on. However, the majority of buildings in the city of Bandung are in the art deco architecture built in the 1920s. This architectural style became a popular decorative architectural style in the period between World War I and II [16]. A distinctive feature of the art deco architecture is that it displays a variety of unique decorations and emphasizes the modern style of the building [17]. Art deco architectural style uses bold colours with high contrast, for example, bright or vibrant colours combined with additional and ornament colours in black, silver, gold, deep yellow, grey, blue, red, green, etc. The use of colour in the art deco architectural style gives the impression of luxury and modernity. In general, the architectural style and colours applied to buildings in the city of Bandung are adapted to the climatic and geographical conditions of Bandung for the convenience of European society at that time. Efforts were being made to achieve comfort for the European community in Bandung by made buildings with wide and high roofs, installed canopies above doors and windows, made many ventilations, and light colours façade [18]. So that, Bandung city had earned the nickname as Europe in the tropics [19].

### 3. Social and Culture

Based on data from the Central Statistics Agency in 2018 [20], the city of Bandung is occupied by 92.26% of the Muslim population, 5.42% Christian, 2.24% Catholic, and the rest are Hindus. Especially in Muslim religious buildings, Arab culture tends to be influenced by Colours that give the impression of luxury such as greyish orange and gold on the dome of the mosque. Besides various religions, the city of Bandung is also inhabited by residents from different regions and tribes, but as a Sundanese land, the population of the city of Bandung is dominated by Sundanese. Sundanese traditional houses utilize materials available in nature as building materials, such as wood as the primary material and roofing material from palm fibre and leaves. Therefore the distinctive colour of the timber and withering leaves become the typical Colour of traditional Sundanese houses. In addition, conventional Sundanese people whose sources of livelihood are farming know five basic colours, namely red, white, black, yellow, and green, all of which are identified by the colour of plants and fruits. The Sundanese traditional clothes are grouped according to their position in the community, but in general, black is the basic colour with golden accessories.

### 4. Technology Development and Building Materials

The buildings that became the majority of the research samples were built during the Dutch colonial era when viewed from the use of technology and building materials; there were many influences from the colonial period. Technological developments in the early 20th century have enabled the production of colour industries that produce chemically cheap and varied colours. In addition, the development of modern architecture was characterised by flat roofs and white buildings in the colonial period, along with the development of concrete technology to support buildings construction [21]. So that, buildings that were built at that time used concrete and several buildings were also built with a combination of other materials, such as wood, natural stone, shingles and roof tiles made of clay. Decorative elements of buildings use fairly sophisticated techniques such as stone carvings of various shapes to create facade elements of high aesthetic value that support the applied architectural style. The use of materials such as concrete makes it easy to apply the desired colour, whereas for the use of wood, natural stone or roofing materials from clay material, it usually retains the natural colour of the material.

### 5. Government Policy

Bandung city government realises the legacy of the Dutch colonial era is part of the identity of the city of Bandung, which should be maintained. The efforts made by the government to preserve the authenticity of historical heritage buildings is to make regulations on the management of the cultural heritage area and buildings as a concrete step in protecting the historical heritage. In addition, the Bandung city government also plays an active role in the efforts of restoration, reconstruction dan revitalisation of cultural heritage buildings to make these buildings as similar as possible to the original conditions. However, specific and detailed rules and policies related to the use of colour are not regulated in the existing regulations, thus allowing inaccuracies in the use of colour in buildings in Bandung city.

#### *4.2 Colour Characteristic of Bandung City Architectural Buildings*

In identifying the colour of architectural buildings in the city of Bandung, the building is grouped according to function. Architectural buildings are divided into seven groups, namely buildings that function as places of worship, museums, hotels, schools, banks, offices, and socio-cultural activities.

##### *4.2.1 Worship Place (W)*

The buildings of worship place used as samples are the worship places of Muslims and Catholics. The mosque, located in the centre of Bandung, called the Great Mosque of Bandung, was completed in 2003, which has an Arabic architectural style and uses natural stone materials. The primary colour of the mosque building is greyish orange, with additional colours of dark moderate orange and detail colours of dark greyish-green. As for the church building is a historical heritage building by a Dutch architect built-in 1922. This church has a primary colour and

details that are similar to greyish blue with an additional colour of dark greyish cyan.

#### 4.2.2 Museum (M)

There are six museum buildings surveyed with locations in downtown Bandung. The buildings were built between 1920 and 1974 which are included in historical heritage buildings. Four of the six buildings were constructed in the art deco architectural style designed by Dutch architects, while the other two were in the old and traditional style of West Java. The main colour of the buildings are light grey and one building has greyish orange as basic colour. While the additional colours tend to be darker mostly black and dark greyish orange. While detail colours and ornaments tend to vary, such as black, dark orange, greyish-yellow, and greyish-blue. The material used for the walls is concrete with some parts of the building using wood materials such as door frames and windows, while for the roof covering are clay tiles and shingles.

#### 4.2.3 Hotel (H)

Hotel Preanger and Savoy Homann are hotels located in the centre of Bandung precisely on the Asian-African road. Both of these hotels are the result of a Dutch architect design with art deco architectural style and using concrete materials. The Preanger Hotel was built in 1929, while the Savoy Homann Hotel was built in 1880. The Preanger Hotel has main colour of white; additional colour is very dark greyish orange and light greyish-yellow detail. Whereas the Savoy Homann Hotel has the main colour of dark greyish orange, additional colour is white, and light greyish orange as ornament colour.

#### 4.2.4 School (S)

School buildings in the city of Bandung that are sampled, namely Cicendo Special School, Junior High Schools 2 and 5 Bandung, and Senior High Schools 3 and 5 Bandung. These four buildings were built between 1920 and 1953, with a typical Dutch architectural style and combined with tropical climate conditions in Indonesia. These buildings had experienced some conversion functions until finally made as schools. The material used is concrete and wood as additional material, especially in the construction of roofs and door-window frames. The main colours of the building are dark greyish cyan to light greyish-blue and bright greyish-yellow. While the additional colours vary, such as dark orange, very soft blue, desaturated red, and dark greyish orange. The detail colours and ornaments tend to be very dark (mostly black) and dark greyish-blue.

#### 4.2.5 Bank (B)

Some historical buildings by Dutch architects in Bandung city today functioned as banks. The buildings were built between 1899 and 1936 with the main building materials in the form of concrete and several wooden and clay roofed buildings. The colour composition as the main, additional, and ornament colours of buildings are described as follows: Bank BJB (dark greyish yellow-greyish blue-light greyish orange), Bank Mandiri ex. Trading Bank (greyish blue-very dark greyish red-very dark grey), Bank Mandiri ex. Exim Bank (greyish blue-very dark greyish red-dark greyish blue), Bank Indonesia (very light grey-very dark greyish yellow-moderate blue), and Bank OCBC NISP (De Vries) (light greyish red-very dark greyish orange- greyish orange).

#### 4.2.6 Office (O)

Seven buildings in Bandung city functioned as offices and supporting government activities and community services which also became an icon of Bandung city. All of these buildings are heritage buildings of the Dutch colonial era which are witnesses of history that deserve to be cared for. Therefore, the Bandung city government makes these buildings as offices, to facilitate their maintenance and management. The buildings were built between 1867 and 1940, where the architectural style was influenced by the tastes of Dutch architects at that time, namely art deco style, modern dutch indies, indische empire and typical colonial style. The main colours used in these buildings are light grey to white. Additional colours tend to be darker, for example, dark greyish-yellow, dark greyish violet, dark greyish red, and dark greyish magenta. The detail colours and decoration also tend to be darker and more varied, such as very dark greyish lime green, greyish blue, very dark greyish orange, very dark greyish red, and very dark greyish-yellow.

#### 4.2.7 Culture and Social (CS)

One effort to facilitate the maintenance of cultural heritage buildings that are assets of Bandung city is to make it a place for cultural and social activities. Four buildings are sampled in this study, namely De majestic, the National Gas Building, the Indonesian Menggugat Building, and the Paguyuban Pasundan Building. This historic building was built between 1907 and 1930, in the style of art deco architecture, European indische and western traditional works by Dutch architects. The basic colours of these buildings are very light to white, with additional colours that are very dark to mostly black, while the colour of the ornaments varies such as light greyish orange, dark greyish-yellow, dark greyish orange, and very dark desaturated cyan-lime green.

#### 4.3 Buildings Colour Composition

The colour composition of 30 buildings used as samples in this study was divided into 3 parts, namely the main colour, additional colours, and detail/ornament colours. The main colour is the colour of the biggest area such as the colour of the building walls, while the additional colour is the colour of additional building elements with less coverage than the main colour. Detail/ornament colour is the colour with the smallest coverage in the composition of the building colours, which includes the colours of the building's additional elements.



Figure 1 : Buildings Colour Composition W1-B1

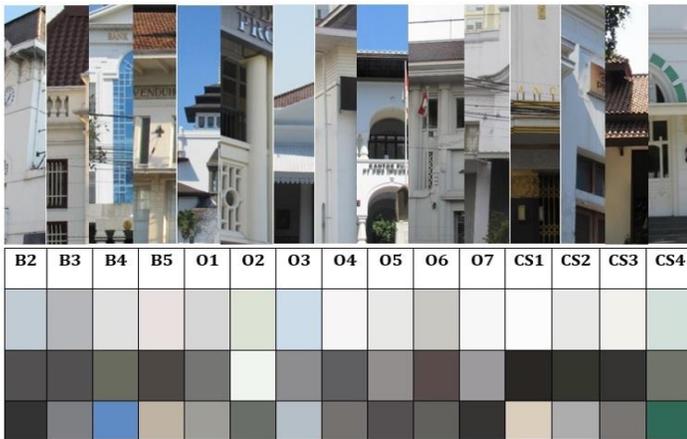


Figure 2 : Buildings Colour Composition B2-CS4

The naming of buildings in the colour composition table is given based on the category of building functions and the number of building samples analysed. For example, for the W code indicating the building is used as a worship place, W1 and W2 indicate that there are 2 buildings with the same function being analysed.

Many factors greatly influence colour analysis, namely lighting conditions, position when shooting, and the sensitivity of the software used. The colours shown in the results of this study are colours that are considered capable of representing colours with varying tones in a part of the building under review.

#### V. CONCLUSION

Based on the results of the analysis, it can be concluded that the formation of the colour character of Bandung city is influenced by several factors, namely climate and geographical conditions, history, social and culture, technological development and building materials, and government policies. However, the colour characteristics of the city of Bandung has mainly been passed on by the Dutch colonial era in its heritage buildings. Important architectural buildings that are icons of Bandung city are divided into several functions, namely as places of worship, museums, hotels, schools, banks, offices and social and cultural activities managed directly by the Bandung city government.

The colour of Bandung city architectural buildings is dominated by white and grey for the facade walls, while for the colours of the roofs, doors, windows, frames and other additional colours tend to be darker, namely light brown, dark brown to black. Detail colour for decoration and aesthetics is very diverse, namely gold, black, green, blue, yellow, dark grey, and so on.

The architectural buildings that are sampled in this study show that the colours that until now exist in these buildings are colours that have maintained their authenticity from time to time and show the unique colour character of tropical cities in the highlands that once passed through the colonial period. However, the challenges faced in maintaining the colour character of the city of Bandung include (1) inaccurate colour selection when restoring or reconstructing cultural heritage buildings, (2) additional attributes installed on buildings, such as billboards that do not pay attention to colour harmony, and (3) the use of material that has a colour that is not

in harmony with the colour of the building. These three challenges can cause visual chaos and colour pollution in Bandung city.

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# Study of challenges and issues of e-governance in Afghanistan

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**Abstract-** In Today's world, public sector organizations increasingly concentrate on transformations of socio-economic & political and administrative structures through the application of e-governance to provide efficient, convenient and affordable services and information to the citizens, business-entities and for public organizations. Developing and developed nations around the world have attained significant improvement in application of e-governance and making e-services easily available and accessible and as well as to provide information and knowledge about entire government operations to their citizens. In recognition of importance of e-governance, the government of Afghanistan initiated the development and implementation of a comprehensive e-governance strategy to improve the working condition of public administration. Several Studies have shown that the implementation of good governance, economic growth, social-progress strongly rely on e-governance initiatives.

E-governance provides many opportunities to improve the higher quality service to the citizen. Citizens should be able to get service or information in seven days of the week. The paper relies on the primary and secondary sources of data. The secondary data was extracted from books, journals and websites and primary data was collected through distribution of structural questionnaires. The total sample size was 50 respondents. The overall object of this paper is to investigate challenges and opportunities in implementing e-governance and as well as to identify what means and practice will really help the present administration to promote e-governance in the context of Afghanistan? As a matter of fact, the current study concludes that there is no sufficient evidence of e-governance in comparison other countries in Afghanistan and that in actual practices, the bad governance is the order of the day. All in all, e-governance must be embraced in Afghanistan through political, administrative and economic reforms and by adopting the time-tested based on experiences of e-governance initiatives in other countries.

**Index Terms-** E-governance, efficiency, transparency, service-delivery, citizen satisfaction.

## I. INTRODUCTION

E-governance provides many opportunities to improve the higher quality service to the citizen. people should be able to get service or information in seven days of the week. Citizens, businesses and state and as well as local governments should be able to figure out required reports without having to hire accountants and lawyers.

Government employees should be able to do their work as timely, efficiently and effectively as their counterparts in the global world. The challenge for governments is how to move on, from focusing on service delivery to provide people-centered tools and applications. This means placing priority not just on how they delivery services to citizens, but using e-governance to enrich the lives of its citizens. E- Governance should also be employed to improve the way public servants use public resources to support the society.<sup>1</sup>

E-governance has been implemented by developed as well as developing countries to be an enabler toward accelerating processes, delivering a higher level of service to citizens and businesses, increasing transparency and accountability while lowering costs. Additionally, in developing countries it has been recognized as an enabler towards catapulting governments in to the 21st century while leap frogging multiple generations of technology.

In the age of globalization, governments and public sector organizations around the globe are faced with increasing complexity to reform their public administration structures and deliver more efficient, faster and cost effective services, as well as better information and knowledge to their stakeholders. People have different perceptions regarding e-governance. Today governments increasingly concentrates on transformations of social, economic, political and administrative structures through use of information and communication technology (ICT) and to provide efficient, convenient and cost effective services and information to the citizens, business-entities and for public organizations.<sup>2</sup>

E-Governance is the application of Information and Communication Technology (ICT) for delivering government's services, exchange of information, communication transactions, integration of various stand-alone systems and services between

<sup>1</sup>Richard Kerby. (2005). E-government provides value to clients.

<sup>2</sup>Dobrica Savic. (2006). E-Governance: Theoretical Foundations and Practical Implications. Montreal. p.1

Government-to-citizens (G2C), Government-to-Business (G2B), and Government-to-Government (G2G) as well as back office processes and interactions within the entire government framework.

Through e-Governance, government services are made available to the citizens in a convenient, efficient and transparent manner. Three main target groups that can be distinguished in governance concepts are governments, citizens and businesses/interest groups.<sup>3</sup>

It is beneficial to the citizens as they can enjoy faster, effective and timely government services and also to the government as it can become more integrated into the community and can focus its resources where they are needed the most. E-governance that involves technology, policies, infrastructure, training and funds is becoming popular around the world including Afghanistan and India and rest of the globes. E-Governance is not just about government web sites and e-mails. Neither is it just about service delivery over the Internet or digital access to government information or electronic payments. E-governance aims at changing how citizens relate to governments as well as how citizens relate to each other.

**World Bank**<sup>4</sup> The Afghan population's access to basic services has greatly improved in nearly all areas since 2001. School enrolment has increased sharply, with over eight million children currently enrolled in school, of which 39 percent are girls. Current strategies for improving sub-national service delivery focus on delegating greater authority to provincial and district administrations.

**Afghanistan Shows the Way in E-Government (2015)**<sup>5</sup> The Ministry of Communication and Information Technology (MoCIT) has modernized over 100 websites in the public sector and made information more accessible, consistent, and reliable. The Electronic Government (E-Government) Department, a key section of MoCIT, has led the progress in introducing E-Government systems in government institutions and agencies. It has taken the lead in creating a unique feature for all government institutions to make access to information more convenient, consistent, and reliable as well as developed a comprehensive package of services for ministries including training, troubleshooting, and hosting their websites. Over 100 governments and government-linked websites have been designed and hosted by MoCIT.

This report aims to identify administrative constraints in three key sectors of public service delivery, education, health and agricultural extension services. The analysis follows the service delivery chain, from central to provincial, through district to community level, and is particularly concerned to examine service delivery in these three sectors through the window of sub-national governance and its relations to the service delivery mandates of line ministries.

<sup>3</sup>C.S.R. Prabhu. (2009). E-Governance. New Delhi: PHI Learning Private Limited. p.1.

<sup>4</sup>World Bank. (2017). Improving Public Services in Afghanistan's Transformational Decade. Retrieved from [worldbank.org/en/country/afghanistan/publication/improving-public-services-afghanistan-transformational-decade](http://www.worldbank.org/en/country/afghanistan/publication/improving-public-services-afghanistan-transformational-decade). Accessed on 27 March 2017

After the collapse of the Taliban administration in 2001, every individual expects to see public sector organizations to deliver good governance and e-governance for the betterment of the nations. Unfortunately, Afghanistan's government faces multiple challenges in relation to e-governance application, sustainability issues, rapidly increasing of population, abuses of human rights, poverty, unemployment, food crisis, ozone depletion, dwindling resources, famine and disease and all these challenges are as a result of the inability of sound leadership to plan effectively for development using appropriate educational tools.

The major question that arises within this paper is that why realization of e-governance has remained a great dream in Afghanistan. Researcher strongly believes that developing nations faces many constraints than developed and therefore governments of developing nations would learn a lot by looing what works and what does not. Last but not least, applicability of e-governance can curtail administrative pathologies and build trusts between government and citizens. This research intends to investigate challenges and opportunities in implementing e-governance and to identify what means and practice will really help the present administration to promote e-governance in the context of Afghanistan?

### 1. 1.2 Conceptual Meaning of E-governance

E-governance or 'electronic governance' is basically the application of Information and communications Technology to the processes of Government functioning in order to bring about 'Simple, Moral, Accountable, Responsive and Transparent' (SMART) governance.<sup>6</sup>

E-governance means the use of technology to enhance the access to and delivery of government services to benefit citizens, business partners and employees<sup>7</sup>.

E-governance involves the automation or computerization of existing paper-based procedures that will prompt new styles of leadership, new ways of debating and deciding strategies, new ways of transacting business, new ways of listening to citizens and communities, and new ways of organizing and delivering information.<sup>8</sup>

E-governance involves new styles of leadership, new ways of debating and deciding policy and investment, new ways of accessing education, new ways of listening to citizens and new ways of organizing and delivering information and services. E-governance is generally considered as a wider concept than e-government, since it can bring about a change in the way citizens relate to governments and to each other. E-governance can bring forth new concepts of citizenship, both in terms of citizen needs and responsibilities. Its objective is to engage, enable and empower the citizen."<sup>9</sup>

E-governance means application of information and communication technology to enhance the effectiveness of a

<sup>5</sup>Retrieved from [www.worldbank.org.2015/09/24/afghanistan-shows-way-e-government](http://www.worldbank.org.2015/09/24/afghanistan-shows-way-e-government). Accessed on 18 October 2016.

<sup>6</sup>Report of the Working Group on convergence and E-Governance for e-Tenth Five Year Plan (2002-2007). Planning commission. November, 2001.

<sup>7</sup>Deloitte, 2003.

<sup>8</sup>Okot-Uma, 2002.

<sup>9</sup>Retrieved from [www.unesco.org](http://www.unesco.org). Accessed on 15 October 2016.

legislative, judiciary or administration either to improve efficiency or to change the relationship between citizen and government or both.<sup>10</sup>

### 1.3 E-Governance Program-Context and Principles in Afghanistan

The Ministry of Communication and IT of Afghanistan's National Unity government's vision to set up knowledge based society in upcoming years for Afghanistan through ICT and provide globalized and democratic nation that effectively uses the potential of ICT in trade, commerce, health, education and public governance while maintaining and preserving its tradition and culture.

In sum, this section presents aim and objectives of EGOV Programs in Afghanistan and explains the Afghan strategic context towards achieving EGOV vision and strategic goals. It highlights key principles for AeGP (Afghanistan Electronic Government Program)<sup>11</sup> implementation and management.<sup>12</sup>

## 2. 4 Aims and Objectives of E-Governance in Afghanistan

The aims of AeGP are the implement EGOV initiatives towards realization of strategic goals of Afghanistan EGOV Strategy and ultimately, achieving it vision.

**In line with this aim, the key objectives of AeGP are:**

1. To provide an efficient, professional and modern institutional, environment and management framework for AeGS implementation.
2. To organize, plan and manage EGOV related projects in Afghanistan implemented by various government agencies and stakeholders in coordinated, collaborative and effective way.
3. To deliver the outcomes associated with AeGS Strategic goals with expected professional capabilities through relevant organizational changes in public sector management.
4. To ensure the realization of benefits of technology enabled transformation in public administration and service delivery to citizens and stakeholders.
5. To raise the Afghan government capacity for EGtOV development, coordination and the implementation based on partnership and collaboration.<sup>13</sup>

### 1. 5 Goals of E- Governance in Afghanistan

The main goals of e-governance in Afghanistan are:

- a. All the government ministries, departments and agencies both at the central and provincial levels would be optimally computerized and their operations re-engineered, digitized and networked in line with the e-governance and m-governance plan of the government.
- b. All public services, other than the ones which cannot be delivered through electronic means, would be delivered as e- services or m- services as per the e-Government Plan of the Government.

- c. Transparency in public sector recruitment, procurement and service delivery would be enhanced through optimized use of ICTs. 90 per cent of all public procurement and recruitment would be ICT based using appropriate E-recruitment and E-procurement systems.
- d. Citizen participation in governance and democratic processes in the country would be strengthen and enhanced through optimal application of ICTs.
- e. All citizens of the country would have convenient means to access the e-services of the government either on individual access devices or through e-service centers located within convenient distances (not to exceed 1-hour travel time) from the location of the service recipient.
- f. The use of ICTs in the justice sector would be promoted to enhance rule of law and transparency in the legal processes. ICT based systems and applications would be developed and deployed across the country, as a part of the government's e-governance programs to bring in effectiveness, efficiency and transparency in all the legal institutions and organs of the state.

### 1.6 The following objectives are framed for the present study:

2. To study the conceptual framework of e-governance in Afghanistan.
3. To examine the implementation of e-governance initiatives in Afghanistan.
4. To examine the working of department of e-government in Afghanistan.
5. To analyze the Perceptions of citizens regarding e-governance initiatives, programs and delivery of services in government offices.
6. To access information and knowledge about e-government initiatives to the citizens.
7. To analyze the challenges and to suggest remedies measures.

This paper concludes from above discussion that e-governance implementation will build an informed society, increase government and citizen interaction, encourage citizen participation, bring transparency in the governing process, make the government accountable, reduce the cost of Governance, and reduce the reaction time of the government in Afghanistan.

## II. RESEARCH METHODOLOGY

The present study was conducted in Afghanistan. This paper compressively evaluates the existing research literature, documentation and strategies of the current government on the e-governance. The study is based on primary and secondary data. Primary data was collected from different areas of Afghanistan through structured and semi structured interviews and distribution of questionnaires with key informant public administrators and citizens. Secondary data was collected from different books,

<sup>11</sup>UNU-IIST Centre for Electronic Governance. (2011). Electronic Government Strategy Draft for Afghanistan. Policy Report. Macao: UNU-IIST.

<sup>12</sup>Mohamed Shareef, Zamira Dzhusupova, & Tomasz Janowski. (2011). Electronic Government Program Draft for Afghanistan. UNU-IIST. p.8.

<sup>13</sup>Ibid. p.1.

international and national journals, speeches websites, etc. this research is qualitative and quantities in nature. Descriptive and exploratory method of data analysis was used.

## 2.1 Result of research

Questions	Strongly agree	agree	Neutral	Disagree	Strongly disagree
1 E- governances helps to implement good governance initiatives.	33	15	-	-	2
2 E-governance helps to increase efficiency in public services delivery.	26	18	3	3	-
3 E-governance helps public servants to interact with citizen timely.	15	21	1 2	2	-
4 Citizens show less nonchalant attitude in the use of e-service in Afghanistan.	4	20	1 5	9	2
5 Internet services are easily available in every part of Afghanistan.	5	7	4	27	7
6 Access to internet and computer is available nationwide.	5	12	6	19	8
7 The speed of internet and quality of service is good enough to access e- government services.	2	11	5	22	10
8 E- government provides the right to access on government services for people with the disability.	9	26	7	6	2
9 E- governance helps to rebuild public trust in the Afghan National Unity Government.	11	16	1 5	5	3
10 Afghan National Unity Government has a national strategy (including an action plan) related to e- governance issues.	11	14	1 9	6	-
11 E- governance helps to reduce corruption in public administration.	19	26	3	2	-
12 E- governance brings transparency in delivery of services.	18	19	8	3	2
13 ICT sector helps to implement e- governance in countryside.	7	23	1 9	1	-
14 Infrastructural development in government ICT sector facilitated the delivery of public services.	11	25	9	3	2
15 The role of ICT infrastructure for successful e- governance is to provide services to all citizens and increase interaction between citizens and government.	14	28	6	1	1
16 There are shortages of ICT human resources to implementation of e- governance projects.	5	23	1 5	5	2
17 ICT skills among government officials is very poor	10	17	1 5	8	-
18 Afghan Unity National Government has such institution to implement and coordinate e- governance projects.	5	14	1 7	13	1
19 There is lack of coordination among central, regional and local agencies.	11	24	1 0	4	6
20 Coordination between administration and citizens is poor due to lack of e- government services.	7	22	1 1	8	2
21 The government to government coordination is effective for providing e- governance services in Afghanistan.	15	20	1 1	3	1
22 There is less allocation of financial resources for e- governance.	19	14	7	7	3
23 The Right to Information to all citizens is practically secured by e- governance initiatives in Afghanistan	5	15	1 7	11	2

24	E- governance initiatives to entire administrative units of Afghan National Unity Government	8	10	1 9	12	1
25	E- governance services is fruitful in providing the government services to the citizens.	15	11	4	17	3
26	I am satisfied with E- government services of Afghan National Unity Government.	5	7	3	30	5
27	E- governance helps to provide services in time bound manner.	6	20	1 5	7	2
28	E- governance helps to fix accountability in the departments	11	23	9	7	-
29	Awareness campaigns for people were initiated by government regarding various e- portals.	4	12	2 4	7	3
30	local governments at village level is involved in creating awareness among people	7	18	9	10	6

2.2 The data collected shows that majority of the correspondents were view that there are some barriers prior to conduct e-service portal and implementation in the contest of Afghanistan.

### III. DISCUSSION

It can be said that the application of e-governance will grow and bring development if it has achieved the requirements of citizens also, the services are provided through e-governance must be consistent with the needs of citizens. If the citizens achieve their needs, the level of satisfaction for e-governance will increase. Many studies have been conducted to explore challenges confronting e-governance implementation in public organizations of Afghanistan. The tremendous technical and financial cooperation of international agencies advance the Information and Communication Technologies (ICT) strongly influenced the work process that brought change into the administrative setup of Afghan government after post-9/11.

3.2 The important critical factors which are key challenges for implantation of e-governance are summarized below:

- Budgetary Barriers
- Laws and Legislation
- ICT Infrastructure
- Low ICT Literacy
- Professional workforce
- Workforce and Resistance of Change
- Digital Divide
- E- Literacy,
- Lack of Competency
- Lack of Security
- Lack of privacy, protection the personal information that government collects about citizens.
- Lack of safety, ability of e- governance to operate without catastrophic failure.
- Lack of confidentiality, designers should normally respect the confidentiality of their employers or clients irrespective of whether or not a formal confidentiality agreement has been signed such as code of ethics.
- Cultural and Educational Barriers
- Collaboration and Coordination

**Following are some suggestions for successful implementation of e-governance in Afghanistan’s Public Administration in case of service delivery to the citizens:**

- Enhancement of ICT
- Cultural Adaptation of E-governance
- Improving Technical Education
- Sound Public Administration
- Allocation of Financial Resource
- Generating Public awareness

### IV. CONCLUSION

A government and public organization around the globe is facing multiple challenges with regard to bring reform in the public administration systems and deliver more efficient and cost effective services, as well as better information and knowledge to their stakeholders. In developing countries like Afghanistan, where insecurity, literacy level is very low and most are living below poverty line, people are not even aware about the benefits of e- Governance activities and people do not use Information and Communication technologies much, there exist a number of problems to implement e- Governance activities. E-Governance is considered as a high priority agenda in Afghanistan, as it is considered to be the only means of taking IT to provide opportunities to harness the power of ICT making the business of governance inexpensive, qualitatively responsive, and truly encompassing.

In sum, Afghanistan, besides, many problems, government did not optimum use of technical and financial of international community cooperation in efficient and effective manner. So, there is massive gap between Afghanistan and developed countries in case of e-governance and Afghanistan has the lowest position in world e-government rankings. This gap indicates that Afghanistan is the most back warded nation in the international level. This study helps to Afghan Nation Unity Government to success in improving accessibility, cutting down costs, reducing corruption, to implement good governance, extending help and increased access to un-served groups.

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# Automatic Trash Collector Robot

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**Abstract-** In our current scenario life people are facing lots of problems due to improper waste collection and disposal of it. Filled garbage bins causes many problems to the nearby persons and also pollutes the environment. Finding the garbage bins on each floors whether it is filled or not is very difficult. For this problem we introduce our system to solve it. It will save the time and it also prevents the surroundings from pollution. This method is used automatically to identify the level of bins and the send data to a trash collector which inturn comes and collect the trash from the bins. Arduino UNO board is used to process the data from the ultrasonic sensor and the Bluetooth module is used to send the data to the UNO board in the trash collector. Garbage level can be detected by using the ultrasonic sensor which is used as the level detection unit and the information is passed to the UNO board with the help of the Bluetooth module. With the help of that data, the trash collector identifies the bin which is filled on the floor and moves in the predefined path with the help of Infra-Red sensors and ultrasonic sensor for movement and returns back to its initial position after collection of trash.

**Index Terms-** Automatic, Arduino UNO, Ultrasonic sensor, Infra-Red sensor, Bluetooth Module.

## I. INTRODUCTION

As the population in our country is rising, tonnes of trash unit are being generated. Improper management of waste affects the standard lifetime of individuals. Thus, waste management is an important issue or crisis to be thought of. Zigbee and GSM units are used in a number of foremost usually known and proved technologies for transmission of signals in the previous areas of analysis. RFID technology has been used for distinguishing the target objects by attaching a tag to the trash bins for identifications. These technologies are designed either for monitoring or collecting trash placed on outdoors. There are very limited technologies that are specifically designed for indoor operations due to some complex and advanced operations in receiving the signals. This planned system is specifically designed for floor waste collection purpose for any high rise buildings.

## II. LITERATURE REVIEW

Shobana et al [1] planned a system which continuously monitors the level of the waste and passes the information on to the cloud storage. Once the garbage is filled the information is transferred to the personnel who with the assistance of a GPS identifies the location of the bin. This system also monitors the temperature of the bin incase of any emergency fire incidents.

Fetulhak Abdurahman et al [2] designed a system that completely monitors the amount of garbage filled in the Bin with different level indicators for denoting the extent of the trash. This system uses Arduino board and ultrasonic sensors for detecting the level of the waste and the info is passed when the bin is filled through a GSM module stuffed to a mobile which is connected.

Rakshith Ranganath et al [3] designed a system which completely does an autonomous process for collecting trash. This system “Wall-E” uses master slave method between a Raspberry Pi and an Arduino Board. The Raspberry Pi board is the master board which identifies the object through a vision system and based on the object identified the command is passed on to the slave board i.e. Arduino Uno which does the remainder of the process such as collecting the trash by activating the motors.

### III. SYSTEM WORKING AND DESCRIPTION COMPONENTS

#### *A. System Working*

The components used in this project are ultrasonic sensor, Infra-red sensor, HC-05 Bluetooth module, Arduino UNO and L298N driver module. The planned system monitors the amount of waste that is being stuffed within the dustbin and when filled the signal is transferred to the arduino board through a HC-05 Bluetooth module. Upon receiving the signal the motor is turned ON and the Infra-Red sensor is employed to follow the trail to reach the required destination of the bin. For making a turn and track the path the IR sensors present on the sides are used as a the detection unit. Based on the signal received from the sensor unit the arduino makes the decision and adjusts the motor to make the turn. Upon reaching the destination wherever the trashcan is placed the arm is mechanically adjusted to pick the dustbin and it is dumped. After the process is finished the Trash collector is returned to its initial position.

#### *B. Use of Simulation software*

To design the graphical model of the overall system Fusion 360 software was used. Each and every part of the system was designed as per the needs and assembled together. A replica of the working model is created using this software and further processing of the design can also done such as the impact it takes due to environmental factors.

#### *C. Description of Components*

This automation technique uses a mix of sensors to work as a single unit and the information is transferred with the help of a Bluetooth module to an Arduino board which does all the necessary processing.

#### *Arduino:*

Arduino Uno is a microcontroller board based on the more capable ATmega328P. It has 14 digital input/output pins of which 6 can be used as Pulse Width Modulation outputs, 6 analog inputs, 16 MHz ceramic resonator for clock triggering, a USB connection. It also consists of a power jack, an ICSP header and a reset button. Arduino Programming is an easy process and can be programmed with the help of Arduino software and can be altered easily based on the needs of the system. The output voltage through the Arduino board is used as the power supply for other components.

#### *HC-05 Bluetooth module:*

HC-05 is a Bluetooth module used for wireless communication with Bluetooth enabled devices such as smart phones and other electronic communication devices. It communicates with microcontrollers using a serial communication. Default settings of HC-05 Bluetooth module can be changed using certain AT commands as per the requirements. It is used for many applications in our daily devices such as wireless connectivity of headset, game controllers, wireless mouse, wireless keyboard and many more consumer applications. It has a range of <100m which depends on geographic & urban conditions. It is possess IEEE 802.15.1 standardized protocol, through which one can build wireless Personal Area Network (PAN). It can also implemented in the function of Master-Slave method.

#### *Infra-Red sensor:*

An on board LED is utilized to demonstrate the nearness of a shaded portion. This is a multipurpose infrared sensor which can be utilized for identification shaded portions. The sensor gives a computerized just as simple yield. The measure of reflected light relies on the shade of surface from which it is reflected. The reflection is diverse for various shaded surfaces. This makes it a shading identifier. An IR LED and a Photo diode are utilized in a blend for nearness and shading recognition.

#### *Ultrasonic Sensor:*

Ultrasonic sensor utilizes SONAR to make a decision of the distance of an object simply like what the bats do to detect obstacles. It offers superb non-contact extend location with high exactness and stable readings in a exceedingly easy to utilize bundle from 2 cm to 400 cm range or 1" to 13 feet. Ultrasonic sensors has the ability to detect with precision of up to 0.3cm.

#### IV. BLOCK DIAGRAM

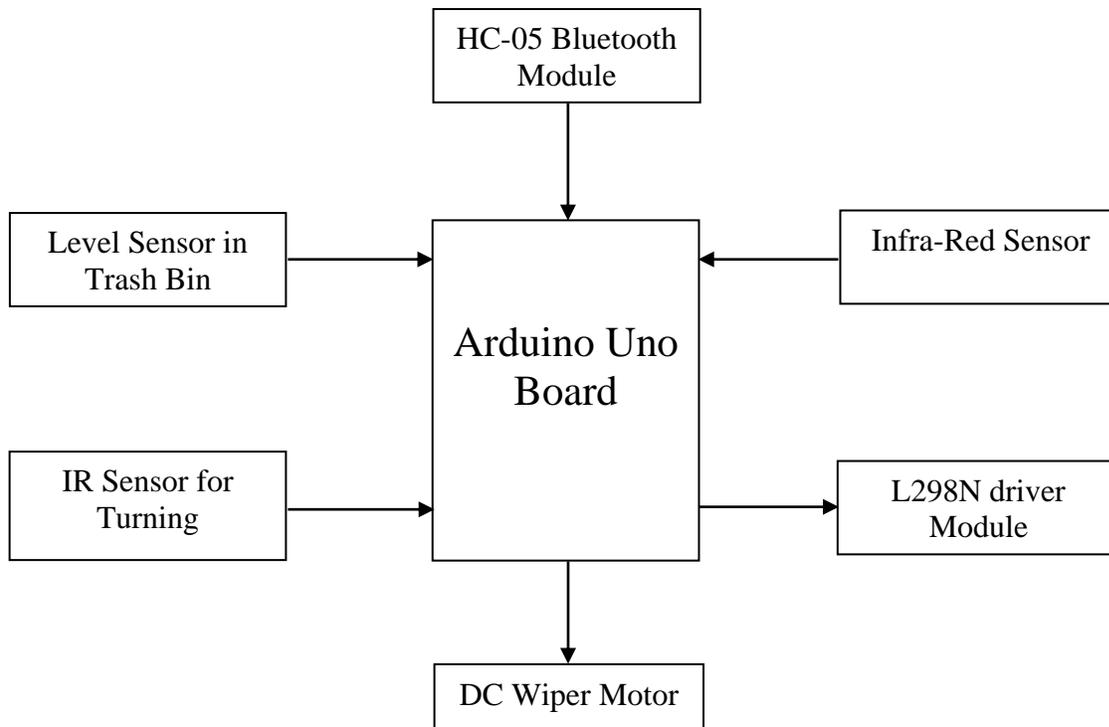


Figure 1: Block Diagram of the Circuit

The above block diagram represents the flow of information from each component to the Arduino board. The Bluetooth module sends the information of the level of trash in the bin onto the Uno board which processes it and later it activates the Motor to start moving forward with the help of the information received from the IR sensors. The required input supply is given to the motors with the help of the driver module.

### V. FLOWCHART

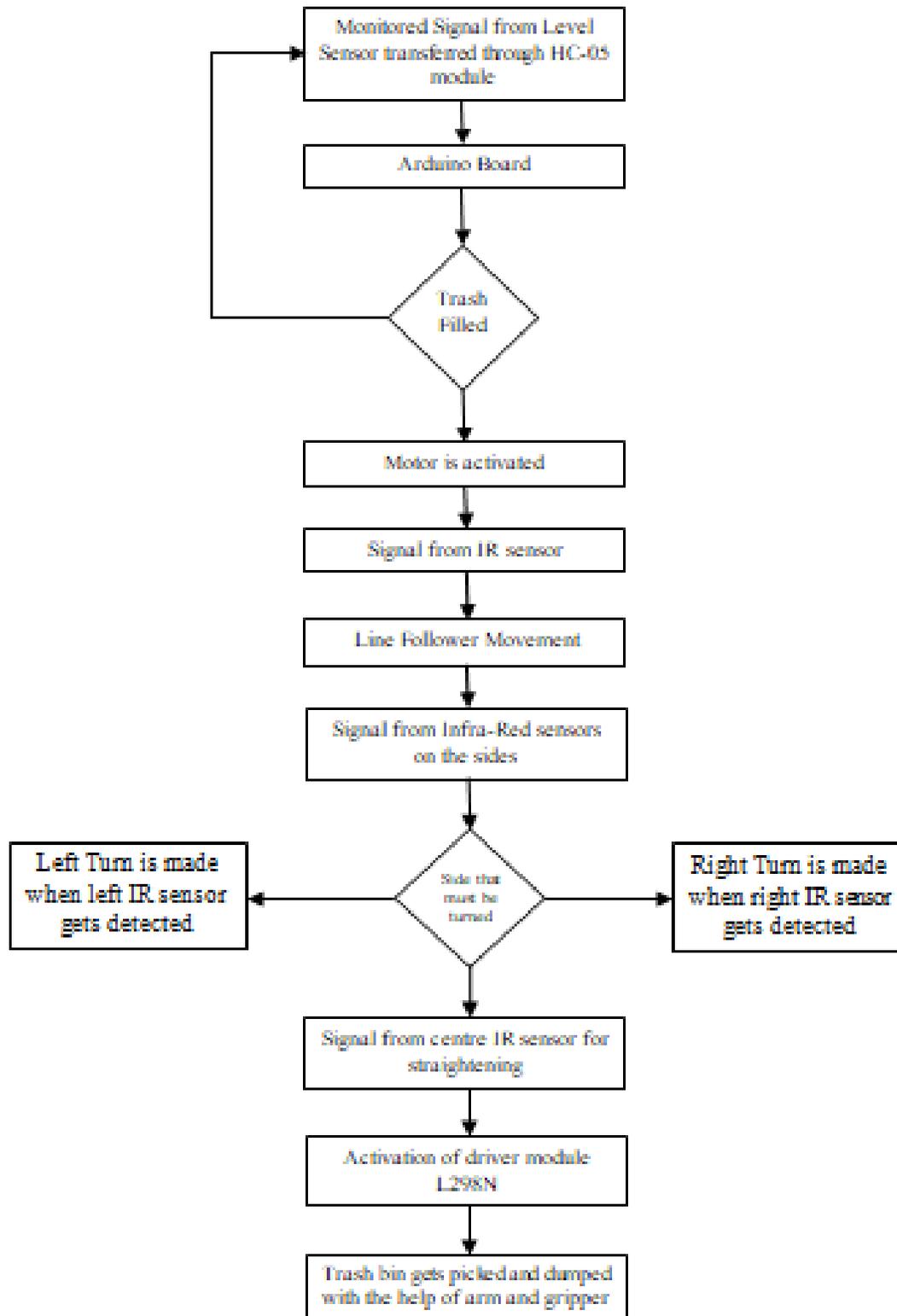


Figure 2: Flowchart of the system process

## VI. DESIGN AND FABRICATED MODEL

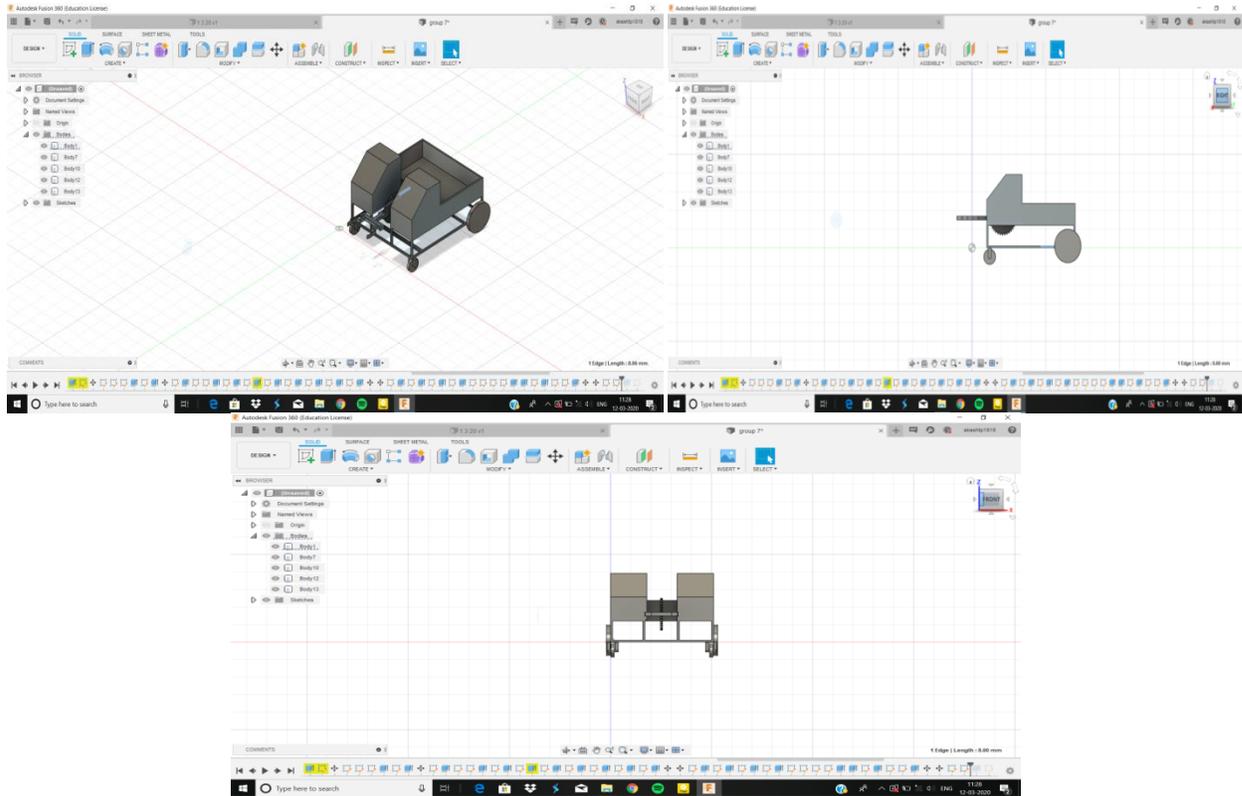


Figure 3: System Design



Figure 4: Fabricated Working Model

## VII. CONCLUSION

This is a perplexing undertaking which interfaces the information processing gadgets, for example, sensors and the Arduino Uno board. As we tend to recognize, creation of recent innovations has prompted fritter away of our valuable time by an extensive edge. This is a Mechatronics venture with such kind of utilization. The tasks like this have an incredible impact in the present situation. The machines can finish the works all the more accurately in brief timeframe with smallest of efforts. By including additional technologies such AI and Machine Learning the robot can perform far more additional tasks.

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# Concept and Features of North Indian and South Indian Temples with Special Reference to Temples in Kerala

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**Abstract-** The paper tries to analyse the similarities and differences which are generally seen in North Indian and South Indian temples. It was visible in iconographs, design and architecture of temples. The influence of Buddhism and Jainism in the construction temples are also discussed. The prevalence of Nagara and Versa architecture in the construction temples and its expansion to differed parts of India is also analysed. The expansion of the temple architecture of the Pallavas, Pandyas and Cholas to Kerala is another area of discussion in the paper. Kerala has great cultural legacy of temples and temple arts. Most of the temples are constructed either in Pallava or Pandya style of architecture. The Aryanisation in Kerala and the socio-economic changes happened here very much influenced the rise of temple culture in Kerala. In ancient and medieval period temple not only centre of worship but also great centres of learning. In the newly engaged social formation of Kerala after the decline of Second Chera Kingdom temple, particularly temple in Brahmin settlement played a crucial role in the power structure of Kerala. A close examination of the nature of the functioning of temples in Medieval and early modern Kerala reveals its deep influence in Bhakti and feudalism.

## I. INTRODUCTION

Temple is standing symbol of devotion to God. The concept of the temple was an extension of the concept of personal God. The temple was a Devalaya or a residence of a God. The deity stood or sat there on a pedestal ready to receive the prayers and gifts of the devotee, not unlike a kindly monarch on this throne who receive the humble tributes and petitions of his loyal subjects.

As a religious, institution and a place of worship, the temple in India has had a dim past. For ancient times various forms of nature worship idolatry and polytheistic beliefs have existed in India<sup>i</sup>. Belief in spirit pervading and manifesting themselves in the working of nature has been universal in Hinduism. For an idea of what the first temples were like, we must come down to Asoka, the fervent Buddhist emperor. In addition to rock-cult architecture and excavation into living rocks of *Chaityas* and *Viharas* of the Buddhist initiated by Asoka near Gaya was soon taken up in the traprock regions of the Deccan and western India, reproducing aspects of contemporary brick and timber originals which, because of the perishable nature of the fabric of their construction, did not survive the march of time<sup>ii</sup>.

This expression of forms of architecture and sculpture through the permanent medium of stone, adopted earlier by the Buddhists, then by the Hindus and the Jains, has enabled the

monuments to last for centuries and give us a fairly good idea what the contemporary religious architecture built *Stupas* and *Chaityas*, which are in essence temples, in the Eastern Andhra and northern Karnataka regions, too have survived because of the adoption of stone for their protective casing and sculptured veneer not to mention the stone railings which totally imitated timber work in their journey and fixtures. These *Stupas* and *Chaityas* show their own distinct regional characters as against their counterparts in North and North-Western India.

Buddhism almost went into complete eclipse soon. The Hindu temples to a greater extent and the Jain ones to a lesser extent predominating. There had been of course a natural heritage of ideas and usages among the three during their periods of development and growth in the region on a matrix that was essentially indigenous. More over an Indian temple is not necessarily a Hindu shrine. It can belong to any of the several religious denominations Buddhist, Hindu, Jain or Sikh<sup>iii</sup>. Barring Sikh temples where the only object of veneration is the sacred book-Guru Govindh Saheb all others are build to ever shine the images of Gods or Goddesses or saints.

From archaeological evidence it would be clear that the conception of tree-worship is very ancient, dating back to the Harappan times. There was a reference in early Buddhist texts to their existence even prior to the Buddha. In Buddhist literature such tree shrines, with or without a temple signature and not specifically Buddhist, are referred to as *rukhachitya* (Vriksha chaitya-vrikshas) or tree temples, while those around the Bodhi tree that had become sacred to the Buddhists are called *Bodhi gharas*.

The Bodhi ghara is always represented as a high gallery, open or roofed, immediately surrounding the *Bodhi* tree and the *Vajrasana* at its foot, with definitely posed entrances into the enclosed sacred area, the *Bodhi-Mandala*. The *Bodhi-ghara* structures around the principal object of worship would thus anticipate the cloister galleries (dalans) round the roofed temples structures or *Vimana*, often more than one stored enshrining the object of worship. The other type of hypothermal temple brought into vogue by the Buddhist was the *Stupa*, often called *Maha-Chaitya*. The Stupas on the East Coast, lying between Nagarjunakonda and Amaranata on one side and salihundam on the other, stupas like those at sankaram have the *ayuka* platforms on one of their sides.

Thus the Buddhist contributed a lot to the development of Indian culture and it can be visible in the cave at Sudama. It could be taken for a Buddhist *Chaitya* or one of the old saivaite sanctuaries of Kerala and could thus to be fare runner of the

apidal temple<sup>iv</sup>. After the Buddhist and the Mouryan phase the Guptas that contributed for the beginning of structural temples in stone masonry made their appearance.

The period of the imperial Guptas is described in most standard books on Indian History as one of the Hindu Renaissance. Religion was intimately connected with developments in architecture and the plastic arts. The doctrine of Bhakti and the growing importance of image worship led to the construction of the free standing temple with a sanctuary (garbhagriha). In which the central cult image was placed. Several temples with central shrines have survived from the Gupta period. It can be seen in the temple at Sanchi, Ladhkhan, Deogarh, Pigawa and Bhumara<sup>v</sup>.

The most ornate and beautifully composed example of Gupta temple building however is the fragmentary temple of Vishnu at Deogurh. It may be one of the earliest specimens of the five shrine (panchayatana) variety of temples which became common in subsequent times and which reflected the feudal hierarchization of the ever expanding Indian pantheon. But the development of free standing temples did not altogether displace cave temples.

Some of the caves at Ajanta May be assigned to the period of the Guptas, though perhaps the highest achievement of the early Indian cave architecture is seen in the Kailashanath temple at Ellora, belonging to the eighth century<sup>vi</sup>.

Gupta period saw the flourishing of the structural procedure. The ritualistic needs, connected with the worship of an image, are not quite suited to cave excavations. The proper enshrinement of an image requires a free standing temple, and this can be more easily put up but the structural method. For this purpose the employment of sized and dressed stone began in a large scale in the Gupta period. The Brahmanical temples of the Gupta period are usually small and unpretentious and represent an initial stage of development. The Gupta period constitutes an age of experiments in temple forms and types.

The flat roofed square temple with a shallow porch in front, the flat roofed square temple with a covered ambulatory surrounding the sanctum cella and preceded by a porch in front, sometimes with a secondary storage temple with a low and squat lower or *shikhara* above, the circular temple with shallow projection at the four cardinal faces. The other three groups of Gupta temples are however, supremely important as supplying the genesis of the medieval Indian temple styles. One of the most well known examples of the first group may be found in temple at Sanchi.

The location of Talakkavu in Wynad near the Mysore border, Alattur and Paruvasseri near the Kongu border, Chitral near Pandyan border would suggest that Jainism in Kerala was influenced by the centres across the political borders in Mysore, Kongu and Pandyadesa.<sup>vii</sup>

Other temples of this group are the Kankali Devi Temple at Tigawa in Jabalpur and Vishnu and Varaha temple at Eran in sugar, at Nalling in Madhyapradesh. The numerous sculptural and architectural remains found at Ggawera in Allahabad, Khoh (Nagod) etc from their style of Carlings as from the evidence of inscriptions, are known to have belonged to the period under study Cunningham and Coomaraswamy are inclined to think that Patani Devi Temple near vnchavara (Nagod) also belonged to this period. The temples at Nachna Kuthara Bhumara and Brigram have

covered ambulatory (for *Pradakshina*) and this style came to be known sandhara prasada.

The third group of Gupta temples is represented by the *shikara* or tower, capping the santum cella. In this respect it marked the beginning of movemental temple architecture in North Indian Shinkhara temple at pathari belong to the 6<sup>th</sup> century AD was the most important example for this type of architecture. The Lakshmana temple at sirpur (Rajpur) of the 7<sup>th</sup> century AD, represents one of the most beautiful monuments among the shinkara temples of the early period.

Another development of distinctive styles of which three are recognized in the Canonical Shilpa texts. They are the *Nagara*, the *Vesara* and the *Dravida*. The temple style prevalent in the region between the Himalayas and the Vindhias has been described as the *Nagara* in the available Shipla texts. With reference to the *Nagara* the texts unanimously describe it as being quadrangular all over, from the base to the stupid (*top*). The octagonal and circular shapes, prescribed respectively from the *Dravida* and *Vesara* styles, are also considered as inadequate distinguishing marks.

It is thus in the North and in the South the square pyramid of the Hindu temple terminates in a circular object<sup>viii</sup>. In the North the amalaka surmounted by a cone supporting a vase destined to receive the celestial amborsia and bearing the trident of Siva or the double triangle of Vishnu. For the Dravidian architect the roof, with the storyed pavilions, is the holy Kailasa on which stand the homer of gods, and the named them accordingly Meru, Mandara or Kailasa. Even today, the 60 metre high sanctuary tower of Brihadeswara at Tanjore is known as the Meru of the south. The same can be said of all temple, both in the North and South, built before the 14<sup>th</sup> century, since their sanctuaries hall high roof preceded by a lower and all are present the same aspect. The daria cave of the sanctuary thus appears as the centre of divine radiance glowing out on the world, and the believer who makes ritual circuit ground the walls can thus contemplate the variety of divine manifestations before uniting them in a meditation on the central symbol. Finally in as much as temple is the universe in a likeness, its dark interior is occupied only by a single image or symbol of the informing spirit, while externally its walls were collared with representation of the Divine powers in all their manifested multiplicity<sup>ix</sup>.

In visiting the shrine one proceeds inwards from multiplicity to unity, just as in contemplation; and on returning again to the outer world, one seen that one has been surrounded by all the innumerable forms that the sole seer and Agent within assumes in his playful activity. And this distinction between the outer world and the inner shrine of an Indian temple into which one enters "so us to be born again from the dark womb". It was form the beginning of the temples in India, the whole cities turned into religious cities, comprised of vast sacred documents. The organized religious, Hinduism, Jainism and Buddhism, did in their early stages of growth, spread into the southern peninsula across the Vindhyan barrier of mountains and forests because of their own vitality, in successive waves merging into the regions of the south which had variable cultures, social patterns, traditions and religious beliefs of their own not to speak of a language that could flower into its own literature, independently of every other factor. Asoka tried to spread the Buddhism through friendly relation with neighbours across the border whom he could spread his message

through his Southern administrators. Asoka's mission seem to have attained greater success in South India<sup>x</sup>. In Tamil countries of the south Ceylon as well as in Suvarnabhumi, the law of piety and through it is the culture of India had an abiding influence. The tradition of rock cut architecture and Evaluation into living rocks of Chaityas and Viharas of the Buddhist initiated by Asoka near Gaya was soon taken up in South. From the sixth and seventh centuries AD, the Hindus and Jains of the south too adopted the stone medium, and started excavating rock cut cave temples or caving out rock cut monolithic temple forms, and ultimately building them of stone. In south, the stone temple tradition was still surviving. Even the early Hindu and Jain temples came into being under the royal Patronage of the rulers of the three great empires of the South the Chalukyas, the Pallavas and the Pandyas<sup>xi</sup>. The spirit was soon caught up by the nobility the mercantile corporations and the agricultural trade, and artisan guilds that flourished during those times. The result was that chain of temples, great and small, studded every village and town of the south, which thus came to be known as the land of the temples. The temples were documented by their own expressive and detailed inscriptions.

The beginnings of the Hindu temple architecture in south India are best traced in the remains of the early Brihadratha temples of the Ikshvahas excavated at Nagarjuna Konda in 1959. Here the temple complexes are seen to comprise shrines with *ardha* and *Maha-Mandaraja* in one axial line, prakara, gopura, *stambha* etc, at this early date. One of the temples has parivaraśyas subsidiary shrines, with square, octagonal and circular plans anticipating the later *Nagara*, *Dravida* and *Vesara* styles<sup>xii</sup>.

Durga temple at Ladhkhan was another experiment seeking to adapt the Buddhist *Chaitya* to Brahmanical temple. This temple, perhaps of the eighth century, is an apsidal structure with a flat roof and a *Sikhara* rises above the *garbhagriha* and a massive square columns with heavy brackets and this forms the *pradakshina* path. Temples from the Chola times became the very hub of the rural and urban life in all its aspects – religious cultural, social economic and educational and thus became the repository of all that was best in fabric architecture, sculpture and other arts. The Jains had by then established their sangas at Madurai and even earlier their creed of the Digambara persuasion had centered principally in Sravanbelola in Mysore with its affiliates and branches the Guchchahas relating to Andhra, Karnataka, Tamil Nadu and Kerala. Hinduism witnessed great revival under the Saiva saints (Nayanars) and the Vaishnava saints (Alvars). Sankara, the great philosopher and teacher, also reformed the popular Hindu creeds- the Shanmata and the model of the related worship. In this background the growth of temples and organized temple worship became a trustworthy phenomenon.

The heaviness of the stone work relieved by an increase in the amount and quality of the sculpture. The main shrine, distinct from the Mandapa, has a *pradakshina* path. The pillared mandapa has thick walls with perforated stone windows. The square *sikhara* rises in clearly defined glories each of considerable elevation. The sculptures include the representations of *Siva*, *Nagas* and *Nagins*, and scenes from the Ramayana.

The art and architecture of the post-mahendra period, are found in the sea port town of Mamallapuram at the mouth of the Palar river, 32 miles south of Madras<sup>xiii</sup>. The monuments at Mamallapuram can be grouped into cut in cave temples, cut-out

monolithic temples now called *rathas*, sculptures in the open air rocks and structural temples. The relief is a masterpiece of classic art in the breadth of its composition, the sincerity of impulsiveness which draws all creatures together around the beneficent waters and its deep fresh love of nature.

In South India the geographical isolation of Kerala from the rest of the Sub continent caused by the western ghats had never denied her the inheritance of a common cultural heritage from the neighboring regions. Her Society which was basically Dravidian was exposed to certain extent to Aryan influences. Though, Jain, Buddhist and Brahmins coming from the Deccan, Mysore and Kalinga region. Through these immigrants the Aryan institutions and concept had also found their way to the Dravidian society of Kerala. One of the most imposing features in the landscape of early medieval South India was the temple, "the temple as an institution, was an Aryan gift to the South India and that the so called Kerala school is responsible only for covering the product of the Dravidian tradition<sup>xiv</sup>. Temples in Kerala used to be called in earlier times as *Mukkalavottam*. Later they came to be called *ambalam* or *Kshetram* or some time *tali*. The Kerala temple has *Srikovil* as its main core. The architectural style of Kerala temples has an inherent simplicity which becomes very conspicuous when juxtaposed, *Nagara*, *Vesara* and *Dravida* temple styles. Influence of the natural environment upon the temple form has to be recognized along with the socio historical developments. In its original form is closely bound to the earth; is subject to the needs of society; is faithful to a programme<sup>xv</sup>. It creates its great monuments be neatly a known sky and in a known climate upon a soil which flourishes particular material and no other. The environmental space which envelopes the architecture has a major role in the articulation of architectural form.

Unlike the other architectural traditions in the mainland the design of Kerala temples shows a close similarity with the domestic architecture of the region. It was in the style of *nalukettu* and *ettukettu* with four or eight wings, apartments or rooms, were built according to requirement, of the classical *vastuśastra*, the architect was treatise. This closeness of layout between the secular and religious architecture are not in fact uncommon when we consider other traditions all round the world<sup>xvi</sup>.

Inscriptional evidence of the ninth- tenth centuries, clearly inform the beginning of temple building in Kerala. The cave temples of seventh eighth centuries in Kerala has imbibed direct inspiration from Tamil country especially the Pandyas of Madurai. The Kerala temple tradition could, however, overcome all of its limitations by making use of indigenous raw materials like timber, bricks etc. which formed more versatile media, functionally as well as structurally. Kerala cave Temples, of which ten exist, are distributed accordingly in three groups. The Southernmost group consists of those at Tirunandikara, Vizhinjam, Tuvarankad and Bhutapandi. The central group consist of the temple at Kaviyur, Kottakkal and Aruvi para. The northern group from those at Iruvillamcode, Trikkar and Bharatanapara.

All the cave temples with apsidal ground plan, some of the Kerala temples however, can easily be associated in their structural similarity, with the Buddhist *Chaitya* halls found elsewhere in the main land<sup>xvii</sup>. The Parasurama temple at Tiruvallam, with an inscription of thirteenth century consists of a circular shrine combines with a rectangular mandapa. Another example of the *Dravida Vimana* of this phase is the

Kathirmandapam at Chalapuram<sup>xviii</sup>. In thirteen – fourteenth centuries, when the state underwent a political revival, rising out of which, a technical indigenization of its arts idioms was consciously adapted a way that it did not violate the earlier architectural tradition or the essential character and symbolism of the cult traditions of Kerala. And thus the developments which took place in the earlier periods has got further elaboration and enrichment. The temples from fourteenth century show more elaboration in the layout of such an evolved Kerala temple, the *Srikovil* forms the nucleus while the other component, like the open air *Pradakshina patha*, the *nalambalam*, the *vilakkumandapam*. In some temples, especially in South Kerala, there is another Pillared structure, the *Balikkal Mandapam* in front of the Valiyambalam providing the main entrance into the temple proper. In front of the *Balikkal Mandapam* in some cases we can see the *Koothambalam*, it used for the performance of visual arts also can be seen. The *Koothambalam* in the Haripad temple and the *Garudamanapam* at Srivallabha temple, Tiruvalla were most important architectural structures. The temple and its settlement itself became an important institution in the social life of Kerala. More over the temple expressed the architecture, sculpture and other skills of that time. But its sweep and range of activities went far beyond religion and art. It was pivot round with much of the social and cultural activities of the locality revolved. Thus the temple became the centre of cultural activities. The festivals were instituted with a view to making the Hindu religion more attractive to the common people. The development of temple arts was accompanied by the progress of sculpture and painting. This temple acted as one of the archaeological source material which reflected the Socioeconomic, political, religious and architectural skill of that society and its people. The temple proliferation brought about some changes in the religion of the people. Hinduism, which was more or higher philosophy of the few got popularized as it result. More social contracts were possible on the occasion of the numerous temple festivals which are described in inscriptions to been conducted on a grand scale<sup>xix</sup>. The festivals of the temples used to attract people from all over South India. This helped the popularization of Hinduism which was transformed into the active faith more sections of society and which evolved the participation of large number of tenants, sub-tenants, skilled artisans and other professional quantitative change in the character of the Hindu faith. The temple have played and important part in the religions, social and economic life of the people. The South Indian temple with their life and policy were essentially religious institution. They were also a powerful social and economic entity. The temple is historically more important as a social and economic entity than a religious institution. The temple was the centre of universal culture. The best architecture and sculpture and such painting as there was were lavished on it. Fine arts like music, dancing and jewel marking flourished in the temples and primarily on their account.

In Kerala, the arts associated with the temple. Arts can be defined as an expression of anything's with skill or in a well disciplines form. It may either be in the form of music, instruments, performing arts or any other form. The origin of music can be traced to the primitive days when man imitated by raising his sounds similar to bird-calls, animals noises etc. the arts associated with the temple are music in form of Soupana-Sangeetha, Musical instruments, ritualistic arts like Theyyam,

Thira etc, Performing arts like Koothu, Krishnanatam, Thullal, Kathakali etc.

Temples were developing as the ideological canthers of the agrarian settlements under the control of Brahmins. The information on Koothu and Koodiyattom shows that they were in vogue in all major temples from ninth century. The performance of Koothu was in Koothambalam specially constructed for the purpose in the temple premises. The Koothambalam in the Vadakkumnatha temple and Trisur and Irinjalakkuda. Koothu is being conducted to this. The Kerala temples are not only unique in its structural aspects but also a treasure house of carvings and mural paintings. The wood carvings in Kerala temples has a unique style. Its impact is seen in the various components parts of the temple viz, sreekovil, namaskaramandapa, koothambalam, balikkal mandapas etc. Stone carvings were also visible on the temple walls though the construction of temples is datable in 2<sup>nd</sup> century BC. In Kerala generally the temples are built with stone wall and superstructure are made of literate and studio, timber and tile<sup>xx</sup>.

The beginning of the mural painting in Kerala is still in obscurity and it is unknown when these paintings found a place in temples of Kerala. The techniques of mural paintings have been broadly described in vishudharmother 7<sup>th</sup> century, Abhilasha Chintahamani (12<sup>th</sup> century). The walls of the temples in Kerala which are made of laterite stones, granite stones etc have cavities and uneven surface. The mural paintings generally give larger life size characters and they generally depict scenes from epics and Puranans, particularly Ramayana and Mahabharatha. The colors generally used are red ocher, Yellow ocher, Green etc. there is no doubt that these paintings depict perfect craftsmanship and significance. Generally the talents of artists are executed in these mural paintings. As the themes of these paintings in Kerala are based on Puranic legends they evoke Bhakti besides being master piece of art. Sree Padmanabha Swamy Temple at Thiruvananthapuram, Sree Bhagavathi temple at Puliyarakkavu at Chirayinkeezhu, Sree Krishna Swamy Temple at Neyyettinkara, Sree Lokanarkavu at Vatakkara in Kozhikode district etc have mural paintings<sup>xxi</sup>. The carvings and mural paintings, the temples given an insight into the great cultural heritage of Kerala. The great artists who made these carvings and paintings have given us great legacy and it become an inspiration for the development of modern paintings. The art of carvings and paintings shows decline from the second half of the 19<sup>th</sup> century due to various reasons such an exorbitant cost of wood, non availability of dedicated artisans and absence of lovers of wood sculpture. The changes of political situation and lack of rulers, having aesthetic sense have resulted in the retrogression of masterpieces of wood sculpture, particularly in temples. The temple, which began as a centre of worship and as the nucleus of the Brahmin colony, began to grow in space and in the range of economic, social and even political activities with this it was able to influence to a very great extend, the pattern of economic, social, religious and political evolution in Kerala.

Several temples contained libraries and were centers of religion and secular learning. Education was promoted through the organization of *Salai*. Even public utility services like hospitals and banking were attended to by the temple. The drama closely allied to the dance, was promoted by some temples. This is relevant in the case of Kerala dance forms. In the famous book

Chilappathikaram written by Ilango Adikal, a prince of Chera kingdom of which the present Kerala was a part mention is made of this area. Mention is also made of the institution of devadasis assigned for various chosen duties connected with the temples<sup>xxii</sup>. With the success of the Bhakti movement in South India it is presumed that these dancers, through their right to perform dance offerings in the temples. There are evidences to show the existence of a powerful group of devadasis in almost all the important temples of South. There are many factors ethnic, social and religion that shaped ancient Indian education. Temples had played a greater role as educational centers, religion was one of the main factor for this temple centered education in South India, in ancient and medieval times was basically religious in character.

In ancient times, religion and education were indistinguishable and almost all the branches of education sprang from the religious rituals and sacrifices. The priests who were the authorities of the hymnal knowledge and religious rituals laid the foundation of the ancient Hindu education by way of imparting it to their kith and kin.

The temples of Hindu, Buddhist and Jaina creeds and allied institutions also played a prominent role in promoting education. Numerous inscriptions and literary evidence give as glimpses into the types of educational services rendered by the temple.

The institutions mainly concerned with the development of education in ancient and medieval period besides the Hindu temples are the ghatika, matha, agrahara, guhai, salai and Buddhist and Jaina monasteries while the temple was a symbolic expression of the religious feeling, of the people, these educational institutions stood for the propagation of the religious ideas and philosophy. These institutions played a prominent role in fostering the religious and cultural life of the people. Salai were mainly concerned with the religion and temple rituals, thus showing its close affinity to the temple. Temples acted as a repository of fine arts also Art and religion are inseparable and in fact sustain each other. Art in India was essentially channelized for religious purposes for a long time. The arts like music, dance and dramatics served as the best suited mode of worship to the people, right from the day of the initiation of religion or cult. With the advent of the Bhakti movement music and dance became part and parcel of worship. Those spontaneous outpourings of devotional hearts, the song of the Saiva Nayanars and Vaishna Alvars in praise of God are filled with music. Thus with the religious approval and sanction, the fine arts thrived well under the patronage of the temple and temple itself became the repository of fine arts.

The word salai is referred to the most of the inscriptions as a feeding house wither attached to a temple or as an independent one. It is also taken to mean as a "residential hall of learning". There are inscriptions which refer to this as an institution not merely for feeding activities, but also as a centre of learning. The tax free land given for the upkeep of the Salai was known as *salabhoga* in inscriptions. There were many of these institutions in early times in the southern part of Tamil Nadu and also in Kerala. The Salai at Parthivasekharapuram, and the celebrated Kandllur Salai are well known. Like ghatika and matha the salai was also an educational institution attached to the temple. This is evidenced by the copper plate grant of parthivasekharapuram and also founded a Salai very near to it. This Salai in all probability was associated with the temple. The temples of South India also witnessed the development of a peculiar system known as the

Devadasi system alleged to the temple especially in Kerala. The devadasis formed a unique class of employees in the temples of South India and were dedicated to the service of the Devatha or deity of the temple. In literary manner the servant of the maids of Gods.

The origin of the Devadasi system in South India may be dated to period not later than the 8<sup>th</sup> century AD. The first known mention of the Devadasis is found in an inscription in the Chokkar Temple of Malabar. It is only in the K.E. 215 (AD 1040) that Devadasis are mentioned in Thiruvananthapuram. The interventional evidence prove that the crises of temples and the Bhaktimovement started by the Alvars and Nayanars in the 8<sup>th</sup> century AD led to the crises of the institution of Devadasi system in Kerala in order to attract the people to the temple and taken to awaken their love of art. There are seven classes of Devadasis. They were (1) Datta or one given herself as gift to a temple (2) Vikrita, one who sells herself for the same purpose (3) Bhritiya, one who offers herself as a temple servant for the prosperity of her family (4) Bhakta, one who joins a temple out of devotion (5) Horuta, one who is enticed away and presented to a temple (6) Alankara, one who being well trained in professional and profusely decked is presented to a temple by nobles and kings (7) Rudra Ganika or Gopika who receives regular wages from a temple and employed to sing and dance. This system gained popularity during the time of the Cholas. Kings had taken special interest in the appointment of Devadasi in the temples.

The oldest rock edicts referring to them in Kerala is that of Chokkoor temple in Ponnani taluk which is believed to be of 932 AD. Evidences are also there at the temples of Nedumpram Tali, Tiruvalla 11<sup>th</sup> century and Kandiyoor. Sculptures showing the dance forms prevalent in those days are seen in the temples of Thirukkulsekharapuram, Thiruvikramangalam, Kidangoor, Ettumanoor, Thrikkodithanam and Thirunavaya.

In course of time, the prosperous temple which was landed magnate from the beginnings also developed into a store house of gold and silver and precious jewels as well as regular place of assembly for the rural elite<sup>xxiii</sup>. This produced the need for exclusiveness and protection leading eventually to the development of the temple to the fortress like proportions with several circles of streets with in streets Bazars and armed forces. The inscriptions of the Kulasekhara age give us information about the arrangements that had been made for the management of the temples. A committee called the Sapha was constituted for a fixed period to look after the affairs of the temple. Its members were mostly Brahmins they were known as sapha Aryar. The overall authority in regard to the management of temples was vested in the hands of Koyiladikarikal appointed by the emperor. Muzhikkulam Kacham which laid down strict rules and regulations for the temple properties, and funds by the Uralar (*trustees*) as well as neglect of duties by the Karalar (*tenants*).

The Muzhikkulam Kacham is referred to in the inscriptions of the age discovered all over Kerala from Tirunelli to Thirunandikkara in Kanyakumari districts. Some of the other Kachams of the period, was Kadamkattu Kacham, Tavanur Kacham and Sankaramangalam Kacham which laid down rules governing landlord tenant relations in regard to temple properties. The schools attached to the temple were the mainspring of religious life. The records of the religious movements in which the

South Indian rulers took an active part and have been carefully preserved in both Sanskrit and vernacular literatures.

In brief the great temples of South India were public institutions representing the collective energy of the state rather than monuments for the king's personal glorification. They had civic as well as religious uses, they fulfilled the purposes of the town hall, college and technical school. The people met in the temple porch as to elect representatives from local bodies, to listen to sacred music recitations or plays. The school attached to the temples were the repositories of the philosophical thought which were the main spring of the religious life. The records of the religious movements in which the South Indian rulers took an active part have been carefully preserved in both Sanskrit and vernacular literature. Then the rulers built temples tell nothing of their lives except brief summaries of conquests which made so little impression on the popular memory that whole dynasties were

forgotten although their temples are still in daily use. Kerala temples which are monuments of legacy and ancient culture and take earnest effort to preserve them. In temples one can see two types of activities the spiritualistic and non-spiritualistic. The non-obligation items often seen such as maintenance of colleges, Kalyanamandapa etc. Temple patronized music, dance and other fine arts. The temples also became great centers in fostering and encouraging fine arts like music, dance, drama, sculptures, painting and other kind of art.

AUTHORS

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# Does Phillips Curve Apply in ASEAN Countries?

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**Abstract-** This study aims to prove again whether the applied Phillips curve occurred in 10 ASEAN countries namely Indonesia, Philippines, Malaysia, Singapore, Brunei Darussalam, Thailand, Vietnam, Laos, Cambodia, and Myanmar over the past ten years (2008-2017). The research is quantitative and is processed using the dynamic panel data method. The results of the study are in the short and long term there is a trade-off between the variables of inflation and unemployment, so it is concluded that the Phillips curve applies in 10 ASEAN countries.

**Index Terms-** inflation, unemployment, Phillips curve, dynamic panel data.

## I. INTRODUCTION

Inflation and unemployment are the macroeconomy indicators to see a country's economic stability. For the last few years, unemployment is highly increasing and the opportunity to get a job is becoming more difficult. Most economists agree that in the short-run, there is an inverse relationship between unemployment and inflation. While in long-run, such a relationship does not exist. Inflation is simply defined as the increase in the prices generally and continuously. Inflation can be the effect of both demand and supply, so the approaching policies to control it should consider both sides. On the demand side, the inflation control is needed to keep the people's purchasing power, while on the supply side, the inflation control is needed to maintain the production costs to keep the businessmen surviving and competing. If the inflation is uncontrolled, the businessmen will dismiss their employees and such action will increase the unemployment. Unemployment is an unavoidable problem of a country and it may lead to social problems such as crimes as well as economic problems. The condition may decrease people's well-being and their purchasing power.

Both variables are economically related. When unemployment is high, inflation is low and vice versa (Umaru & Zubairu, 2012). Every economy will put an effort to maintain both at a low level, mostly in one-digit level, because by then, the country's macroeconomic policy tends to be stable. The stability is important to achieve the economy's growth and development effectively, as well as to reach the economic goals and objectives (Orji, Orji-Anthony, & Okafor, 2015). Inflation and unemployment are very important to any economic growth and development. Both factors are especially used in assessing the poverty level in a developing country. Thus, the countries will be encouraged to escalate their production level to help to reduce the inflation effect in the economy. Besides, the increase in goods and services will raise the living standard, hence creating social harmony in a country.

Inflation and unemployment cannot be totally eradicated, but both can be controlled using the policy instrument. Certain inflation and unemployment are needed to maintain the market's equilibrium. The relationship between unemployment and inflation is stated in a Phillips curve, in which there is a trade-off between both variables. The classic economist defined the long-run Phillips curve as a natural unemployment level in an economy. This explains that in the long-run, inflation and unemployment are not meant to be related (Phillips, 1958). The validity of the Phillips hypothesis was examined by Furuoka & Munir (2014) in Malaysia, but the study finding of Al-zeaud (2014) in Jordan concluded that there is no causality between unemployment and inflation. This study also found that the Phillips curve did not apply to Rusia (Alisa, 2015). Such findings raise questions, how about countries of ASEAN?. ASEAN (Association of Southeast Asian Nations) is an international organization in Southeast Asia consists of Indonesia, Philippines, Malaysia, Singapore, Brunei Darussalam, Thailand, Vietnam, Laos, Cambodia, and Myanmar. Most ASEAN countries are developing country, with an exception of Singapore and Brunei Darussalam who have a high income per capita. Countries in ASEAN most definitely have inflation and unemployment problem at different magnitudes, both in short-run and long-run. Based on the problem, this study aims to review the relationship between inflation and unemployment in ten ASEAN countries.

## II. LITERATURE REVIEW AND HYPOTHESIS

Many pieces of research about inflation and unemployment have been conducted in developed countries. Inflation is described as an economic situation when the increase in the money supply is faster than the production of new goods and services in the same economy (Hamilton, 2001). Inflation is further described as a sustained rise in prices of goods and services within a certain period (Balami, 2006). According to Keynes theory, inflation occurs because people spend beyond their economic ability. This theory highlights how the struggle for economic resources between groups of people can lead to aggregate demand that is greater than the number of goods available. The inflation rate can differ between one country to another, or within a country in a different time period. According to its rate, inflation is divided into three categories: creeping inflation, galloping inflation, and hyperinflation.

Creeping inflation is characterized by a low rate of inflation (less than 10 percent per annum). The price of increase rises slowly with a low percentage in the relatively long time period. Galloping inflation is characterized by the exceptionally high price rises (around double or even triple digit) and sometimes occurs in a relatively short time period and is accelerated. It means that the prices of this week/month are higher than last week/month. It damages the economy greater than creeping inflation. The hyperinflation is the most damaging inflation. The prices may rise 5 or even 6 times higher. People will no longer want to keep their money. The money value drops sharply that it is better to be exchanged with goods. The circulation of money is faster as the prices rise in acceleration. This situation is most likely comes when the government experiences a budget deficit that is solved by printing more money.

The Phillips Curve states that there is a trade-off between inflation and unemployment. It means that when inflation is high, the unemployment will be low and vice versa. In such a case, unemployment becomes the output and inflation is described as the change of prices. The condition when the unemployment is simultaneously high followed by the high inflation is called the stagflation. A. W. Phillips (1958) described how the relationship between the inflation and unemployment level is based on the assumption that inflation is the depiction of the aggregate demand increases. When the aggregate demand increase, it would suit the theory of demand that if the demand rises, the prices will rise too. The high price (inflation) will encourage the producers to increase the production capacity by adding more manpower (in an assumption that manpower is the only input that can increase the output). As the effect of the increase in demand for manpower, the price will rise (inflation) and the unemployment will decrease.

The study about the relationship between the unemployment level and the inflation that is in line with the Phillips curve has been done in various countries. Furuoka and Munir study in Malaysia found that there is a strong relationship between the unemployment level and inflation using the error correction model (ECM) approach within 30 years time period (1975-2004). A study conducted by Al-Zeaud (2014) using the Granger causality investigated that there was no trade-off between the unemployment and inflation in the economy of Jordan within 28 years time period (1984-2011). This study recommended the productive projects creation and intensive labors, replace the foreign labor with local labor, as well as keep controlling the inflation to solve the unemployment. The same occurrence happened in Russia in the study finding by Alisa (2015) that used two time approaches, long-run (1999-2015) and short-run (January until December 2014). The study finding shows that a certain level of inflation and unemployment is needed to maintain the equilibrium of the market and the Phillips curve does not really apply to Russia modern situation. Research by Ningsih (2010) also found that there is no relationship between inflation and unemployment level in Indonesia, as well as study finding by Qomariyah (2013) in East Java. Based on the Phillips theory and previous empirical research, the hypothesis built in this study stated that the unemployment level significantly affects inflation.

The main source of inflation and unemployment is fiscal and monetary policies as well as the balance of payments. The increase of circulation money causes monetary policy inflation while the fiscal policy especially involves the deficit of budgets. The fiscal policy inflation also closely relates to the aforementioned explanation about the monetary policy inflation because the printing of money mostly used for paying the government deficit. Furthermore, in the balance of payment aspect, the high exchange value is also important. This is because the increase of the exchange value leads to the increase of import prices as well as escalate the inflation expectation that will cause inflation (Umaru, Donga, & Musa, 2013). A study conducted on the inflation and unemployment in UE within 1998-2007 time period found that there was a negative relationship between inflation and unemployment (Popovic & Popovic, 2009). Another study conducted using the economic situation in Nigeria found that there was no tradeoff between both factors (Abachi, 1998). There was also an examination in the relationship between money, inflation, and output using the co-integration and the granger's causality test. The study showed that the co-integration vector was unavailable in the series used. Granger concluded that the money supply caused output and inflation. It further confirmed that the monetary policy has a bigger input in the stability of prices in the economy of Nigeria just because the variation of the price level was highly affected by the money supply. Therefore, the inflation in the economy will especially become a monetary problem (Omoke & Ugwuanyi, 2010). The inflation has an alarming effect especially on the fixed incomes in an economy; this will drastically affect the people's living standard because it causes the decreases of real income, saving, and capital form (Buhari, 1987). The economic

growth is greatly affected by the inflation hence the limitation of economic development in a country will trouble the population (Adamson, 2000).

### III. RESEARCH METHOD

This is quantitative research using secondary data. The data analysis method used was the dynamic panel data analysis mode. The Error Correction Model (ECM) is a short-run balance that requires the co-integration relationship between variables. The estimation of the short-run was previously conducted after estimating the long-run. The variables of this study were inflation and unemployment. According to the Bank of Indonesia, inflation is simply defined as the increase of the prices generally and continuously in a certain time period. In this study, the inflation variable is stated in percentage. According to the Central Bureau of Statistic, in the employment indicator, the unemployment is the resident, who does not work but is looking for a job or is preparing for a business, or the resident who does not look for a job because he has been accepted to work but has not started working. In this study, the unemployment variable is stated in a percentage. The model specification of the long-run relationship formulation was stated in the following equation:

$$\text{Log INF}_{it} = \beta_0 + \beta_1 \text{LogUNM}_{it} + \varepsilon_i \dots (1)$$

While the formulation of the short-run relationship was stated in this following equation:

$$\text{DLogINF}_{it} = \beta_0 + \beta_1 \text{DlogUNM}_{it} + \beta_2 \text{BLogUNM}_{it} + \beta_3 \text{ECT} \dots (2)$$

In which

- INF = inflation
- UNM = unemployment
- B = operation lag
- D = changes
- DLogINF = LogINF - BLogINF
- DLogUNM = LogUNM - BLogUNM
- BLogINF = Log INF – LogINF-1
- BLogUNM = LogUNM - LogUNM-1
- ECT = LogUNM-1 - LogINF-1
- $\beta_1, \beta_2$  = coefficient
- i = cross section
- t = time series
- $\varepsilon_i$  = the error component on the unobservable individual specific effect.

### IV. RESULTS AND DISCUSSION

Before doing a regression using the ECM test, we had to make sure that the variables used had been stationer. An initial test was conducted to test all the variables using the unit roots test, with the result as follows:

Table I: The Estimation Result of Unit Roots Test on Inflation (INF) Variable at the Level Difference

Test	Probability value	Significance level	Conclusion
LLC	0,0000	0,05	Stationer
IPS	0,0000	0,05	Stationer
ADF	0,0000	0,05	Stationer
PP	0,0000	0,05	Stationer

Table II: The Estimation Result of Unit Roots Test on Unemployment (UNM) Variable at the Level Difference

Test	Probability value	Significance level	Conclusion
LLC	0,0000	0,05	Stationer
IPS	0,2385	0,05	Not Stationer
ADF	0,1700	0,05	Not Stationer
PP	0,1010	0,05	Not Stationer

Based on the estimation result on table I and II in the level stage, the finding showed that the data used in inflation variable was stationer, but only one test in the unemployment variable data that was stationer, so it can be concluded that the data in the unemployment variable was not stationer yet. The variable had not been stationer because its probability value or statistic value was bigger than significance level 5%. Therefore, the test was continued by the first level integration test, which was the higher unit roots test to get stationer data. The integration level test was done because there was a variable that had not been stationary on the previous test. An integration level test with level 1 unit roots test (first difference) was then conducted and resulted in this following finding:

Table III: The Estimation Result of Unit Roots Test on Inflation (INF) Variable at the 1st Difference

Test	Probability value	Significance level	Conclusion
LLC	0,0000	0,05	Stationer
IPS	0,0000	0,05	Stationer
ADF	0,0000	0,05	Stationer
PP	0,0000	0,05	Stationer

Table IV: The Estimation Result of Unit Roots Test on Unemployment (UNM) Variable at the 1st Difference

Test	Probability value	Significance level	Conclusion
LLC	0,0000	0,05	Stationer
IPS	0,0000	0,05	Stationer
ADF	0,0000	0,05	Stationer
PP	0,0000	0,05	Stationer

Based on the estimation result on the tables above with the integration degree test using unit roots test level 1 (first difference), it can be seen that all the variables tested were stationer, which was seen by their probability values that were lower than the significance level 5%. It could be concluded that all the variables were stationer on the 1st level of unit roots test (first difference). Because all the variables were stationer, a co-integration test (Johansen) was conducted to see the variables in the long-run. The result of the co-integration test is shown in table V. The variables were co-integrated or were considered to have a long-term relationship when their probability value was less than the significance level of 5%. Then, based on the finding on table V, it can be seen that the probability value of PP panel and ADF panel were less than 5%, which were 0.0403 and 0.00269; it showed that the observed variables had a long-run relationship or were co-integrated. Furthermore, an estimation of co-integration panel balance and error correction method was conducted in the short-run through regression panel.

Table V: Residual Pedroni Co-integration Test

Pedroni Residual Co-integration Test				
Series: UNM INF				
Null Hypothesis: Co-integration				
Trend assumption: No deterministic intercept or trend				
Automatic lag length selection based on SIC with a max lag of 1				
User-specified bandwidth: 2 and Bartlett kernel				
Alternative hypothesis: common AR coefs. (within-dimension)				
	<u>Statistic</u>	<u>Prob.</u>	<u>Weighted Statistic</u>	<u>Prob.</u>
Panel PP-Statistic	-1.747673	0.0403	-5.521034	0.0000
Panel ADF-Statistic	-1.530677	0.0269	-5.299156	0.0000
Alternative hypothesis: individual AR coefs. (between-dimension)				
	<u>Statistic</u>	<u>Prob.</u>		
Group PP-Statistic	-2.626787	0.0043		
Group ADF-Statistic	-2.436556	0.0074		

The ECM test was conducted to find out whether the independent variable affected the dependent variable in the short-run period. According to the previous tests, the variables were stationary on the first difference and the variables were co-integrated, so the ECM estimation was then conducted to the variables. The ECM estimation equation used was stated as follows:

$$DLINF_{it} = \beta_0 + \beta_1 DLUNM_{it} + \beta_2 BLUNM_{it} + \beta_3 ECT \dots\dots\dots (3)$$

The ECM estimation equation in short-run finding was shown in table 6. The estimation finding was stated in a short-run ECM regression equation as follows:

$$DLINF_{it} = 0,428722 - 1.407346DLUNM_{it} - 0,555122BLUNM_{it} + 0,560572ECT \dots\dots\dots(4)$$

Based on the calculation with ECM analysis above, we found out the ECT variable value, in which ECT was used as the indicator that the model specification was considered as good or not according to the significance and the coefficient of the error correction (Insukindro and Aliman, 1999: 54). Came from the ECM linear regression function above, it could be seen that the ECT coefficient value (error correction term) was 0. 560572. It means that the proportion of the cost of imbalance in the inflation development to the unemployment on the previous period which was suited to the current period was around 0. 560572%. Assessed by its significance level, the ECT showed 0.0000 values which were significant on 5% level. It means the model specification was valid and indicated a short-run and a long-run relationship.

Table VI. ECM Test Result

Dependent Variable: D(LINF)				
Method: Panel Least Squares				
Periods included: 9				
Cross-sections included: 10				
Total panel (unbalanced) observations: 77				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.428722	0.176843	2.424303	0.0178
D(LUNM)	-1.407346	0.605506	-2.324247	0.0229
LUNM(-1)	-0.555122	0.137226	-4.045323	0.0001
LUNM(-1)-LINF(-1)	0.560572	0.093357	6.004606	0.0000
R-squared	0.362101	Mean dependent var		-0.121312
Adjusted R-squared	0.335886	S.D. dependent var		1.090739
S.E. of regression	0.888878	Akaike info criterion		2.652838
Sum squared resid	57.67766	Schwarz criterion		2.774594
Log-likelihood	-98.13425	Hannan-Quinn criter.		2.701539
F-statistic	13.81271	Durbin-Watson stat		1.776454
Prob(F-statistic)	0.000000			

The constant value on the short-run was 0.428722 according to the estimation above, which indicates that the change of inflation on the unemployment was 0.428722% if all the explanatory variables were zero. The ECM estimation result above showed that in the short-run, the unemployment variable has a negative and significant relationship with the inflation rate. On the short-run, the coefficient of unemployment variable was -1.407346 with a probability value of 0.0229 which means it is insignificant on the significance level 5%. After the ECM estimation result on the short-run was obtained, the next step was finding the long-run coefficient. The formula used to calculate the long-run coefficient according to Widarjono (2009) was stated as follows:

$$\text{Constanta} = (\beta_0 / \beta_3)$$

$$B(\text{LUNM}) = (\beta_2 + \beta_3) / \beta_3$$

Based on the formula and the short-run regression result, the long-run coefficient could be calculated with the result as follows:

$$DL INF_{it} = 0,428722 - 1.407346DLUNM_{it} - 0,555122BLUNM_{it} + 0,560572ECT \dots\dots\dots(5)$$

The number of long-term regression coefficient was calculated of using this following formula:

$$\begin{aligned} \text{Constanta (C)} &= (\beta_0 / \beta_3) \\ &= (0.428722 / 0.560572) \\ &= 0.764793817 \end{aligned}$$

$$\begin{aligned} \text{BLUNM} &= (\beta_2 + \beta_3) / \beta_3 \\ &= (-0.555122 + 0,560572) / 0,560572 \\ &= -0,009722212312 \end{aligned}$$

Table VII: The Long-term ECM Estimation Result

Variable	Coefficient	T – Statistic	Prob.
C	0.7647	2.4243	0.0178
BLUNM	-0,0097	-4.0453	0,0001

Based on the result shown in table 7, the result of long-term ECM regression was stated as follows:

$$\text{DLINF}_{it} = 0,7647 - 0,0097\text{BLUNM}_{it} + 0,560572\text{ECT} \dots\dots\dots (6)$$

According to the study findings, on the short and long-run, the inflation and unemployment relationship in ten ASEAN countries (Indonesia, Philippines, Malaysia, Singapore, Brunei Darussalam, Thailand, Vietnam, Laos, Cambodia, and Myanmar) is negative and significant. Such finding is in line with the Phillips theory that on the short-run, there is a tradeoff between inflation and unemployment, and is suitable with previous researches by Safdari, Hosseiny, Sachsidaa, Divinob & Cajueiroc (2011), Prado, Rao & Sheremirov (2018), as well as the study by Furuoka (2007) and Furuoka & Munir (2014) in Malaysia, the study by Insukindro & Sahadewo (2010) in Indonesia, the study by Erdal, Dogan, & Karakas (2014) in Turkey, as well as the research by Singh (2016) in India and Bhattarai (2016) in OECD countries.

ASEAN (Association of Southeast Asian Nations) is a geopolitical and economic organization found by the countries in Southeast Asia with the objective to improve the economic growth, develop the cultures of the member countries, maintain the stability and the peace as well as provide the opportunity to the members to discuss the differences peacefully. The countries in Southeast Asia are mostly developing countries, which are the countries that are developing anything inside, including the governmental system and the economy. Even though most of the countries are developing countries, there is also a developed country in Southeast Asia, which is Singapore. The economy in Singapore is supported by the service sector, manufacture, and construction that it takes up a lot of manpower. The increasing inflation rate in 2011 was caused by the housing and car prices that were relatively high.

Another ASEAN country, Indonesia, has a characteristic inflationary behavior given its nature or characteristic as a developing country, which has imperfect information or problematic institutions. Indonesia also has an open economy so that any internal or external shock may contribute to inflation. An in-depth knowledge regarding the factors that influence the inflation behavior in Indonesia is extremely necessary (Insukindro & Sahadewo, 2010). The relationship between the unemployment level and inflation level in Malaysia may be an interesting example. There is an inverse relationship between the unemployment level and inflation level. In the 1970s, the unemployment level of Malaysia was above 5%. In 1981 and 1982, it decreased to below 5%. Since 1983, the unemployment level has gradually increased and reached 8.7% in 1987. However, since 1988, the unemployment rate was declining due to the economic boom and it reached 2.6% in 1997. From 1998 to 2004, the unemployment rate remained around 3.5% (Furuoka, 2007). Compared to the unemployment rate, there were greater fluctuations in the inflation rate in Malaysia between 1975 and 2004. In the second half of the 1970s, the inflation rate in Malaysia was around 4%. In 1980, the inflation rate increased and reached 6,6% and continued increasing to 9.7% in 1981. However, since 1982 the inflation rate has declined and reached less than 1% in 1985. In the first half of the 1990s, the inflation rate was stable at 4%. Because the Asia economy was on the crisis in 1997, the inflation rate in Malaysia increased to 5.2% in 1998. From 2000-2004, the inflation rate was stable and remained at around 1.5% (Furuoka, 2007). Inflation and unemployment are the important measures of the economic performance and they are often seen through the Phillips curve. The Phillips Curve reflects the short-run aggregate supply curve that can affect the aggregate demand curve through monetary and fiscal policies. At all times, expected inflation and the supply shocks can be out of control of policymakers. However, by changing the aggregate demand, policymaker may change output, unemployment, and inflation (Mankiw, 2007).

The Phillips Curve does not only have a strong theoretical basis but also implies politic. There is a little doubt that one of the main policy targets of the Central Bank is stabilizing the price by controlling inflation. Many central banks tend to use the monetary-fiscal to keep the inflation target as low as possible. However, if the tradeoff between inflation and unemployment occurs, the central banks are able to keep the low inflation level just by sacrificing high unemployment. In other words, the governors of the central bank will face a serious dilemma to decide whether they would like to have the combination of low inflation and high unemployment, or vice versa. In this context, the "Phillips Curve" becomes an important criterion for the decision makers of the central banks until 1980 when that hypothesis was strongly argued by several economists that owned different thoughts. This is a warning to policy makers (government) on how far they are able to reduce the inflation rate or the unemployment rate without too much-risking others because of the tradeoff relationship between these macroeconomic variables.

On the other hand, the high unemployment rate problem has become the only important political issue in many countries including ASEAN countries. The political leader in ASEAN countries may be worried about the high unemployment rate in their countries. They may be against the central bank initiative to stabilize the price market if such monetary fiscal negatively impacts the unemployment rate. In other words, the central bank and the political leader may have a different opinion about the consequences of the price stabilization policy. At every point of time, the policy makers who control the aggregate demand may choose the combination of inflation and unemployment. The high inflation causes the side attitude in capital flows and the loss of purchasing power in personal income as well as an increase of needs for external sources. In addition, it may cause the income distribution gap. The phenomenon of unemployment is easier to understand compared to the direct effect of inflation on society. This may lead to destructive social patterns, cause social unrest, and diverse family integrity. For this reason, it seems like the better idea for macroeconomic policymakers to pay attention to the reciprocal interaction of these two factors instead of making choice between them. It seems that this is the best way to keep the inflation rate at an optimal and stable level by economic means and to state a natural and appropriate unemployment rate. Thus, there is a need for strong institutional collaboration and inter-ministerial relations to handle these macroeconomic variables.

## V. CONCLUSION

According to the study findings, on the short and long run, the inflation and unemployment relationship in ten ASEAN countries (Indonesia, Philippines, Malaysia, Singapore, Brunei Darussalam, Thailand, Vietnam, Laos, Cambodia, and Myanmar) were negative and significant. This finding is in line with the Phillips theory which states in the short-run there is a tradeoff between inflation and unemployment. On the other hand, the high unemployment problem seems to become the only important political issue in many countries, especially the ASEAN country. The political leader in ASEAN countries may worry about the high unemployment rate in their countries. They may be against the central banks initiative to stabilize the price level if the monetary policy negatively impacts the unemployment rate. In other words, the central bank and the political leader may have a different opinion on the consequences of the price stabilization policy. Based on the study findings, there are some suggestions of alternative policies such as utilizing the modern technology efficiently to create more sustainable job and increasing the wage of the labor, as well as developing the infrastructure especially electricity, which in turn may generate employment.

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# The Use Of Group Work To Enhance Speaking Skills For High School Students In Vietnam

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## Abstract

The present study aims to investigate the significance of using cooperative group work on improving students' speaking production and communicative skills in EFL classes. The present work is mainly attempts to investigate the students' awareness of the important of speaking skills in learning English at some high schools in Thai Nguyen province, Vietnam. The results of the study show that most of the students think that speaking is difficult for them because of the lack of real practice. They all agreed that cooperative group working will help them to talk more in a speaking class. It is also true for teachers who participate in the semi-structured interview. The findings from this research provide evidence that cooperative group work is the right technique for developing students' language use and increasing their classroom oral participation in interactional environment.

**Key words:** *cooperative, group work, speaking skills, communicative skills, language learning*

## I. INTRODUCTION

The main objective of learning a foreign language is to be able to communicate in that language. The students in Vietnam have many difficulties when they communicate in the English language. Improving the learners speaking ability in English is one of the most important challenges that Vietnamese teachers try to achieve. The problem we are confronted with here is that the importance of classroom participation is almost neglected and of little interest and the learners are just passive consumers of the knowledge.

It is generally accepted that knowing a language and being able to speak it are not synonymous because speaking is a skill which has to be developed and practiced inside and outside the classroom. We all know that speaking is one of the four macro language skills. For students who learn English as a foreign language in Vietnam, speaking can be seen as the most challenged task for them. This is because of some reasons. Firstly, the class size is large. There are often 30 to 40 students in a class that makes it impossible for teachers to take care of them individually. Secondly, students lack of background knowledge of the topic to be discussed. Thirdly, they might feel insecure about their performance in the target language or they do not want to lose face in front of their classmates so they are reluctant to speak in English. This can be solved by participation in speaking activities in groups that can limit the embarrassment while speaking English.

The use of group work has become more appealing in the teaching and learning process, as it is interactive and encouraging. Group work can be used in teaching varieties of language skills, namely speaking, listening, reading, and writing. Group work offers students opportunities to refine their understanding through discussions with members. It is often recommended for developing social interactions and language skills. It is also a means by which students can support, challenge and extend their learning together, for example by searching for information or through problem solving or working on creative tasks.

According to Douglas (2000: 11) group work can develop the students to interact with other students. It means that group work can develop quite warm, friendly atmospheres in which members feel comfortable and accepted in their membership. The appropriate use of group work in language classroom brings several benefits for the students. First, group work demonstrates the ability of students to communicate, discuss, and cooperate with other students. Second, group work is an effective means of dividing the workload. Third, this allows for small sections or units to be completed providing a sense of completion for everyone and allows better management of the project as a whole. As the result, group work can promote students' practice, the quality of their talk, their motivation, and positive classroom atmosphere in teaching and learning speaking.

### Aims of the study

The overall aims of this study are firstly to advance an understanding of the effectiveness of cooperative learning strategies in the classroom to enhance speaking skill. Secondly, the researcher would like to explore teachers' awareness towards cooperative learning activities such as pair works and group works. Finally, we would find out the effect of using cooperative activities in enhancing speaking ability

### Research questions

With the objectives stated above, the study aims to answer the following research questions:

- *What are students' perceptions towards group working activities to enhance speaking ability?*
- *What are teachers' awareness of the using cooperative learning?*
- *How can cooperative learning technique affect the learners' speaking skills?*

## II. LITERATURE REVIEW

Teaching English as a foreign language (TEFL) requires learners' exposure to what is called the foreign language skills: reading, speaking, writing and listening. The main aim of acquiring such language skills are to achieve a high development of abilities of receiving and producing the second language either in oral or written form. Speaking skill has always been considered as the most essential skill to be mastered and developed because it is necessary for displaying the language proficiency, learners are going to be put in situations where communication in English is needed, that is why the emphasis is mainly on speaking. So that it is the teacher job and responsibility to develop learners' oral proficiency to allow them effectively use their background knowledge to respond coherently in a given communicative situation.

### **Communicative language teaching**

The foreign language teaching in general and English language teaching in particular has witnessed many changes over the last few years. Many methods and approaches have been investigated, trialed and piloted. These changes have created a variety of methods with different principles and techniques. Among them we have the grammar–translation method, the total physical response, the natural approach, and many others. In the 1970s, a reaction to traditional language teaching methods and approaches began and spread around the world as older methods such as grammar–translation method, audiolingualism, and situational language teaching. With the growing need for good communication skills and the importance of English on today's world, teachers seek to discover a significant that meets the demand of students to use this language for communication. Thus, communicative language teaching (CLT) is viewed as the best approach for this purpose. It is mainly related to the idea of Harmer (2001: 70) which stated that “language learning will take care of itself”. According to the center for applied linguistics members, communicative language teaching is considered as the product of educators and linguists who had grown dissatisfied with the audiolingual and grammar-translation methods of foreign language instruction.

Therefore, on account of the limitations of the previous methods, CLT has been developed and it mainly focused on the students' ability to interact and communicate which was absent in the other methods. Nowadays, communicative language teaching is considered as an approach for teaching rather than a method; hence, it is based on the idea that language learning means learning how to use the language to achieve a better communication inside and outside the classroom. Richards & Rodgers (2001, quoted in Brown, 2007: 241) noted that “CLT is best understood as an approach rather than a method”. CLT leads to a re-examination of language teaching goals, syllabi, and classroom activities and has had a major impact on changes in language teaching worldwide. Some of its principles have been incorporated into other communicative approaches, such as Task-Based language teaching, Cooperative language learning, and Content-Based instruction.

Spada (2007) distinguished two versions of communicative language teaching, weak and strong versions, both of which emphasized the importance of promoting learners' communicative competence in the target language. The weak version's general consensus was that communicative language teaching is a meaning-based, learner-centered approach to second language teaching where fluency is given priority over accuracy and the emphasis is on the comprehension and the production of messages, not the teaching or the correction of the language form. Spada's strong version (2007: 275) described “communicative language teaching is an approach to L2 instruction which is primarily meaning-based and includes attention to both fluency and accuracy. When we compare the two versions we find that, the first one could be described as ‘learning to use English’ while the second one entails using English to learn it”.

Communicative language teaching (CLT) refers to both processes and goals in language classroom. The central concept in CLT is ‘Communicative Competence’. Therefore, it aims to make communicative competence the goal of language teaching; it means the ability to use the linguistic system effectively and appropriately. In other words, its goal is making use of real-life situations in which communication is needed. Richards (2005: 3) declared that:

“CLT can be understood as a set of principles about the goals of language teaching, how learners learn a language, the kinds of classroom activities that best facilitate learning, and the roles of teachers and learners in the classroom”.

A deep understanding of Communicative Language Teaching theory and its implication for classroom practice is very crucial for both teachers and learners, as it aims to help learners to use the target language for communication. In addition, to give learners freedom to say what they want and when they want.

### **The nature of speaking**

Speaking is one of the four macro skills in addition to listening, reading and writing that are necessary for effective communication language in both first and second language learning contexts. As it was noted at the beginning of this work, the main objective of learning any foreign language is to be able to speak and communicate in that language. So speaking is very important since it provides learners with the opportunity to hold successful conversation as well as manage interaction.

The learning of English speaking skills is a preference for a lot of English as a foreign/second language learners. Language learners sometimes evaluate their success in language learning based on how well they have improved in their spoken language ability. Teachers and textbooks use either direct approaches that concentrate on particular aspects of oral interaction such as turn-taking and topic management or indirect approaches which make situations for oral interaction by group work, task work, and other strategies (Richards, 1990).

According to Harmer (2007), human communication is a complex process. Persons need communication when they want to say something and transmit information. Speakers use communication when they are going to inform someone about something. Speakers apply language according to their own goals. Therefore, speakers should be both listeners and speakers at the same time

for the effective communication.

Speaking is very important in second language learning. Despite its importance, speaking has been overlooked in schools and universities due to different reasons like emphasis on grammar and unfavorable teacher-student proportions. Speaking has been absent from testing because of the problem in assessing it objectively and the time it takes to carry out speaking tests (Clifford, 1987). Speaking is a skill which is worthy of attention in both first and second language. Learning the speaking skill is the most important aspect of learning a second or foreign language and success is measured based on the ability to perform a conversation in the language (Nunan, 1995).

Of the most difficult skills language learners face in language learning is speaking skill. It is believed that speaking is the most important of the four language skills. Many learners state that they have spent so many years studying English language but cannot speak it appropriately and understandably (Bueno, Madrid, & McLaren, 2006).

### **The teaching and learning of speaking**

Speaking is an activity of delivering message, it occurs between speaker and listener orally. In other words, the main point of speaking activity is that speakers communicate their message to the listeners. In this case, the speaker and listener should be able to understand each other. The speaker can produce the sounds that involved the messages and the listener can receive, process, and response the messages. Byrne (1984: 8) in Temungingsih (1997: 6) further says that speaking is an activity involving two or more participants as hearers and speakers who react to what they hear and their contributions. Each participant has an attention or a set of intentions goal that he wants to achieve in the interaction. In speaking, there is a goal or a purpose to be achieved by the speaker.

Speaking involves two participants at least. It means that we cannot do it individually we need partner to communicate in the same language. So, speaking is a process of transferring information, ideas and expressions that used the good form of sentence in order to make the listener understand of what we are saying. In addition, speaking is described by Fulcher as much more than just a skill, it is actually "the ability that makes us human" (Fulcher, 2003).

Bygate (1987) distinguishes between language knowledge and language skills; knowledge is what enables people to talk and skills is knowledge actively carried out in interaction, something that can be imitated and practiced. He further states that language knowledge is basically a set of grammar and pronunciation rules, vocabulary and knowledge about how they are normally used; skills are considered to be the ability to use this knowledge. Brown (2000: 250) states that speaking is an interactive process of constructing meaning that involves producing, receiving, and processing information. Based on that idea, there are three important points that have to be occurred to the participants of communication (speakers and listeners) to construct the meaning during the interaction among them.

In speaking process, one tries to communicate with and send out his/her message to the others. In this case, the communication needs a speaker and a listener. Therefore, in speaking process, especially in dialogue, needs at least two people because we cannot do it individually. Referring to this, transactional dialogue is suitable to measure students' speaking achievements since transactional dialogue refers to situation where the focus is on what is said or done. The message and making oneself understood clearly and accurately is the central focus, rather than the participants and how they interact socially with each other. Itkonen (2010) mentions other relevant features as proficiency and coherence. Equally, Louma (2004) includes components of speaking as pronunciation, and spoken grammar.

According to Rivers (1987) the teaching of speaking skill is more demanding on the teacher than the teaching of any language skills. There are five aspects must be fulfilled in a speaking classroom, they are:

- (1) *Fluency* which is defined as the ability to speak fluently and accurately. Signs of fluency include a reasonable fast speed of speaking and only a small numbers of pauses. Fluency refers to the ease and speed of the flow of the speech (Harris, 1974). Fluency is the smoothness or flow with which sounds, syllables, words and phrases are join to other when speaking. It means that when a person makes a dialogue with another person, the other person can give respond well without difficulty.
- (2) *Grammar* as defined by Heaton (1990) that grammar as the students' ability to manipulate structure and to distinguish appropriate grammatical form in appropriate ones. Meanwhile, Syakur (1978) defines grammar as a correct arrangement sentence in conversation.
- (3) *Vocabulary*, the speaker cannot communicate well if he/she does not have sufficient vocabulary. Therefore, vocabulary means the appropriate diction which is used in communication as what stated by Syakur (1987).
- (4) *Pronunciation*, which is the ability to produce easily comprehensible articulation (Syakur, 1987). Meanwhile Harris (1974) defines pronunciation as the intonation patterns.
- (5) *Comprehension*, comprehensibility denotes the ability of understanding the speaker's intention and general meaning (Heaton, 1990). Defines comprehension for oral communication that requires a subject to respond to speech as well as to initiate it (Syakur, 1987). This idea means that if a person can answer or express the sentence well and correctly, it shows that he/ she comprehends or understands well.

### **Speaking difficulties in foreign language learning**

The goal of teaching the oral skills is to enhance the learners' communicative efficiency, but when they try to express themselves there is always hesitation, repetition, and too much pauses. Learners often find some difficulties when practising the speaking skill due to a lack of interest in the subject, lack of self-confidence, etc. Ur (1991) claim that there are four main problems in getting students speak in the foreign language in the classroom which are: inhibition, nothing to say, low or uneven participation, and mother-tongue use.

#### ***Inhibition***

This problem which occurs more when EFL learners attempt to participate in the classroom, make them unfortunately face many difficulties that decrease the students' ability to speak confidently in front of their classmates, so that Guiora et al (1980; as cited

in Brown, 2000: 148) concluded after designing an experiment, that there is a direct relationship between inhibition and pronunciation ability in second language.

#### ***Nothing to say***

The common expressions EFL Learners employ when they are imposed to participate in a given topic is “I have nothing to talk about”, “I don’t know”, “no comment” or they keep silent. Ur (1991: 121) confirmed that when he states “even if they are not inhibited, you often hear learners complain that they cannot think of anything to say”. Monath & Kase (2007) share the same idea, since they believe that people often feel nervous when they have to talk in public meeting, and the lack of self-confidence and preparation make them think that they have nothing to say, and they are going to look like idiots.

#### ***Low or uneven participation***

This problem refers to the amount of each student’s talking time. Ur (1991: 121) states that “only one participant can talk at a time if he or she is to be heard; and in a large group this means that each one will have only very little talking time”. This problem is compounded by the tendency of some learners to dominate, while others speak very little or not at all.

Goh & Burns (2012: 234) share the same concern expressed so far when stated that “speaking lessons should not be limited to simply asking learners to complete a speaking tasks. There is more that teachers can do to help them gradually improve their speaking.” Teachers should be careful by designing and selecting the appropriate classroom techniques, skills, strategies, and the most important emphasizing repeated tasks so that learners have further language resources for improving their first performance.

#### ***Mother tongue use***

EFL learners of the same mother tongue tend to use it outside and even inside the classroom because they feel more comfortable and less exposed to the target language. Ur (1991: 121) confirmed that by stating: In classes where all, or a number of, the learners share the same mother tongue, they may tend to use it: because it is easier, because it feels unnatural to speak to one another in a foreign language, and because they feel “exposed” if they are speaking their mother tongue. Therefore, learners will never be able to use the foreign language correctly if they keep using their mother tongue. Harmer (2001: 131) states that “it is an entirely natural thing to do; when we learn a foreign language we use translation almost without thinking about it, particularly at elementary and intermediate level.” Unconsciously learners use their mother tongue, but Harmer (2001) ensures that this is not only learner’s responsibility; rather it seems to be an example of failure for both learners and teachers. In other words, teachers should be aware if they frequently use the learner’s language in the classroom, because learners also will feel more comfortable to use their mother tongue in the classroom, and this of course may not help them to improve their proficiency level.

#### ***Cooperative language learning***

One of the specific adaptive approaches of group work is cooperative learning. In their research study, Kutnick et al. (2006) found that small cooperative and collaborative learning is more effective for students to share their cognitive perspective and problem-solving skills than students working individually. However, cooperative group work is different from collaborative group work because it must include, and students need to demonstrate five specific principles for cooperative group work to be successful (Cheong, 2010; Chiriac & Frykedal, 2011; Gillies, 2003; Sachs, Candlin, & Rose, 2003; Schwartz & Pollishuke, 2013). According to Gillies (2003) and Chiriac and Frykedal (2011), in structuring cooperative learning, it must include these five key elements: positive interdependence, accountability, social and cognitive development, and interaction.

Cooperative learning is an effective way to encourage students to “want to learn more, like school better, like each other better, have higher self-esteem, and learn more effective social skills” (Johnson & Johnson, 1991:15). In cooperative learning groups, each student has a specific role and students are able to produce work based on everyone’s input. By assigning roles in group work, students in the class will be able to contribute as well as gain from other members in their group. Furthermore, some of the benefits of cooperative learning include: academic gains across different subjects, increase in participation in classrooms, and more social interactions with peers (Gillies, 2003).

Therefore, cooperative learning is an essential strategy for supporting students in the mainstream classroom. For the strategy to be effective, it must be purposeful and meaningful for the students (Coelho, 2004). In cooperative learning, students will benefit by working with peers with more proficient English skills who will provide oral feedback and be language models for the students in the classroom (Coelho, 2004).

Cooperative language learning represents the systematic and carefully planned use of group - based procedures. It seeks to overcome some of the weaknesses of traditional group work. It was typically informal, unstructured, and only used on rare occasions (Slavin, 1995: ix). Macaulay and Gonzalez (1996: 2) characterize it as follow:

“The instructional use of small groups so that learners are able to work together in a manner that enhances both group and individual learning. The key to cooperative learning is the careful structuring of learning groups. There are many ways to structure such groups, but some of the key elements are building interdependence, the designing of interactive processes, and account ability ... the building of social skills around such areas as decision making, communication, and conflict management is also fundamental to cooperative learning.”

#### ***Group work in language learning***

Brown (2000: 3) has offered the following minimalist, common-sense definition of groups: 'a group exists when two or more people define themselves as members of its and when its existence is recognized by at least one another.' In another words, a group qualifies as a 'group' when it has become a psychological reality for insiders and outsiders alike. We can, of course, try and provide a more detail and more descriptive definition.

Cohen (2014: 66) defines group work as:

‘students working together in a group small enough so that everyone can participate on a clearly assigned learning task.

Moreover, students are expected to carry out their task without direct and immediate supervision of the teacher. Group work is not the same as ability grouping, in which the teachers divide up the class by academic criteria so that they can instruct a more homogeneous group. It should also be distinguished from small groups that teachers compose for intensive instruction, such as the flexible and temporary grouping procedures often used in individualized reading instruction or differentiated instruction.'

### ***Why use group work in language teaching?***

It is clear that in order to maximise the opportunities to learn in your classroom, student teachers should not just learn on their own, but engage in collaborative learning and support one another. Research shows that group work is one of the most effective ways of increasing learning outcomes. Slavin and colleagues (1995: 177) reviewed a great deal of evidence and concluded that "co-operative learning is one of the greatest success stories in the history of modern research". The four main reasons for this success seem to be Motivation, Social cohesion, Personalisation, Cognitive elaboration.

If students are to get the help they need, especially in a large class, they must be available to help one another. Student teachers teaching one another can be surprisingly effective: in one study students learned almost as much when peer-tutored as they did from one-to-one instruction from their teacher, possibly because they feel less intimidated asking questions of a peer.

### ***Group formation***

Group formation is an important factor in creating positive interdependence. Richards and Rodgers (2001: 196) state that while the teacher breaks down his classes into pairs and small groups, many factors should be considered:

- Considering group size: typically group size is from two to four. This will depend on the tasks the students have to carry out, students' age, and time division.
- Assigning students to groups: groups can be teacher - selected, random, or students - selected.
- Suggesting student's role in groups: Each group member has a specific role to play, such as noise monitor, recorder, or summarizer.

### ***Group work for speaking skills***

Group work in language learning is a powerful educational approach principally because of its contribution in enhancing students' achievement and productivity and providing more opportunities for communication. From the perspective of second language teaching, McGroarty (1989; in Richards & Rodgers, 2001: 195) offers the potential advantages for ESL students in CLL classrooms:

- Increased frequency and variety of second language practice through different types of interaction.
- Possibility for development or use of language in ways that support cognitive development and increased language skills.
- Opportunities to integrate language with content - based instruction.
- Opportunities to include a greater variety of curricular materials to stimulate language as well as concept learning.
- Freedom for teacher to master new professional skills, particularly those emphasizing communication.
- Opportunities for students to act as resources for each other, thus assuming a more active role in their learning.

There are additional important benefits of cooperative learning. Slavin (1995: 60) found that the most important psychological outcome of group work is its effect on students' self-esteem. Students' beliefs that they are valuable and important learners are of critical importance for their ability to be confident decision-makers, and ultimately to be productive individuals. In cooperative classroom, motivation found to have great effect on enhancing students' performance Slavin (1995: 16) states that:

Rewarding groups based on group performance (or the sum of individual performances) creates an interpersonal reward structure in which group members will give or withhold social reinforces (such as praise and encouragement) in response to group mates' task-related efforts.

### ***Types of group work***

#### ***Collaborative group work***

Group work, or collaborative group work, is a teaching and learning strategy that can be utilized for all types of students and can take various forms in the classroom. Using group work as a pedagogical tool can be useful in numerous ways. It can be used to organize activities or tasks in the class where an assignment is given by the teacher and students are expected to work as a group to solve the group task (Chiriac & Frykedal, 2011).

In collaborative group work, every group member is involved in working on a given task to produce an outcome that they all agree upon (Chiriac & Frykedal, 2011; Kutnick, Ota, & Berdondini, 2006). This allows all types of learners, including English language learners, the opportunity to be in an environment where they can work together to discuss their ideas, share and listen to their peers' thinking process. Nair and Alwee (2012) state that opportunities are provided through group work for students to talk freely with their peers, which ultimately allows all students to practice and improve their oral language skills.

Working in pairs or groups is considered as one of the important factors to improve learners' communication. Different individuals have developed many approaches to group work over the last time. According to Toseland & Rivas (2009: 5) group work is defined as goal-directed activity with small groups of people aimed at meeting socio emotional needs and accomplishing tasks. It means that task is directed to individual members or a group and as a whole within a system of delivery. Gillies & Ashman (2003: 54) state that group work, in language class, is a cooperative activity, it is designed and implemented to develop social strategies and acceptable social attitudes in students, and to improve social relations within and between groups. In cooperative activity the students share aims and responsibilities to complete a task assigned by the teacher in groups or in pairs.

Blatchford & Kutnick (2009: 3) states that, there are four principles to be made successful of group work: first, the students and classroom need good organized and strategically managed its means that make the group work more effective in composition classroom seating arrangements and the characteristics of groups such as their size. Second, group-work skills have to be developed. Third, group-work activities should encourage the activist of group, and the last, the students should adopt a range of roles that are supportive of group work and that encourage the independence of students directly.

#### **Student interaction**

One of the greater benefits of implementing group work in the classroom is that students have the opportunity to communicate and interact with each other. By allowing students to interact with other students in the classroom, students can listen and have conversations with their peers. With limited interruptions by the teacher during group work, students can form discussions amongst themselves about the topic or problem being discussed. By participating in group work, all students are able to collaborate and have opportunities to exchange feelings, ideas, and thoughts (Tuan & Nhu, 2010). Therefore, within group work, student interactions are encouraged and fostered between students, which allows all students to develop and practice their social skills. Student engagement and interaction is especially important for students because as Tuan and Nhu (2010) further state, one of the ways in which students acquire the English language is through their environment and the interaction occurring between the students.

Small group peer interactions are paramount for students to acquire the language and research has shown that students feel less pressure to be accurate at all times working in groups (Long & Porter, 1985; Tuan & Nhu, 2010). Wong Fillmore and Teale (as cited in Helfrich & Bosh, 2011), report that through opportunities to interact with native or native-like speakers, there was an increase in the language of instruction with ELLs. According to Tuan and Nhu (2010: 39), "interaction is a key of second language acquisition and exists as the central feature [,] it facilitates language learning and engages students in participating language learning activities". It is evident that through group work, students are provided with opportunities to engage in social interactions and conversations, which contribute to enhancing their oral language skills.

#### **Classroom environment**

Providing all students with a safe and an inviting environment will encourage students to explore their learning. When students participate and are engaged in group work, Long and Porter (1985) state that because it allows students to communicate face-to-face, it sets up a natural setting for conversation. Kutnick, Ota, and Berdondini (2006) further support that this natural environment in the classroom fosters students to communicate in a higher quality than during independent or teacher directed work period.

Furthermore, Tuan and Nhu (2010) also note that group work also creates a more relaxed atmosphere in the classroom, which increases the quantity and quality of language use in students. When students work in groups, they feel that they are not hurried to create and produce sentences or answers as they would in a whole-class discussion. Furthermore, "students are more likely to participate orally in class when they [feel] supported by [their] teachers and peers" (Long & Porter, 1985: 19).

#### **The role of the teacher with group work activities**

Although group work is led by students and is created for student learning opportunities, it is the teacher's responsibility to organize students and prepare tasks for group work. As there are great benefits to implementing group work in the classroom for all types of learners, teachers need to use this strategy to maximize each student's learning opportunity to speak and listen to the English language (Tuan & Nhu, 2010). Teachers often fear implementing group work in the classroom because of either previous negative experiences with classroom management challenges or lack of ability to hand over control to the students (Chiriack & Frykedal, 2011; Kutnick et al., 2006).

Using group work as a pedagogical tool will empower all types to students to participate and enjoy learning in the classroom. Therefore, within the classroom, teachers need to integrate students as fully as possible and not underestimate the role of peers in the education of students (Helfrich & Bosh, 2011). All students, including students, should be given the opportunity to contribute and all group members should be able to use each other as resources for the assigned group work. When grouping students together, teachers should also consider partnering native and non-native English-speaking students to work together so that they can learn from their different perspectives (Helfrich & Bosh, 2011).

Therefore, although students benefit from teacher-led activities, these types of activities should be implemented along with peer-focused activities so that students have the opportunity to practice their oral language skills with their fellow peers (Helfrich & Bosh, 2011).

### **III. METHODOLOGY**

#### **Research design**

The present study employs a mixed method which consist of both qualitative and quantitative method. In the present study, the quantitative phase is carried out first to obtain teachers and students' awareness of their difficulties in teaching and learning speaking skill. The qualitative phase comes after as a source of information to consolidate what has gained from the quantitative phase.

#### **Participants**

The participants of the study consist of 272 grade 11 high school students. Among the participants, 142 (52.2%) are females and 130 (47.8%) are male students. In order to investigate teachers' awareness of cooperative activities in class, 10 teachers of English participate in a survey and interviews.

#### **Instruments**

Questionnaires and interview were the main tool to collect data.

### Data analysis procedure

The data obtained from the survey will be analyzed using SPSS and Microsoft Excel software to find out the mean figures for different items. These results will then be used for interpretation of the findings. Interviews were conducted in Vietnamese, were recorded, transcribed and translated into English.

## IV. FINDINGS AND DISCUSSIONS

### Results of research question 1

The first research question tries to find out the students' perception towards group work activities in a speaking class. There are 14 questions in the questionnaire. The findings from the survey are summarized in the table 1 below.

Items	A	B	C	D	E	F
1. How do you find speaking in English?	0 0%	0 0%	152 55.9%	120 44.1%		
2. What is the most important skill that you need to develop?	180 66.2%	51 18.8%	20 7.4%	21 7.6%		
3. How often do you participate in the classroom activities?	77 28.3%	150 55.1%	29 10.7%	16 5.9%		
4. If you are afraid to talk in the classroom, is it because of	32 11.7%	24 8.8%	167 61.4%	20 7.4%	29 10.7%	
5. Do you feel comfortable in the oral class?	28 10.3%	244 89.7%				
6. If uncomfortable, what makes you feel so?	85 31.3%	62 22.8%	125 45.9%			
7. Do you think that in order to learn the language you have to speak it?	101 37.1%	171 62.9%	0 0%	0 0%		
8. Have you ever heard about cooperative learning?	59 21.7%	213 78.3%				
9. In oral expression session, do you prefer?	63 23.2%	74 27.2%	135 49.6%			
10. Do you find it difficult to work with your classmates in groups?	117 43%	155 57%				
11. When you work in small groups, do you feel that you are?	60 22%	165 60.7%	47 17.3%	0 0%		
12. Which of the following problems do you usually face when working in groups?	78 28.7%	116 42.6%	13 4.8%	49 18%	16 5.9%	
13. Do you feel that cooperative group work helps you to	40 14.7%	32 11.8%	10 3.7%	83 30.5%	41 15%	66 24.3%
14. Do you think that cooperative learning helps you to improve your speaking skills?	196 72%	76 28%				

**Table 1: Results of research question 1**

In the first question, there are four options as the answers (A) *very easy*, (B) *easy*, (C) *difficult*, (D) *very difficult*. None of the students said that speaking is easy. 152 students (55.9%) said that speaking is difficult, 120 students (44.1%) said that speaking is very difficult. That can be inferred that most of the students think speaking is a challenge skill for them. In the second question. In the second question, the four options are (A) *Speaking*, (B) *Listening*, (C) *Writing* and (D) *Reading*. 180 students (66.2%) admitted that Speaking is the most important skill. About the same numbers of answers 20 and 21 for writing and reading respectively. This is rather strange that most of them find speaking is difficult but most of them said that speaking is the most important skill. Question number 3 contained four options as (A) *Frequently*, (B) *Sometimes*, (C) *Rarely* and (D) *Never*. 16 students (5.9%) said that they never participate in the classroom activities and 150 students (55.1%) said that they sometimes participate in classroom activities. Only a third of the students said that they frequently participate in activities in a speaking class. This might be an explanation why they find speaking is difficult. In question number 4, 167 students (61.4%) confirmed that they do not have sufficient vocabulary to speaking. 32 of the students (11.7%) afraid of making grammatical mistake whereas 29 students (10.7%) afraid of teaches' negative feedback. 24 students (8.8%) and the last 20 (7.4%) agreed that they are afraid of making pronunciation mistakes and they lack of self-confidence. In the next question, most of the students (244) affirmed that they do not feel comfortable if the speaking class. Only 28 of them (10.3%) agreed that they feel comfortable if the speaking class. In question number 6, 125 out of 272 students (45.9%) agreed that (C) *the different classroom activities* make them feel

uncomfortable. 85 students (31.3%) said that (A) *the teacher* is the reason that make them uncomfortable while 62 students (22.8%) confirmed that (B) *the classes* are the main reason. In question number 7, 171 students (62.9%) agreed and 101 students (37.1%) strongly agreed. None of them disagree or strongly disagree. In question number 8, 213 students (78.3%) said that they have never heard about it. Only 59 students (21.7%) know what it is. In question number 9, 135 students (49.6%) prefer group work, 74 students (27.2%) like working in pair and 63 students (23.2%) love working on their own. In the next question, more than half of the students 155 (57%) find it easy to work with their friends, and 117 students find it hard to work in groups. In question number 11, 165 students (60.7%) find that they are motivated whereas 60 students (22%) said that they are strongly motivated and 47 of them (17.3%) agreed that they feel less motivated. None of the students find that they are not motivated during their English speaking class. In question number 12, 116 students (42.6%) found that they find it difficult to express their ideas to the group members. 78 of them (28.7%) were afraid of making mistakes. 49 students (18%) imposed points of view while only 16 students (5.9%) had to face with their group members noise and 13 students (4.8%) did not like when other members correct their mistakes. In question number 13, 83 students (30.5%) agreed that group work helps building good relationship among members. 66 students (24.3%) found that it helps them feel more comfortable, 41 students (15%) confirmed that it helps arguing the ideas to convince others, and 40 other (14.7%) believed that they can ask and respond for more questions while 32 students (11.8%) said that they can learn to listen to different opinion. Only 10 of them (3.7%) said that cooperative group work helps evaluate their peers' performance. In the last question, 196 students (72%) agreed while 76 students (28%) disagreed. It is clear that students understand about the benefits of working in groups.

### Result from questionnaire 2

In order to find out teachers' awareness towards the uses of cooperative language teaching and learning activities in classroom the researcher carried out a survey using questionnaire for teacher (See Appendix 2). The findings from the survey are summarized in the table 2 below.

Questions	A	B	C	D
1. To what extent do you think your students value the importance of speaking in learning a foreign language?	3 30%	3 30%	2 20%	2 20%
2. Which of the following describes your students' level of oral performance in English?	0 0%	5 50%	5 50%	
3. Can you say that the majority of your students are motivated to speak in English?	7 70%	3 30%		
4. How often do your students participate in the oral expression session?	7 70%	2 20%	1 10%	
5. Do you think that students do not participate in because ...	3 30%	4 40%	3 30%	
6. What do you find most difficult for teaching speaking?	2 20%	4 40%	2 20%	2 20%
7. Do you evaluate your students' oral production?	10 100%	0 0%		
8. If you answer YES, what do you prefer?	2 20%	2 20%	1 10%	5 50%
9. Do you agree that in order to learn the language, students have to speak it?	8 80%	2 20%		
10. Which of the following techniques do you use most?	5 50%	2 20%	2 20%	1 10%
11. How often do you use group work when teaching speaking?	7 70%	3 30%	0 0%	0 0%
12. Does cooperate language learning enhance your students' participation?	8 80%	2 20%		
13. Do you rise your students' awareness towards the value of cooperative learning?	15 100%	0 0%		
14. Do your students face problem working in groups?	8 80%	2 20%		
15. Do you think that cooperative group work technique improves learners' speaking skills?	15 100%	0 0%		

Table 2: Results of research question 2

In the first question, 6 out of 10 teachers (60%) agreed that the students find the important role of speaking in learning foreign language. 4 of them (40%) showed that their students understand a little and did not know about the important role of speaking. The second question, 5 teachers (50%) stated that the students are at average levels, and the other 5 (50%) believed that their students are at low level of oral performance in English. In the next question, 7 teachers (70%) confirmed that most of the students

are motivated to speak in English in speaking lessons while 3 teachers (30%) believed that the learners are not motivated speak in English during their speaking lessons. In the fourth question, most of the teachers, 7 (70%) said that their students frequently participate in the oral expression session. 2 of them (20%) stated that they sometimes take part in the activities and only one teacher said he/her students rarely participate in the oral expression session. Question number 5, 4 out of 10 teachers (40%) showed that the students are not interested in the classroom activities whereas 6 teachers (60%) assigned that the learners are shy and the classroom are overcrowded. In question number 6, 4 teachers (40%) found pronunciation is the most difficult for teaching speaking while 6 of them (60%) found that grammar, vocabulary and sentence structure were the problem when teaching speaking. In question number 7, all teachers agreed that they evaluate learners' oral production. In question number 8, 5 of the teachers (50%) preferred all types of evaluations including self-evaluation, peer-evaluation, and teacher-evaluation. 4 teachers (40%) preferred self-evaluation, peer-evaluation, and only one of them (10%) preferred teacher-evaluation. In question number 9, most of the teachers questioned, 8 (80%), agreed that in order to learn the language, students have to speak it. Only 2 teachers (20%) did not agree with the idea. In question number 10, 5 teachers use group work techniques in their class, 4 of them (40%) use role-play and problem solving techniques to teach, and only 1 teacher uses discussion in her/his lessons. In the next question, 7 teachers (70%) said that they always use group work when teaching speaking while 3 of them (30%) said they often have group work activities in their speaking lessons. In question number 12, 8 (80%), agreed that cooperate language learning improve their students' participation. Only 2 teachers (20%) did not agree with the idea. In question number 13, 10 teachers (100%) stated that they rose their students' understanding towards the value of cooperative learning. In question number 14, most of the teachers, 8 (80%), agreed that their students have difficulties when working in groups. Only 2 teachers (20%) said that the students have no problem when working in groups. In the last question, all of the teachers confirmed that cooperative group work technique improves their students' speaking skills.

### **Results of research question 3**

In the last phase of the study, the researcher interviewed 5 teachers of English at Chu Van An high school in Thai Nguyen province. The selected format is semi-structured interview. The interviews are conducted in Vietnamese language because all of the teachers and the interviewer are Vietnamese. The response then will be recorded and noted for further analysis. After that all the notes are transcribed and translated into English.

The first interviewee was an experienced teacher of English. She has been teaching English for over 15 years and holds master degree in English language teaching. She is quite concerned about the teaching and learning of English, especially speaking skill. She understood that the communicative language teaching should focuses on speaking and listening, however, the time limit and exam-based syllabus prevent her from carrying out activities to promote speaking ability. She admitted that her students do not enjoy speaking too much. They paid most of their time doing grammar and pronunciation exercises which are useful for their graduation examination. For the question of possible problems when teaching speaking, the teacher said that most of the students do not talk even they know the answers. They are not willing to co-operate with other students. The teacher expected a change in the format of the graduation exam so that students shift their aims to speaking rather than grammar and readings.

The second teacher in the interview was a newly-graduated student. She was quite open and talked a lot about how to change students' attitudes about English language learning. The teacher emphasized the importance of productive skills. She used many co-operative activities in class and assigned many extra reading for students. However, as she said, her students are lazy and be dependent to some strong students. That means when she assigned homework, only some students work, the rest does nothing. She also agreed that the final exam format shapes the way her students learn English.

The third teacher in the interview is a young teacher. She started teaching two years ago. She admitted that students are not willing to participate in the speaking activities, especially group or pair work. Students are also reported that they have little knowledge to participate in the speaking activities. Sometimes the poor vocabulary prevents students from speaking. The teacher also mentioned the exam-based syllabus is the most challenges for the teaching and learning of speaking.

The fourth teacher in the interview said that she rarely carries out speaking activities in class because not many students pay attention to the activities or want to talk. What they want to work on is reading and grammatical exercises. She also noted that students are negative and poorly activated speakers. That means they do not see the importance of speaking when studying English.

The last teacher in the interview is an old teacher who have been teaching English for nearly twenty years. She confessed that she herself rarely practice speaking. She tries to avoid speaking activities such as group works and pair works. She gave students a lot of reading exercises and tried to make them be aware of grammar points. She said that her students prefer doing those exercises to doing speaking activities.

## **V. CONCLUSION AND RECOMMENDATION**

By looking at the results from the quantitative research, the researcher found that most of students in the study think speaking is a difficult skill to develop. Most of them do not participate in speaking activities such as group work or pair work, but they do not speak because they do not want to make mistakes. Another reason for not speaking in class is that they do not have enough vocabulary. However, most of them said that speaking activities are motivated and they found cooperative learning method such as group work and pair work help them speak better.

The results from teachers' survey show that all the teacher use speaking activities in speaking classes and they all evaluate students' speaking skill. Almost of the teachers agree that speaking activities enhance their students' speaking skills. Most of the teachers said that they actively carried out speaking activities while teaching. However, the interviews show some contradict results. Most of the interviewed teacher said that they rarely do speaking activities in class because their students do not enjoy speaking as they prefer exercise for the final graduation exams.

By looking at the results from qualitative and quantitative study, the researcher would like to suggest some ideas for teaching students at high schools as followed:

- Teachers should raise the awareness of teaching and learning speaking for the students.
- There should be extra exercises for students so that they can accumulate an input for speaking as an output. These include reading assignments.
- Teachers should be positive when giving feedbacks to students' performance, especially the speaking performance.
- In a long term, the English assessment should include communicative activities so that students may change their attitudes towards the learning of English.
- There should be varieties of activities outside classroom for students to speak

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**Appendix I: Students' questionnaire**

Dear students,

We are preparing a research on **"The use of group-work to enhance speaking skill for students at Tran Phu high school"**. We would be grateful if you could answer these questions to help us in our research. Your answers are very important for the validity of this research we are undertaking. Please, circle the letter (A, B, C...) to indicate your choice.

---

**General information**

Full name: .....

Class: .....

Ethnic minority group: .....

---

1. How do you find speaking in English?
  - A. Very easy
  - B. Easy
  - C. Difficult
  - D. Very difficult
2. What is the most important skill that you need to develop?
  - A. Speaking
  - B. Listening
  - C. Writing
  - D. Reading
3. How often do you participate in the classroom activities?
  - A. Frequently
  - B. Sometimes
  - C. Rarely
  - D. Never
4. If you are afraid to talk in the classroom, is it because of
  - A. Fear of making grammatical mistakes
  - B. Fear of making pronunciation mistakes
  - C. Having deficient vocabulary
  - D. Lack of self-confidence
  - E. Fear of teacher's negative feed back
5. Do you feel comfortable in the oral class?
  - A. Yes
  - B. No
6. If uncomfortable, what makes you feel so?
  - A. The teacher
  - B. Your classes
  - C. The different classroom activities
7. Do you think that in order to learn the language you have to speak it?
  - A. Strongly agree
  - B. Agree
  - C. Disagree

- D. Strongly disagree
8. Have you ever heard about cooperative learning?
    - A. Yes
    - B. No
  9. In oral expression session, do you prefer?
    - A. Individual work
    - B. Pair work
    - C. Group work
  10. Do you find it difficult to work with your classmates in groups?
    - A. Yes
    - B. No
  11. When you work in small groups, do you feel that you are?
    - A. Strongly motivated
    - B. Motivated
    - C. Less motivated
    - D. Not motivated
  12. Which of the following problems do you usually face when working in groups?
    - A. Fear of making mistakes
    - B. I find it difficult to express my ideas to the group members
    - C. I do not like when students in my group correct my mistakes
    - D. Imposing points of view
    - E. Group members noise
  13. Do you feel that cooperative group work helps you to
    - A. Ask and respond to more questions
    - B. Learn to listen to different opinions
    - C. Evaluate your peers' performance
    - D. Building good relationships among students
    - E. Arguing your ideas to convince others
    - F. Feel more comfortable
  14. Do you think that cooperative learning helps you to improve your speaking skills?
    - A. Yes
    - B. No

Thank you for your cooperation!

Dear teachers,

We are preparing a research on the “**The use of group work to enhance enhance speaking skill for high school students**”. We would be grateful if you could answer these questions to help us in our research. Your answers are very important for the validity of this research we are undertaking. Please, circle the letter (A, B, C...) to indicate your choice, and specify your answer when needed.

---

**General information**

Your full-name: .....

Your institution: .....

Your qualification: .....

Your experience of teaching English: ..... years

---

1. To what extent do you think your students value the importance of speaking in learning a foreign language?
  - A. Very much
  - B. Much
  - C. Little
  - D. Not important
2. Which of the following describes your students’ level of oral performance in English?
  - A. High
  - B. Average
  - C. Low
3. Can you say that the majority of your students are motivated to speak in English?
  - A. Yes
  - B. No
4. How often do your students participate in the oral expression session?
  - A. Frequently
  - B. Sometimes
  - C. Rarely
  - D. Never
5. Do you think that students do not participate because?
  - A. They are shy.
  - B. They are not interested in the classroom activities.
  - C. The overcrowded classroom.
6. What do you find most difficult for teaching speaking?
  - A. Grammar
  - B. Pronunciation
  - C. Vocabulary
  - D. Sentence structure
7. Do you evaluate your students’ oral production?
  - A. Yes
  - B. No
8. If you answer yes, what do you prefer?
  - A. Self-evaluation
  - B. Peer-evaluation
  - C. Teacher-evaluation
  - D. All of them
9. Do you agree that in order to learn the language, students have to speak it?
  - A. Strongly agree
  - B. Agree
  - C. Disagree
  - D. Strongly disagree
10. Which of the following techniques do you use most?
  - A. Group work
  - B. Role-play
  - C. Problem solving
  - D. Discussion
11. How often do you use group work when teaching speaking?
  - A. Always
  - B. Often
  - C. Rarely
  - D. Never
12. Does cooperative language learning enhance your students’ participation?
  - A. Yes
  - B. No

13. Do you rise your students' awareness towards the value of cooperative learning?
  - A. Yes
  - B. No
14. Do your students' face problems working in groups?
  - A. Yes
  - B. No
15. Do you think that cooperative group work technique improves learners' speaking skill?
  - A. Yes
  - B. No

Thank you for your cooperation!

#### **QUESTIONS FOR INTERVIEW (For teacher)**

1. How often do you use cooperative techniques during your speaking class?
2. How do your students react to the activities?
3. What are possible problems of using those cooperative techniques?
4. Do you find the effectiveness of using those techniques in enhancing speaking ability?

# Magnitude And Associated Factors Of Induced Abortion Among Regular Undergraduate Students Of Dilla University

## Cross sectional study

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### Abstract

#### Background

Abortion is a major public health problem of the world. Sub Saharan Africa specifically suffers 14 % of maternal death due to unsafe abortion. Ethiopia as part of this region, estimated to have 3.27 million pregnancies every year, of which approximately 500,000 end in either spontaneous or unsafely induced abortion. Youth are among the segment of the population with large burden of induced abortion which is unsafe one. Having this fact in mind this study aims measuring the magnitude and identifying associated factors of induced abortion in Dilla university regular female undergraduate students and tries to fill the gap of scarcity of up-to-date and reliable information on induced abortion magnitude and associated factors.

#### Method

Cross sectional study design with internal comparison was employed using a multistage stratified sampling approach; 548 randomly selected respondents replied a self-administered pretested questionnaire. Data entered using Epi info version 3.5.1 then transported to SPSS version 16 for cleaning and analysis. Odds ratio along with the 95% confidence interval was estimated to identify factors associated with induced abortion using multivariable logistic regression. Level of statistical significance was declared at P- value less or equal to 0.05.

#### Result

There were 193 (35.2%) sexually active women out of which a pregnancy of 51(26.4%) were identified three years prior to the survey. The magnitude of induced abortion three years prior to the survey is found to be 35 which is 6.4% (95% CI: 4.4-8.4%) out of all women, 18% (95% CI: 12.6-23.4%) among sexually active and 68.6% (95% CI: 55.9-81.3%) among pregnant women. In multivariable analysis among women it was found that being sexually active before age 19 (AOR=4.298, 95% CI: 1.158-15.954), having single sexual partner (AOR=0.281, 95% CI: 0.108- 0.733) and ever use of FP (AOR=4.510, 95%CI: 1.859-10.942) were associated with induced abortion.

**Key words:** abortion, induced abortion, sexually active, youth, multiple sexual partners

## I. INTRODUCTION

Abortion is the expulsion of the products of conception before the 24th week of pregnancy (28 weeks for developing countries). The word abortion is often considered by women to be a procured termination of pregnancy, legal or criminal. So abortions are either spontaneous, which are usually referred to as miscarriages or induced, which are purposefully caused. Induced abortions are either safe or unsafe[1].

Globally, at least 585, 000 women die each year by complications of pregnancy and child birth. More than 70% of all maternal deaths are due to five major complications: hemorrhage, infection, unsafe abortion, hypertensive disorders of pregnancy, and obstructed labor. Though complications of abortion account for 13% of all direct causes of maternal deaths around the world, its distribution is not uniform. Developing world is being affected more than the developed ones with preventable pregnancy related complication. Not only those unmarried adolescents who suffer in this developing world but also married women living in stable union are prone to unsafe abortion and its complications due to the low accessibility of safe abortion services. And these abortions performed under unsafe conditions claim the lives of tens of thousands of women around the world every year, leaving many with chronic and often irreversible health problems, and drain the resources of public health systems. [2-3].

Generally factors associated with increased maternal mortality from unsafe abortion in developing countries include inadequate delivery systems for contraception needed to prevent unwanted pregnancies, restrictive abortion laws, pervading negative cultural and religious attitudes towards induced abortion, and poor health infrastructures for the management of abortion complications. Due to multiple factors like peer pressure, lack of maturity, alcohol and drug use, rampant habit of watching pornographic movies/pictures and alcohol induced sexual behavior youth in higher education institutions ( like Dilla university ) are assumed to be highly exposed to many risky sexual behaviors which may end up in unsafe abortion[11-12].

Our country Ethiopia as one of developing nations is under huge reform program in different sectors. Among these reform areas higher education expansion is one. New universities are being built, campuses expanded and new courses being added. Unequivocally the number of students joining these universities is increasing from time to time.

Despite the fact that there is dramatic increment of student population there is scarcity of information on how many of them are suffering from abortion and which specific factors exacerbate the risk. Having this in mind, this study aims to measure the magnitude and identify associated factors of induced abortion, fill the gap of scarcity of information and help informed RH interventions to youth in the university as well as similar facilities.

## II. ELABORATIONS

Dilla University is one of accredited government universities in Ethiopia located in Dilla town, southern Ethiopia. It is 365 km south of the capital, Addis Ababa. The university has three campuses; Odaya, health science and main campuses, eight schools and forty four departments. The total students enrolled in on a regular basis during the study period were 12,326. Out of these, 4222 (34.2%) were female students. Cross sectional study design was used and data were collected from March 12-13/2019.

The collected data was checked by principal investigator on daily bases for its completeness and consistency then entered into Epi info version 3.5.1. Data were then exported to statistical package for the social sciences (SPSS) window versions 20 for cleaning and analysis. Descriptive statistics used for the description of the study participants. Bi-variate analysis is applied to see the association of socio demographic and other independent variables with dependent one. Variables with p-value less than 0.25 were taken to multivariable analysis.

During multivariable analysis confounders were controlled and independent factors identified. Odds ratio along with the 95% confidence interval was estimated to identify factors associated with induced abortion. Level of statistical significance was declared at P- value less than or equal to 0.05.

### III. RESULTS

#### Magnitude of induced abortion

Among all study participants 51(9.3%) have had history of one pregnancy in the last three years. Unwanted pregnancies are twice of wanted ones, 68.6% and 31.4 % respectively. All of those wanted pregnancies ended up by giving birth of a child unlike to that of unwanted pregnancies which all ended up in induced abortion. There were 35 induced abortions making the magnitude **6.4%** (95% CI: 4.4-8.4%) out of all women, 18% (95% CI: 12.6-23.4%) among sexually active and 68.6% (95% CI: 55.9-81.3%) among pregnant women. (Table 4)

Majority of the induced abortion occurred in students with the age group of 20-24, 25(71.4%), followed by age category of 15-19, 7(20%) and 3(8.6%) in the age group of 25 and above. (Figure 4)

#### Factors associated with induced abortion

At the end of bivariate, the multivariate logistic regression was taken into account to take the effects of confounding variables. Variables with p-value less than 0.25 were taken to the multivariate analysis and AOR along with 95% CI was used to estimate association. Accordingly, the two variables prior sex education and watching pornography short out of significance during the multivariate analysis but the remaining three variables remained as factors affecting induced abortion.

Practicing sexual intercourse at age 19 and earlier had almost 4 times higher risk of induced abortion (AOR=4.298, 95% CI: 1.158-15.954).

Single sexual partner experience had 73.2% reduced chance of getting induced abortion than with multiple sexual partner experience (AOR=0.281, 95% CI: 0.108- 0.733).

Sexually active students who did not ever used FP /family planning/ were found to have almost 4.5 times higher chance of getting induced abortion than women who had (AOR=4.510, 95% CI:1.859 -10.942). (Table 5)

### Discussions

#### Magnitude and associated factors of induced abortion

The main aim of this study is measuring magnitude and identifying associated factors of induced abortion among regular undergraduate university students. The study revealed that the magnitude of induced abortion is 6.4 %. Majority of induced abortions were undergone at private clinic 15 (42.8%) followed by traditional abortionist's home, public clinic, hospital and other places 9(25.7%), 8 (22.9%), 1(2.9%) and 2(5.7%) respectively.

There are different studies conducted on this issue at community, health and higher education institutions with different figures. The magnitude of induced abortion reported by this study is higher than the magnitude reported by a study conducted on university and college students of Arbaminch town, 2.83%[34] but lower than community studies conducted in Latin American country Peru , Harar ,North West Ethiopia and Guraghe zone with magnitudes 11.6%,14.4%,19% and 12.3% respectively [19, 29-30, 32]. On the other hand it is almost similar with findings from Wolaita Sodo University and South Africa; 6.5% and 6.7% respectively [33, 36].

The three factors identified during the multivariate analysis associated with induced abortion were age at first sexual intercourse, number of sexual partner and family planning service use.

Among the 51 pregnancies traced by this study 68.6% is unwanted which is twice of wanted pregnancies where all ended up in induced abortion (6.4%). This figure shows the discrepancy that youth in the university still are not reached well with reproductive

health services despite the knowledge of modern contraception among sexually active unmarried women is reported to be 99.7% according to EDHS, 2011[37]. This might give us a clue that reproductive health programs being implemented on youth specifically of higher education institutions are not strong enough.

With regard to associated factors, the multivariate analysis revealed women started sex age 19 and earlier were almost four times at higher odds of getting induced abortion than who started sex after age 19. This might be associated with lack of FP information and decreased use and tendency of having multiple sexual partners. This study identified there is larger proportion of women (12.8%) who started sex at age 19 and before but no FP information as compared to those women started sex age after 19 but no women without FP information. Computing the proportion of FP use, there is slightly lower proportion among participants who practiced sex at age 19 and before as compared to those who practiced sex after age 19 (66.4% vs. 67.9%).

The proportion of participants with multiple sexual partners is high in those having sexual experience at age 19 and before as compared to those participants who experience sex after age 19 (23.2% vs. 7.6%).

On the other hand participants with single sexual partners were almost at 71.9 % reduced chance of getting induced abortion than participants with multiple sexual partners in their life time (AOR 0.281, 95% CI: 0.108 - 0.733).

This relation could be an indication that the earlier a woman begins sexual activity, the greater the number of non-marital sex partners she is likely to have over the course of her life. Early initiation of sexual activity and higher numbers of non-marital sex partners are linked in turn to a wide variety of negative life outcomes, including increased rate of induced abortion.

This study also identified an association between ever FP use and induced abortion. Women who did not ever use FP were almost 4.5 times at higher risk of developing induced abortion than their counterparts (AOR=4.510, 95% CI: 1.859-10.942). According to this study 90.7 % of sexually active respondents replied have heard of FP which is also in conformance with the high percentage (99.8%) of FP information of any method reported by EDHS, 2011 among unmarried sexually active women[37]. But coming to FP use among those of sexually active only 126 (65.3 %) responded have ever used on this study and 59 (30.6 %) did not, indicating high number of sexual intercourses are unprotected. This paradox is also explained by the high magnitude of unwanted pregnancy 27 (64.3%) among those sexually active youth despite the knowledge of FP.

From associated factors perspective this study revealed that participants with sexual experience at age 19 and earlier had much higher risk (four times) of developing induced abortion than those who had experienced it after age 19. This is in congruent with different studies.

According to a study conducted in Latin America Peru a high prevalence of induced abortion (7.5%) found among the youngest women in the study (18 years of age) who reported having been sexually active[19]. Another study conducted in Beijing, Shanghai and Zhengzhou indicated comparing women with and without history of repeated abortion, those with history of repeated abortion had higher rate among women whose first sex was below 18 years (16.2% vs. 9.4%,  $P < 0.01$ )[38]. Another supportive study conducted in the district of Diez de Octubre, Havana, Cuba identified first pregnancy in women younger than 24 years of age as risk factor for induced abortion, a risk even increasing with women who were less than 20 years old[39]. This clearly indicates those women who became pregnant younger than 24 years of age started their sexual debut at early age less than 24 years.

Male early sexual initiators had a significantly higher risk profile of partner history of pregnancy in life time (AOR= 2.89, 95% CI: 1.21-6.94) and partner history of induced abortion in life time (AOR=2.95, 95% CI: 1.20-7.26) compared with late initiators. Though this study is conducted on males it highlights us on a picture of their female counterparts[40]. Studies also revealed that early sexual debut are significantly associated with teenage/adolescent pregnancies which are usually unwanted [41-43].

Cross sectional studies can't establish temporal relation or sequence and determine causality however, this study is consistent with other studies above indicated adolescent women who start sexual debut at early age are more likely than older women to have unwanted pregnancies and induced abortion subsequently. This is occurring due to different factors, one is decreased trend of FP use in those who start sexual debut at early age. Others like unwanted or unplanned sex, poor FP knowledge, poor skill to refuse early sex, longer exposure to sexual acts and others [40-42, 44].

Women with single sexual partner are almost with 71.9 % reduced chance of having induced abortion than participants with multiple sexual partners in their life time; indicating the risk of multiplicity of sexual partners. This result is in congruent with studies conducted in different areas.

A study which was conducted in Peru indicated ever having had an induced abortion was associated with having had more than 1 sexual partner in life time ( $p < 0.001$ ). Having 2 sexual partners in life time had 1.6 times higher odds of getting induced abortion as compared with those women with single sexual partner (AOR=1.61, 95% CI:1.23-2.09). The risk also increased when the number of sexual partner a women had in lifetime increased; women with 3 or more sexual partners in life time were found to have 2.79 times higher risk of getting induced abortion than with women with single sexual partner (AOR=2.79, 95% CI: 2.12-3.67). This study also identified having multiple sexual partners in the year before the survey had association with induced abortion ( $p < 0.005$ ). Women with 2 or more sexual partners in the year before the survey had 1.54 times higher chance of getting induced abortion than their counterparts (AOR=1.54, 95% CI:1.14-2.02)[19].

Another study conducted in Beijing, Shanghai and Zhengzhou indicated having multiple sexual partners had higher rate of repeated induced abortion than their counterparts (36.0% vs. 15.0%,  $P < 0.01$ )[38].

Having multiple sexual partners during life time as factor of induced abortion is also evidenced by another study [45].

Initiation of sexual activity at a younger age is linked to tendency of having high numbers of sexual partners. The earlier a woman begins sexual activity, the more sexual partners she will have during her life time. One can anticipate the prevalence of induced abortion to increase with younger age at first sexual intercourse due to an increasing exposure to cumulative risk. If youth are exposed to non-marital sex for a longer time then they will be prone to induced abortion. Unmarried women will have increased risk of repeated induced abortion if exposed to sexual behavior for more than 3 years (33.6% vs. 6.6 %,  $P < 0.01$ ) [38, 40].

The third factor identified to be associated with induced abortion was FP use. Not ever using FP despite the act of sexual intercourse was found to have almost four times higher chance of getting induced abortion than who ever use. Of 193 women who reported practice sexual intercourse, 59 (30.6%, 95% CI: 24.1 – 37.1%) were not using contraception. This kind of relation is also established by other studies. A study conducted in North West Ethiopia revealed contraceptive users were at a reduced risk of having induced abortion compared to non-contraceptive users (AOR = 0.4,  $P = 0.012$ )[30].

Another study conducted in Iran indicated reduction of abortion rates were strongly associated with increased contraceptive use rates.[46] Study conducted in Bangladesh also described the complete lack of use or lack of use-effectiveness of FP methods resulted in unwanted pregnancies that will make desperate women to seek abortion services[47].

Looking at the three different variables identified as factors of induced abortion it is understandable that they are interrelated one another. The earlier the women begin sexual intercourse the more they are prone to harmful sexual behaviors like multiple sexual partner experiences due to repetitive and longer duration of exposure. This is also accompanied by the higher rate of non-use of FP due to lack of knowledge, negligence, not to think thoroughly like their adult counterparts on consequences of unprotected sex, fear of social stigma to attend FP clinics, peer pressure or others.

Other factors which showed significance in the bivariate analysis; lack of prior sex education and watching pornography did not show significance in the multivariate. This is not in line with other literatures which state them as predictors of abortion.

Regarding age, different studies identified different results. In many settings it is believed that abortion distribution by age is bimodal; women at the youngest age who want to delay childbearing and women at the end of childbearing years who think they cannot be pregnant at that age are at increased risk of getting induced abortion. The youngest women due to lack of awareness and unmet need for contraception and older women due to perceived need of contraception. Higher age at interview [19] was identified factor associated with abortion but similar to the finding of the studies conducted at mekele town and Wolaita sodo university [31, 33] the finding of the current study did not confirm an association between age and induced abortion. This could be due to the fact that the mean age of respondents in this study is different than the above studies.

Unlike to a study conducted in Nigeria [28] lack of prior sex education had no association in this study probably due to the fact that majority of the respondents had no communication at all on sexual matters with their parents (70 %). Unlike to different studies origin of residence, marital status, college, class year, income, and alcohol use [30-31, 33] did not show any significant association with the outcome variable.

**Declarations:**

**Ethics approval and consent to participate**

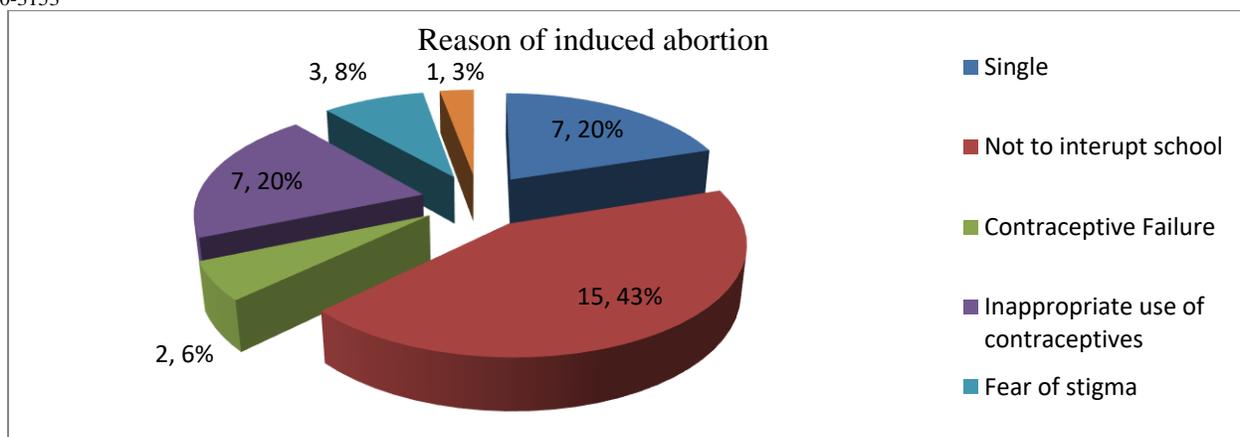
Ethical clearance obtained from Hawassa University, college of medicine and health science IRB. Permission of Dilla University is asked with a letter from Hawassa University, college of medicine and health science. The purpose and benefit of the study is discussed with each study participants. Participants assured of selected randomly, taking part in the study was completely of choice. If they chose not to participate in the study or if they decided to stop participating in the study they had no harm. They were also assured to stop participating in this study at any time, even if they have already given their consent. Refusal to participate or withdrawal from the study had no penalty or loss of any benefits to which they were otherwise entitled. Informed consent of the respondents obtained.

Administering the questionnaires was conducted in a way that it did not compromise their privacy and confidentiality of information as no one had the access to know specific student’s information since it did not involve name and ID number of students.

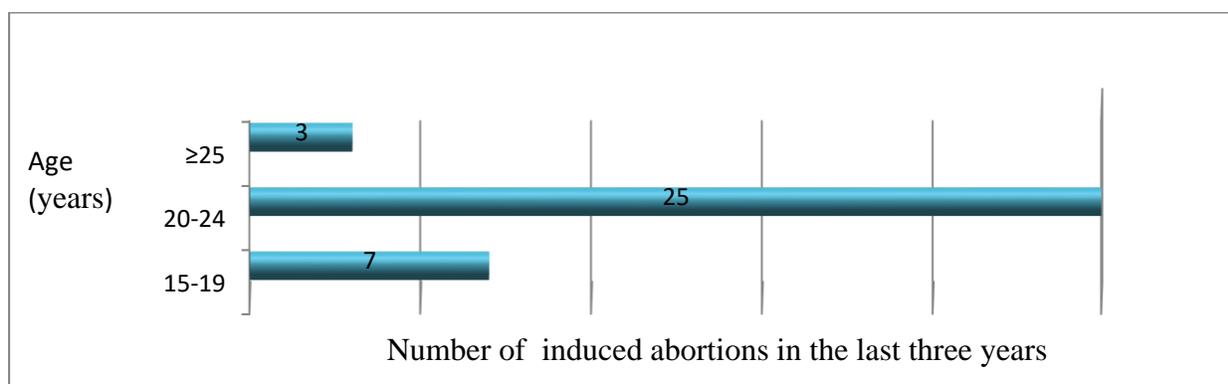
**APPENDIX**

**Table 4** Pregnancy and abortion of regular undergraduate students in Dilla University, Southern, Ethiopia, March, 2019

Characteristics	Category	Frequency	Percent
Ever pregnant within the Last three years (n=548)	No	497	90.7
	Yes	51	9.3
Pregnancy Wanted or Unwanted (n=51)	Unwanted	35	68.6
	Wanted	16	31.4
History of abortion (n=51)	No	16	31.4
	Yes	35	68.6
Induced or spontaneous (n=35)	Spontaneous	0	0
	Induced	35	100



**Fig. 3** Reasons for induced abortion in regular female undergraduate students of Dilla university, Southern Ethiopia, March, 2019, (n=35)



**Fig. 4** Age distribution of respondents who had induced abortion in the last three years among regular undergraduate students of Dilla University, Southern Ethiopia, March 2019, (n=35)

**Table 5** - : Factors associated with induced abortion among regular undergraduate students in Dilla University, Southern Ethiopia, March, 2019

Characteristics	Category	Induced abortion		COR(95% CI)	AOR(95% CI)
		No (%) (n=513)	Yes (%) (n=35)		
Age of respondent	15-19	135(24.6)	7(1.3)	1	
	≥20	378 (69)	28(5.1)	1.429 ( 0.61 – 3.346)	
Origin of residence	Urban	211(38.5)	14(2.5)	1	
	Rural	302(55.2)	21(3.8)	1.048 ( 0.521-2.108 )	
Marital status	Ever Married	35(6.4)	5(0.9)	1	
	Never married	478(87.2)	30(5.5)	0.439 (0.160 -1.203)	
Class Year	First	154(28.1)	11(2)	1	
	Second and above	359(65.5)	24(4.4)	0.936 ( 0.447 - 1.958)	

Age at first sexual practice	>19	50(28.1)	3(1.7)	1	1
	≤19	98(55)	27(15.2)	4.592 (1.33-15.875)*	4.298 (1.158-15.954)*
Prior sex education	No	364(66.4)	18(3.3)	0.433 (0.217-0.864 )*	0.547 ( 0.244 -1.340)
	Yes	149(27.2)	17(3.1)	1	1
Watching pornography	No	325(59.3)	11(2)	0.265 (0.127-0.553)*	1.298 (0.487 - 3.454)
	Yes	188(34.3)	24(4.4)	1	1
Number of sexual partner	One	127(71.4)	18(10.1)	0.248 (0.105- 0.589)*	0.281 (0.108-0.733)*
	Two or more	21(11.8)	12(6.7)	1	1
Heard of any family planning	No	60(10.9)	8(1.5)	2.237 (0.972- 5.149)	
	Yes	453(82.7)	27(4.9)	1	
Ever used any family planning	No	41(22.2)	18(9.7)	4.171 (1.85 - 9.403)*	4.510 (1.859-10.942)*
	Yes	114(61.6)	12(6.5)	1	1

\* Statistically significant at  $P < 0.05$

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# The Influence of Fundamental's Factors on Stock Price: Empirical Study on State-Owned Enterprises Stock Which is Listed in Indonesian Stock Exchange in Period 2014 – 2018

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**Abstract-** The purpose of this study is to know whether there are influence of fundamentals factor, like Return on Equity (ROE), Debt to Equity Ratio (DER), Current Ratio (CR) and Price Earnings Ratio (PER).

The object of this research is the non-banking SOEs which is listed in Indonesian Stock Exchange in period 2014 – 2018. In this study used associative quantitative research methods due to the using of secondary data in this study from Indonesian Stock Exchange website ([www.idx.co.id](http://www.idx.co.id)) and [www.investing.com](http://www.investing.com).

There were 16 sample out of 20 SOEs companies that met the criteria during the five years observation from 2014 – 2018. The sampling technique used in this research is purposive sampling method.

The result of this study through the use of F-test shows that variables ROE, DER, CR and PER have simultaneous influence on the SOEs stock price. The result of the study through the use of t-statistic test shows that ROE, CR and PER have a partial influence on the SOEs stock price.

**Index Terms-** Fundamental, Return on Equity (ROE), Debt to Equity Ratio (DER), Current Ratio (CR), Price Earning Ratio (PER), stock price, SOEs, Indonesia.

## I. INTRODUCTION

Investment activities carried out by investors to obtain a profit. The motive for looking profits in terms of achieving several goals is to increase assets, meet future needs and protection to obtain a sense of secure through precautionary measures by reserving a certain amount of funds. The same thing is also said by Tandelilin (2010: 2) that investment has a meaning as a commitment to a number of funds or other resources that are made or consumed now to obtain greater profits in the future.

The basis for investors' decisions to invest in the capital market is the level of risk and return and the relationship between return and risk. An investor expects profits or returns as high as possible, however there are also important things that should always be considered, namely the level of risk that should be borne. It is due to the greater level of risk, the greater expected rate of return. Therefore, it is necessary to do stock valuation on the

shares that will be purchased before investing in certain shares that could be reflected based on the development of stock prices.

Some of the shares on the Indonesia Stock Exchange (IDX) are shares of State-Owned Enterprises (SOEs) or BUMN consisting of 20 companies from various sectors including the pharmaceutical, energy, metal, construction, banking, mining, cement, transportation and telecommunications sectors.

According to the Law of the Republic of Indonesia Number 19 of 2003 concerning State-Owned Enterprises, that SOEs has an important role in the national economic system as a public implementer, balancing the power of large private companies and in developing small businesses or cooperatives. SOEs is also a significant source of state revenue in various forms, such as taxes, dividends and privatization proceeds. This can be seen from the increase in contributions made by SOEs to the State Budget (APBN) in 2018 to IDR 422 trillion, an increase of IDR 119 trillion compared to 2015 which was recorded at IDR 303 trillion.

SOEs companies listed on the IDX also offer fairly good stock returns. The average stock return offered by state-owned companies from 2014 to 2018 was IDR 221 per year, greater than the LQ45 share of IDR 54 per year. However, SOE stock returns in the 2014 to 2018 period fluctuated differently, compared to LQ45 shares, which had lower stock returns compared to SOE shares, but moved more stably.

Due to the stock returns offered by SOE companies are quite good, so it able to increase the level of investor confidence in SOE shares. It shown by the increasing volume of sales of SOE shares on the Indonesia Stock Exchange from 2014 to 2018. However Stock price fluctuations often occur, therefore investors need to conduct stock analysis or valuation before making a decision to invest their funds by buying shares of a company. In connection with that matter, there are 2 (two) analyzes that can be used, namely technical analysis and fundamental analysis (Budiman, 2017). Based on this, the researcher is interested in examining "The Influence of Fundamental Factors on SOE Share Prices: Empirical Study of Non-Banking SOE Shares Listed on the Indonesia Stock Exchange Period 2014-2018)"

## II. LITERATURE REVIEW

The capital market according to Tandelilin (2010: 26) is a market where both parties who have excess funds meet and need funds by trading securities. The capital market is a market that trades financial instruments both in the short term and long term issued by the government, private or public authorities (Azis, et al., 2015).

Investment has a meaning as a commitment to a number of funds or other resources that are made or consumed now to obtain greater profits in the future (Tandelilin, 2010). There are two types of investments, namely investments in the form of financial assets and real assets (Fransiskus, 2016)

Efficiency Theory Market is a theory that explains that at any time the price of a security reflects all information about its fundamental value (Andrew Ang, et al., 2011). So, this market efficiency theory explains the relationship between market reaction and available information, so that it affects the movement of stock prices or the value of a security.

When investors invest capital in a company, they could use the fundamental factors contained in the company as information to predict the investment returns. These fundamental factors focus on the company's financial statements as an assessment of investors whether the company's performance is good or bad. The analytical tool used in general is ratio analysis. Therefore the company's fundamental information is needed in determining the shares to be bought by investors. Fundamental analysis uses an approach based on the assumption that stocks have intrinsic value which is a combination of functions in generating expected returns and risks. Furthermore the results of the estimated intrinsic value are compared with the current market price to find out the value of the stock in an overvalued or undervalued state. (Sunariyah, 2004).

Financial ratios are the ratio of the results of a comparison of a financial statement post with other posts that have relevant and significant relationships. To find out the condition of the company, it can be done through the company's financial ratio analysis.

According to Syafri quoted in Hantono (2018: 9) financial ratios are the ratio of the results of the comparison of a financial statement post with other posts that have a relevant and significant relationship. To find out the condition of the company, it can be done through the company's financial ratio analysis.

Liquidity Ratio aims to see the ability of the company to meet short-term debt. Current ratio (CR) is used to measure the company's ability to pay short-term liabilities or debt using current assets owned by the company (Kasmir, 2009). CR can be calculated by using formula, as follows:

$$CR = \frac{\text{Current Asset}}{\text{Current Liabilities}}$$

The Solvency Ratio aims to measure the security level of long-term debt lenders. Debt to Equity Ratio (DER) is used to measure how much the proportion of the company's debt compared to the capital or equity owned by the company (Kariyoto, 2017). DER can be mathematically calculated using the formula, as follows:

$$DER = \frac{\text{Total Debt}}{\text{Total Capital}}$$

Return on investment is used to measure the company's ability to generate profits or in other words the rate of return on a company's investment. Return on assets (ROA) is used to measure the company's ability to use assets to generate profits (Kariyoto, 2017). The calculation of ROA, as follows:

$$ROA = \frac{\text{Profit After Tax and Before Interest}}{\text{Average Assets}}$$

Investor ratios are divided into: (a) complex capital structure; (b) Price /Earnings Ratio; (c) Extraordinary Items; (d) Percentage of Earning Retained, (e) Earning Per Common Share, (f) Book Value Per Share, (g) Dividend Payout and (h) Dividend Yield Ratio. Investors usually use Price Earnings Ratio (PER) to measure the value of shares. A large PER value indicates that investors often pay a premium price in the hope that the resulting revenue growth is higher (Kariyoto, 2017). PER can be mathematically calculated using the formula, as follows:

$$PER = \frac{\text{Market Price per Share}}{\text{Earning Per Share}}$$

### 1.1. Previous Studies

1. The result of previous study by Prof. Dr. Radhe S. Pradhan and Laxmi Paudel (2017) indicates that ROA has positive relation to stock price. The higher the ROA, higher would be the stock price. The same result showed from the study by Aty Herawati and Angger Setiadi Putra (2018) through the t-statistic test indicated that ROA has a positive effect on the stock price. While the result of the study by Said Djamaluddin, Rika Mirza Arisandy and Djumarno (2018) showed that ROA have negative effect on stock price. Furthermore, the ROA to stock price in study by Koenta Adji Koerniawan (2007) indicates that there is no significant effect to stock price.
2. The result study by Aty Herawati and Angger Setiadi Putra (2018) indicates that DER has no effect on the stock price. The study by Hari Gursadi (2017), Susan Grace Veranita Nainggolan (2018) and Eva Dwi Astutik, Surachman, and Djazuli (2014) has the same result also that fundamental factor DER has no effect on the stock price. While the different result are showed by Robert Lambey (2014) that there was evidence that DER has positive effect to stock price. The previous study from Rosa Yuminisa Amrah, Elwisam (2018) is proved the DER has negative effect to stock price, it means that that any increase and decrease in the debt to equity ratio moves in the opposite direction to the increase and decrease in stock prices.
3. Hari Gursadi (2017) through his study proved that CR has positive effect on Stock Price. The same result is also showed by the study from Robert Lambey (2014) that CR has positive and significant effect to Stock Price. While the result study by Rosa Yuminisa Amrah, Elwisam (2018) indicates that CR has negative and significant effect to Stock Price. The result of previous study by Oktavia Dewi Yanti dan Ervita Safitri (2013) indicates that CR has no effect to Stock Price. The same result is

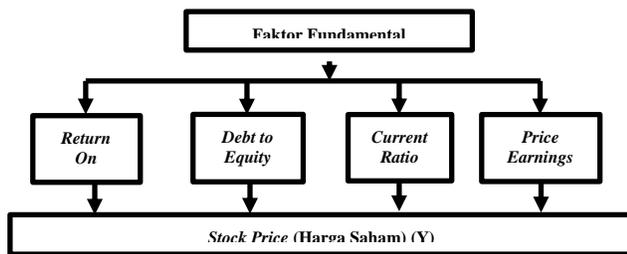
showed by the study by Agie Hanggara dan Gita Maysandra Widi (2017) that CR has no significant effect to Stock Price.

4. The previous study by Pande Widya Rahmadew and Nyoman Abudanti (2018) and Pudji Astuti (2017) indicates that PER has positive and significant effect to Stock Price. While the result study by Dipendra Karki (2018) and Aty Herawati and Angger Setiadi Putra (2018) indicates that PER has no effect to Stock Price.

### III. STUDY FRAMEWORK

Based on the literature review and previous studies, the conceptual framework of the study "The Influence of Fundamental Factors on SOE Stock Prices: Empirical Study of Non-Banking SOE Shares Listed on the Indonesia Stock Exchange in the 2014-2018 Period" as follows:

Figure 1. Conceptual Framework



## 2. Research Hypothesis

Based on the conceptual framework as presented in Figure 1, the following hypotheses are arranged, as follows:

- H1: ROE has significant effect to stock prices
- H2: DER has significant effect to stock prices
- H3: CR has significant effect to stock prices
- H4: PER has significant effect to stock prices

### IV. METHODOLOGY

In this study used associative quantitative research methods due to the using of secondary data in this study from Indonesian Stock Exchange website ([www.idx.co.id](http://www.idx.co.id)) and [www.investing.com](http://www.investing.com). This study aims to see the effect of the independent variable on the dependent variable by the method of data collection through sampling techniques. The independent variables consist of four variables as follows: ROE (X1), DER (X2), CR (X3) and PER (X4), while the dependent variable is stock price (Y). The population in this study are 20 Indonesian SOEs companies listed on the Indonesia Stock Exchange. There were 16 sample out of 20 SOEs companies that met the criteria during the five years observation from 2014 – 2018. The sampling technique used in this research is purposive sampling method. In this research quantitative and statistical analysis techniques are used. The statistical analysis used is Panel Data Regression using E-Views 9.

To choose panel data estimation techniques, namely common effects, fixed effects and random effects, a test is needed. According to Nuryanto and Pambuko (2016: 86) there are 3 tests, including:

(1) Chow test is used to choose between Common Effect (PLS) and Fixed Effect models. If the test result received is a Fixed Effect Model, then a retest is conducted between the Fixed Effect Model and the Random Effect Model. (2) Hausman test is conducted after the test results are known by the chow test to receive the Fixed Effect Model, then compared to the Random Effect Model. If the test results received are the Random Effect Model, then a retest is conducted between the Random Effect Model and the Common Effect Model or Pooled Least Square. (3) Lagrange Multiplier (LM) test is used to choose the Common Effect or Random Effect model.

The determinant coefficient is used to measure the use of the regression analysis model.  $R^2$  is a summary measure that states how well the sample regression line matches the data formed in the formula or regression equation, if the value of  $R^2$  approaches the number 1, it can be said that the use of the model is justified.

#### 2.1. Panel Data Regression Model Test (F-Test)

F test is intended to test the effect of all independent variables on the dependent variable simultaneously (together) between the independent variable and the dependent variable by looking at the calculated F value at the chosen significance level. The accuracy of the sample regression function in estimating the actual value can be measured from Goodness of fit. The basis for decision making are:

$H_0$  :  $\beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$  (simultaneously there is no effect of all independent variables on the Y variable)

$H_a$  : there is at least one  $\beta \neq 0$  (there is simultaneously the effect of all independent variables on the Y variable)

a. The significance of  $F < 0.05$  then the regression model is fit with the data.

b. The significance of  $F > 0.05$ , the regression model does not fit the data.

#### 2.2. Panel Data Regression Coefficient (t-Test)

This test is also known as a partial test. This t-test (partial) is used for testing the panel data regression coefficient analysis.

Decision making T test in this study uses a significance level of  $\alpha = 5\%$ , as follows:

T-test formula for independent variable (stock price):

$H_0$  :  $\beta_i = 0$  (partially there is no effect of variable i on stock price variables)

$H_a$  :  $\beta_i \neq 0$  (partially there is an influence of variable i on the stock price variable)

i : ROE, DER, CR, PER

### V. RESULT AND DISCUSSION

In this study the research data were analyzed descriptively to determine the initial picture of the problem under study using the free variable return on equity (ROE), debt equity ratio (DER), current ratio (CR), price earnings ratio (PER) to stock prices as variables bound to the sample company for the period of

observation. The following are the results of the descriptive analysis of each research variable as seen from the maximum, minimum, mean and standard deviation values.

**Table 1. Descriptive Analysis of Research Variables**

Statistic	lnPrice (Y)	ROE (X1)	DER (X2)	CR (X3)	PER (X4)
Mean	7.484519	0.101740	1.770695	1.684848	15.35325
Median	7.684654	0.105945	1.188187	1.400152	14.91854
Maximum	9.692767	0.525757	9.841553	12.99460	934.2105
Minimum	5.123964	-0.405771	0.091457	0.149079	-835.7143
Std. Dev.	1.038863	0.141730	1.630463	1.741739	171.2335
Observation	80	80	80	80	80

Source: Processed by the author (2019)

The regression model selection results indicate that the best model in this study is fixed effect model. So in this study, hypothesis testing is based on the estimation results of the fixed

effect regression model. Table 2. The following will present the results of fixed effect model data processing using E-Views 9.

**Tabel 2. Hasil Model Fixed Effect**

Dependent Variable: lnPrice (Y)				
Method: Panel Least Squares				
Date: 02/18/20 Time: 13:42				
Sample: 2014 2018				
Periods included: 5				
Cross-sections included: 16				
Total panel (balanced) observations: 80				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.773185	0.148708	52.27149	0.0000
ROE (X1)	0.062352	0.807128	0.077252	0.9387
DER (X2)	0.017208	0.073508	0.234100	0.8157
CR (X3)	-0.178212	0.042695	-4.174040	0.0001
PER (X4)	-0.001643	0.000359	-4.570182	0.0000
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.821639	Mean dependent var	7.484519	
Adjusted R-squared	0.765158	S.D. dependent var	1.038863	
S.E. of regression	0.503438	Akaike info criterion	1.677608	
Sum squared resid	15.20702	Schwarz criterion	2.273114	
Log likelihood	-47.10430	Hannan-Quinn criter.	1.916363	
F-statistic	14.54716	Durbin-Watson stat	2.411908	
Prob(F-statistic)	0.000000			

Source: Processed by the author (2019)

According to the Table 2. the R-Squared value indicates the number 0.8216 means that the ability of the independent variable is able to explain the effect of 82.16% to the dependent variable and the Adjusted R-squared value of 0.7652. Concurrent test (F-Test) all independent variables on the dependent variable

is equal to 14.5472 with Prob. (F-statistic) 0.0000 with an average value of the dependent variable of 7.4845 and the total observations (sample) in this study amounted to 80 (16 companies x 5 years) with 4 independent variables (explanatory) and 1 dependent variable. According to the DW table, the value of dL =

1.5337 and  $dU = 1.7430$ , with the Durbin Watson test value on the fixed effect model = 2.4119 and  $4-dU = 2.257$ , the formed equation is  $1.7430 < 2.257 < 2.4119$ , thus autocorrelation does not occur in the fixed effect model, this is because the DW value is greater than the value of  $dU$  and  $4-dU$ .

Simultaneous influence test in panel data regression analysis is used to test the simultaneous effect of independent variables on the dependent variable. In this study, the testing hypothesis used is as follows:

$H_0$ : Independent variables (ROE, DER, CR, and PER) simultaneously have no effect on the share prices of non-banking SOEs listed on the Indonesia Stock Exchange in 2014 - 2018.

$H_a$ : Independent variables (ROE, DER, CR, and PER) simultaneously affect the stock prices of non-banking SOEs listed on the Indonesia Stock Exchange in 2014 - 2018.

With a significant level of 0.05 then  $H_0$  is accepted, if the significant value of the test results  $> 0.05$  and  $H_0$  is rejected, if the significant value of the test results  $< 0.05$ .

The results of the panel regression analysis are in Table 2. shows that the significant value of the results of the simultaneous prob test (**F-statistic**) obtained is 0.000000. Therefore the significant value obtained is  $0.000000 < 0.05$  then  $H_0$  is rejected, so it can be concluded that the independent variables (ROE, DER, CR, and PER) simultaneously affect the stock prices of non-banking SOE companies registered on the Indonesia Stock Exchange in 2014 - 2018.

**T test** is used to determine the partial effect of each independent variable on the dependent variable. The testing hypothesis used in this test is as follows:

$H_0$ : The independent variable (return on equity, debt to equity ratio, current ratio and price earnings ratio) partially has no effect on the stock prices of BUMN companies listed on the Indonesia Stock Exchange in 2014 - 2018.

$H_a$ : the dependent variables (return on equity, debt to equity ratio, current ratio and price earnings ratio) partially affect the stock prices of BUMN companies listed on the Indonesia Stock Exchange in 2014 - 2018.

With a significant level of 5%, then  $H_0$  is accepted if the significant value of the test results  $> 0.05$  and  $H_0$  is rejected if the significant value of the test results  $< 0.05$ , while the sign that accompanies the regression coefficient of each variable shows the direction of the relationship of the influence of each independent variable with respect to the dependent variable.

Based on the estimation results of the panel regression model in Table 2. The following results were obtained:

(1) The significant value of the effect of the variable return on equity (ROE) on the company's stock price is 0.9387 with a regression coefficient marked positive. Because the significant value obtained  $> 0.05$ ,  $H_0$  is accepted and concluded that partially the company's ROE has a positive and not significant effect on stock prices.

(2) The significant value of the effect of the variable debt to equity ratio (DER) on the company's stock price is 0.8157 with a regression coefficient that is positive. Because the significant

value obtained  $> 0.05$ ,  $H_0$  is accepted and concluded that partially the company's DER has a positive and not significant effect on stock prices

(3) Significant value of the effect of the variable current ratio (CR) on the company's stock price is 0.0001 with a regression coefficient marked negative. Because of the significant value obtained  $< 0.05$ ,  $H_a$  is accepted and concluded that partially the company's CR has a negative and significant effect on stock prices.

(4) The significant value of the effect of the variable price earnings ratio (PER) on the company's stock price is 0.0000 with a regression coefficient marked negative. Because of the significant value obtained  $< 0.05$ ,  $H_a$  is accepted and concluded that the company PER partially has a negative and significant effect on stock prices.

## VI. CONCLUSION AND RECOMMENDATION

According to the results of the analysis, it can be concluded that simultaneously the independent variables (return on equity, debt equity ratio, current ratio and price earnings ratio) affect the stock prices of non-banking SOEs listed on the Indonesia Stock Exchange in 2014 - 2018. Partially, it can be explained that ROE and DER of the company has a positive and not significant effect on the company's stock prices, while CR and PER of the company has a negative and significant effect on the company's stock prices. Based on the results of this study, suggestions that can be given to issuers and investors are as follows: theoretically this study uses data from non-banking SOE companies listed on the Indonesia Stock Exchange for five years from 2014 to 2018, it is suggested that further research can add to the research period as a comparison of test results. This study is also uses independent variables that can represent fundamental factors of financial liquidity ratios (Current Ratio / CR), solvency (Debt to Equity Ratio / DER), return on investment (Return on Equity / ROE), and investors (Price Earnings Ratio / PER), it is recommended for further research to use other variables from each financial ratio as a comparison material.

Practically, companies should be able to pay attention to the company's current ratio value because the high current ratio value does not always indicate that the company has a safe liquidity position, but the high current ratio value also shows that the company is unable to manage assets and investments efficiently, because it has poor liquidity management, so this can result in a decrease in the level of investor confidence in the company. Investors should be able to consider buying shares of companies that have expectations that the current ratio value is not too high. This is because the company's share price with these criteria has the potential to increase. Furthermore, investors should be able to consider other fundamental factors besides return on equity, debt to equity ratio, and price earnings ratio when investing, because the increase and decrease in share prices of BUMN companies listed on the IDX may also be affected by fundamental factors other than these factors.

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# Phase Transformation of Organo-Modified Plate-Shaped OCP to Laminated HAP Nanocrystals

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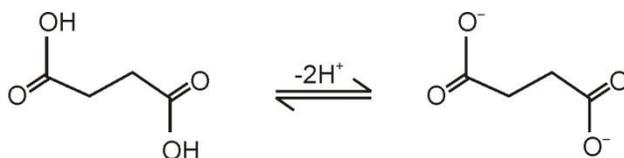
**Abstract:** The formation of laminated thin plate-shaped hydroxyapatite (HAP) nanocrystals from organically modified plate-shaped octacalcium phosphate (OCP) under hydrothermal condition which are performed at 180°C for 3h with pH of solution adjusted to 5.5, further it incorporated succinate ion having Ca/P molar ratio is expected to be 1.56±0.02. The morphological observation of crystals have been characterized by XRD, SEM and other using patterns. Since, the HAP crystal system is hexagonally and its crystallite size in the direction of various (a,b,c) axes depending on the plate-shaped HAP crystals thickness, where their size as perpendicular to the (100) plane is calculated by using of Scherrer equation  $D_{100} = K\lambda/(\beta \cos\theta)$ .

**Keywords:** Hydroxyapatite, octacalcium phosphate, succinate ion .

## [1]-INTRODUCTION:

Biologically, apatite are indispensable for which the general formula is  $Ca_5(PO_4)_3X$ , where X=F,Cl or OH, since they are key component of bone and teeth. Recently, synthetic apatites that permit bone grafts are now available<sup>1</sup>. The hydroxyapatite (HAP,  $Ca_{10}(PO_4)_6(OH)_2$ ) which is the main inorganic components of hard tissue such as bone and teeth and they are used in medicinal application have attracted a great attention including several application such as artificial organs, tissue engineering, medical devices & dentistry etc<sup>2,3</sup>. Although, fabricated biological hydrogels loaded biphasic calcium phosphate nanoparticles have also been reported for bone tissue regeneration<sup>4</sup>. Especially characteristics transformation behaviour of octacalcium phosphate (OCP,  $Ca_8(HPO_4)_2(PO_4)_4 \cdot 5H_2O$ ) to HAP have been reported, which has differences from other calcium phosphate compounds under hydrothermal conditions, (in *vitro* & *vivo*)<sup>5-7</sup>. The HAP may be prepared by various calcium orthophosphates such as  $\alpha$ - &  $\beta$ -tricalcium phosphate (TCP,  $Ca_3(PO_4)_2$ ) and OCP as well. For ( $\alpha$ - $\beta$ -) TCP, because HAP is transformed by solvation precipitation reaction, there is no correlation between the original TCP crystal particle's shape and the transformed HAP particle shape. Generally, forming of the spike or needle shaped HAP crystals from granular  $\alpha$ - &  $\beta$ -TCP particles under hydrothermal conditions<sup>8,9</sup>.

Herein, a plate-shaped OCP crystals are transformed to laminated thin plate-shaped HAP nanocrystals under hydrothermally and characterized the resultant HAP. The OCP crystal is composed of apatite and hydrated layers producing plate-shaped crystals<sup>10,11</sup>. Where, the hydrogen phosphate ion ( $HPO_4^{2-}$ ) in the hydrated layers can be substituted or incorporated by dicarboxylate such as succinate ions into OCP crystal structure has been reported<sup>12,13</sup>. The molecular structure of succinic acid/ion is shown in figure -1.



**Figure 1.** Structure of succinic acid ( $HOOC.(CH_2)_2.COOH$ ) & its succinate ion ( $OOC.(CH_2)_2.COO$ )<sup>2-</sup>.

## [2]-EXPERIMENTAL :

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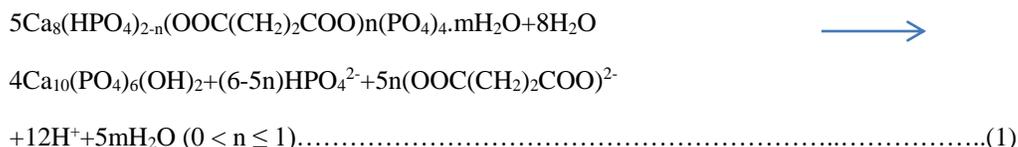
The experimental procedure for organo-modified octacalcium phosphate (OCP,  $(\text{HPO}_4)_2 \cdot (\text{PO}_4)_4 \cdot 5\text{H}_2\text{O}$ ) with incorporated succinate ion has been synthesized by a previously reported method<sup>14,15</sup>, which are adapted from the work described by T.Yokoi et al<sup>16</sup>. The required materials, chemicals/regents have been labotic bases standard, used. In preparation, the 20 mmol of dicorboxylic acid succinic acid ( $\text{HOOC}(\text{CH}_2)_2\text{COOH}$ ); 99.5% is dissolved in 200 cm<sup>3</sup> of ultra pure water, where the pH of solution is about 5.5 with adding of ammonia solution (aqu.NH<sub>3</sub> soln.:25%) in appropriate amount. The 16.0 mmol of calcium carbonate ( $\text{CaCO}_3$ ; calcite) has been suspended in the dicorboxylic acid solution and phosphoric acid ( $\text{H}_3\text{PO}_4$ ;85% aqu.soln.) 10.0 mmol is mixed with the suspension. Then suspension is stirred at 60°C, after about 3h, the pH of the suspension is reduced 5.5 to 5.0 by using of 1.0 mol. dm<sup>-3</sup>HCl solution and after 30 minutes, the precipitates has been vacuum filtrated for isolation and rinsed with ultra pure water and ethanol( $\text{C}_2\text{H}_5\text{OH}$ ), followed by drying overnight at 40°C.

The sample which synthesized in solution containing 20 mmol of succinic acid is denoted as Suc-20 as well as OCP those not containing dicorboxylate ion is synthesized also by using of  $\text{CaCO}_3$  (16.0 mmol) and  $\text{H}_3\text{PO}_4$  (12.0 mmol) which may denoted as CALPHOS . Now, CALPHOS(0.10g) and Suc-20(0.10g) are added to a 28-cm<sup>3</sup> teflon vessel with 10cm<sup>3</sup> of ultra pure water. The samples have incorporated as using of an autoclave, further by hydrothermally treatment at 180°C for 3h. In completion of phase transformation under hydrothermal treatment condition there are changing in morphology of generated HAP, if reaction time become longer due to aging, where hydrothermally treated sample has collected by vacuum filtration and it dried overnight at 40°C, respectively.

**[3]- RESULTS & DISCUSSION :**

As we mentioned earlier that, the succinate incorporated OCP has been reported herein following a procedure well reported<sup>14</sup>. The report reveals that the molar ratio (Ca/P) of OCP with complexated succinate (Suc-OCP) ion is expected to be 1.56± 0.02. The transformation of Suc-20 have proceeded under hydrothermal condition and Suc-OCP is transformed to HAP completely at 180°C for 3h by hydrothermal treatment. There is no by-products such as dicalcium phosphate anhydrous are detected by XRD analysis. It is reported that the colour changing of Suc-OCP from white to brown light upon the heating at 450°C in an air due to residual carbon formation. Notable, the colour of both CALPHOS & Suc-20 in visually, hydrothermal treatment is whitish and observed that non of the colour, which show under the before and after hydrothermal condition the decomposition of succinate ion may not occur.

Hydrothermally treatment at 180°C to 3h for samples (CALPHOS, Suc-20 ,Suc-OCP & Pure-OCP) the crystal morphology have been well assigned<sup>15,17</sup>. Where the characterization of different products of crystalline phases are now being by X-ray diffraction (XRD), scanning electron microscopy (SEM) and other instrumentation. The absorption peak of  $\text{HPO}_4^{2-}$  located in the hydrated layer is detected at 1193cm<sup>-1</sup>. This peak is not absorbed for Suc-20 because  $\text{HPO}_4^{2-}$  have replacement by succinate ion. The arising of observed peaks from the CH<sub>2</sub> bending modes and COO stretching of the complexated succinate ion are observed at 1565,1460 & 1300 cm<sup>-1</sup>. The absorption peak after hydrothermal treatment may corresponding to HAP are detected for both hydrothermally treated CALPHOS and Suc-20. Although, HAP crystallic lattice includes carbonat ions in hydrothermally synthesis in our samples, no detected absorption peak found in corresponding of carbonat ion. In crystalline phase terms the spectral observation of FTIR being in line of XRD results.



The HAP in Suc-OCP transformation is to proceeded from the reaction which are shown as above in eq. 1. For samples, the crystal morphology before & after hydrothermal treatment at 180°C for 3h have displayed that, the both hydrothermally and synthesized show that the CALPHOS sample composed by plate-shaped crystallic in micrometer in size, where there crystallic phases is changed from OCP to HAP. Thus, the crystal morphology of pure-OCP, are almost retained after phase transformation<sup>10,11</sup>. Similarly, to CALPHOS in macroscopic morphology there are no changing for Suc-20. These finding suggestion that for Suc-OCP transformation mechanism has similarity to that pure-OCP. On the basis of SEM images report of the different samples we observed that, the HAP crystals, where the thickness of crystallic HAP which is hydrothermally formed by treatment of CALPHOS is in range 50 - 150nm, having similarity to plate-shaped crystals hydrothermally (before) treatment. The persent observation have shown the dark line (S- line) are found at the centre of the Suc-20 crystal after hydrothermal treatment, in other words, in preparation of HAP crystals from OCP encapsulated to succinate ion mostly has composed of laminated crystallic thin plate-shaped which can attribute as gaping between two different thin plate-shaped crystals and ought to be thinner than the HAP crystal generated from pure-OCP.

Since, in hexagonal HAP crystal system where the crystallite size in the direction of the various axes (a,b,c) dependent on plate-shaped HAP crystals thicknesses<sup>11,16,18</sup>. The size of crystals is perpendicular as to (100) plane, which are calculated by the using of <http://dx.doi.org/10.29322/IJSRP.10.04.2020.p10034> [www.ijsrp.org](http://www.ijsrp.org)

Scherrer equation (as eq.-2) with comparing HAP plate-shaped crystallite thickness of CALPHOS and Suc-20 after hydrothermal treatment at 180°C for 3h.

$$D_{100} = K\lambda/(\beta \cos\theta) \dots\dots\dots [2]$$

Where,  $D_{100}$  = the crystallite size perpendicular to (100) plane,  $K$  = Scherrer constant (=0.9),  $\lambda$  is the wavelength of incident X-ray (0.154 nm),  $\beta$  = the full width at half-maximum of the 100 peak of reflection for HAP &  $\theta$  = the diffraction angle. The  $D_{100}$  values of samples as HAP prepared from Suc-20 have smaller than that of HAP crystals which are synthesized from CALPHOS. The SEM and crystallite size calculation also supports the presence of dark line (S- line) corresponding to gap between to thin-plate crystals, therefore, the HAP crystal which are obtained from Suc-20 likely have laminated nanostructures. Where, the succinate ion elimination from OCP crystal interlayers may necessary for transformation of HAP from OCP with succinate ion encapsulation. Probably, the formation of laminated nanostructured due to in thickness direction the succinate ion to inhibit crystal growth.

#### [4]-CONCLUSION:

In the present articles, we have reported the synthesis and octacalcium phosphate (OCP) transformation with complexed succinate ion to laminated thin plate-shaped hydroxyapatite (HAP) under before and after hydrothermal condition. The organically (succinate) modified plate-shaped OCP is transformed to pure-OCP and Suc-OCP in hydroxyapatite (HAP) under described condition at 180°C for 3h with adjusted pH to 5.5, where incorporated succinate ion having Ca/P molar ratio expected to be 1.56±0.02. The crystallite HAP mostly consisted to thin plate-shaped laminated nanocrystals with submicrometer thicknesses. In characterization of transformed OCP to laminated thin HAP crystals the various technique such as SEM image and X-ray patterns have also been well demonstrated to such study.

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# A Review on the various surgical techniques in the management of complete rotator cuff tear.

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**Abstract- Background:** One of the common problems of the shoulder is rotator cuff tear. The treatment decision for symptomatic full-thickness cuff tears seems largely based on the physician's personal experience and Level III and IV evidence, as high-quality data for guiding treatment is limited. We aim to evaluate the evidence available in recent literature, for the efficacy of various surgical modalities. **Methods:** A systematic search was performed of PubMed, google scholar and Scopus dates (1 January 1990 - 1 December 2018), search terms: 'rotator cuff tear', 'open rotator cuff repair', 'mini open rotator cuff repair', 'all arthroscopic rotator cuff repair', 'transosseous rotator cuff repair' 'single row repair', 'double row repair' and 'surgical indication'. All articles where open repair, mini and arthroscopic rotator cuff repair was performed from January 1, 1990 – December 1, 2018, where the diagnosis was full thickness rotator cuff tear were included. Total no of patients studied, the number of patients who were treated by mini open repair, transosseous repair, single row repair and double row repair, number of studies using various scoring systems were studied. Finally all the functional outcomes according to these various scores were cumulatively tabulated as excellent, good, fair and poor outcomes and were analyzed. **Results:** 12 studies were included. This included 2 RCTs, 6 prospective, and 4 retrospective studies. 4 studies compared arthroscopic and mini open repair and 3 studies compared arthroscopic suture anchor repair and transosseous repair. Functional outcome studies on mini open repair, all arthroscopic repair, single row suture anchor repair, double row suture anchor repair and arthroscopic transosseous repair were also included in the review analysis. Mini open rotator cuff repair had 72% excellent and 15% good results, Arthroscopic suture anchor repair had 44% excellent and 50% had good results and Arthroscopic transosseous repair had 60% excellent and 33% good results. **Conclusions:** All procedures gave good or excellent functional outcomes in most of the patients. Based on the patient convenience, surgeon's experience and monetary consideration, any surgical modality may be used for treatment of full thickness shoulder rotator cuff tear.

**Index Terms-** complete rotator cuff tear, open rotator cuff repair, mini open rotator cuff repair, all arthroscopic rotator cuff repair, transosseous rotator cuff repair, single row repair, double row repair

## I. INTRODUCTION

Shoulder pain is the one of the most common musculoskeletal complaint worldwide. Rotator cuff tear is the most common cause of shoulder disability. Rotator cuff tendons are the most commonly injured tendon. Supraspinatus muscle tendon is the most common amongst them. Rotator cuff tears have an increasing trend in the aging population. Symptoms of rotator cuff tears including pain, limited movement and shoulder dysfunction. However a large number may also remain asymptomatic. They

are subdivided into partial-thickness tears and full-thickness tears. Partial thickness tear can be managed conservatively, whereas complete tears require surgery unless contraindicated.<sup>1</sup>

The various surgical modalities of treatment of complete rotator cuff tear: open, mini open repair and arthroscopic rotator cuff tear, with either suture anchor or transosseous repair<sup>2</sup>.

Unfortunately, the treatment decision for symptomatic full-thickness cuff tears seems largely based on the physician's personal experience and Level III and IV evidence, as high-quality data for guiding treatment is limited<sup>2</sup>. Understanding the true risk of operative care is very important in allowing for careful consideration of treatment options. Risks include infection, bleeding, prolonged hospital stay, retears and suboptimal functional recovery.<sup>3</sup>

The aim of this article is to provide a comprehensive review on improvement in the functional outcome scores following various modern modalities of rotator cuff repair.

## II. METHODOLOGY

A comprehensive systematic review of the available literature in the English language was performed using PubMed, Google scholar and Scopus searches (1 January 1990 - 1 December 2018). We used the search term/combination(s): (complete rotator cuff tear and observation/ open rotator cuff repair / mini open rotator cuff repair / all arthroscopic rotator cuff repair / transosseous rotator cuff repair / single row repair / double row repair). The search was completed, independently, by the author in December of 2019. Initially, the abstracts were identified by title and compiled by the same Author.

After the provisional list of articles were identified and collected. We included all articles where open repair, mini open and arthroscopic rotator cuff repair was performed from January 1, 1990 –December 1, 2018 done on skeletally matured patients, where the diagnosis was full thickness rotator cuff tear. We excluded articles which were non-English study, published before 1990, studies on partial thickness rotator cuff tear, frozen shoulder, impingement syndrome, studies with concomitant lesions of labrum.

These articles were tabulated under the headings as the year of study, surgical technique assessed, number of patients studied, scoring system used and interpretation of the functional score. Total no of patients studied and the no of patients treated by mini open repair, transosseous repair, single row repair and double row repair were derived. Number of studies using various scoring systems as UCLA, ASES, Constant and Murley score, VAS score etc, was identified and the average scores according to these scores for each surgical procedure was calculated. Finally all the functional outcomes according to these various scores were cumulatively tabulated as excellent, good, fair and poor outcomes and were analysed.<sup>4</sup>

## III. RESULTS

A total of 38 studies were identified, of which 12 studies fitted into our inclusion and exclusion criteria. These 12 studies included 850 shoulders following rotator cuff repair, were systematically analyzed on the basis of functional outcome score and tabulated in Table 1. Out of 12 studies, 7 studies were comparative studies including 4 studies comparing arthroscopic and mini open repair and 3 studies comparing arthroscopic suture anchor repair and transosseous repair. Functional outcome studies on mini open repair, all arthroscopic repair, single row suture anchor repair, double row suture anchor repair and arthroscopic transosseous repair were also included in the review analysis. Constant Murley score and UCLA score were the most commonly used score each used in 5 studies. DASH score was used in 4 studies and ASES score was used in 2 studies. As per 4 studies on mini open repair of rotator cuff using UCLA score, the average post-operative score was 31.8. 2 studies which evaluated mini open repair of rotator cuff using ASES score had an average score of 93.5. 3 studies each using UCLA, ASES and DASH scoring systems evaluated arthroscopic rotator cuff repair had an average score of 31.66, 92.4 and 3.76 respectively, whereas Constant

and Murley scoring was used in 4 studies to evaluate the same procedure with an average score of 75.69. DASH score was used to evaluate transosseous repair in 3 studies with average score of 4.5. 2 studies each used UCLA and Constant and Murley scores with an average score of 36.15 and 69 respectively. The comparative studies revealed that there is no significant difference in functional outcome scores either in arthroscopic or mini open repair or between suture anchor repair and transosseous repair using arthroscopic technique. Most of the rotator cuff repair patients evaluated, irrespective of the surgical procedure, had excellent or good results in the various outcome scores they were evaluated with, as tabulated in table 2. Mini open rotator cuff repair had 72% excellent and 15% good results, Arthroscopic suture anchor repair had 44% excellent and 50% had good results and Arthroscopic transosseous repair had 60% excellent and 33% good results.

#### IV. DISCUSSION

Surgical repair is the gold standard in patients unresponsive to conservative management.<sup>5,6</sup> In the last 2 decades comparable functional results have been observed in patients undergoing open, mini-open, and arthroscopic repair.<sup>7,8</sup> The goal of rotator cuff repairs is to achieve high initial fixation strength, minimize gap formation, maintain mechanical stability with cyclic loading, and optimize the biology of the tendon-bone “healing zone” until the cuff heals biologically to the bone.<sup>9</sup>

Mini open technique became popular in the 1990s because it preserves the deltoid origin, allows for strong suture fixation, and involves a shorter learning curve. **Paulos LE** and **Kody MH** reviewed their results of mini-open repairs through a lateral deltoid splitting approach combined with arthroscopic subacromial decompression in 18 patients with a follow-up of 46 months. UCLA scores revealed good to excellent results in 16 patients. The two unsatisfactory results were in cases of workers’ compensation with pending claims. The two patients who had poor outcomes complained of pain localized to the acromioclavicular joint. Pain scores improved from an average of 1.6 to 7.6. UCLA scores improved from 2.5 to 8.4. Paulos and Kody recommended mini open repairs for patients with tears retracted less than 2 cm, regardless of size, and acute tears that could easily be mobilized and concluded, when used for patients with chronic impingement and rotator cuff tear, provides acceptable clinical results with minimal morbidity<sup>10</sup>.

**Blevins FT et al.** reported on 64 patients who underwent mini-open repairs. Approximately 83% of patients demonstrated weakness before the procedure, and only 22% did afterward. The Hospital for Special Surgery Shoulder Score showed 83% good to excellent results at follow-up at 29 months. No correlation between cuff tear size and shoulder score was evident in this study. Blevins et al concluded that this is a safe and effective therapy for patients with tear of the rotator cuff of various sizes but mobilization of large or massive tears was more difficult.<sup>11</sup>

A study by **Baker CL** and **Liu SH** compared open repair with mini open and found equally effective results in terms of relief of pain and functional outcomes<sup>12</sup>. Indications for a mini-open surgical approach are a full-thickness tear of rotator cuff avulsion type tear off the greater tuberosity, deep partial tears, greater than 50%, are also an indication for repair. The mini-open approach is most appropriate for small- to medium-sized tears encompassing a one-tendon tear of the supraspinatus, or possibly a two-tendon tear of the supraspinatus and the upper half of the infraspinatus. The mini-open approach, while well established for supraspinatus tears, is contraindicated in those patients with subscapularis involvement. Mini-open approach in revision rotator-cuff repairs would compromise the ability to release previous postsurgical scarring and adequately expose the rotator cuff in a revision situation<sup>13</sup>.

**Weber SC** and **Schaeffel R** reviewed the results of mini-open repairs versus those of traditional open repairs in a retrospective study in 1993. A total of 69 open repairs and 60 mini-open repairs were performed for patients with small to moderate-sized tears with follow up of minimum of 2 years. Patients in the mini-open-treated group used significantly less

parenteral narcotics and had shorter hospital stays. The results between the two groups were not significantly different, but the lower morbidity rate and cost were believed to be significant advantages.<sup>13</sup>

Arthroscopic repair of the rotator cuff is the most commonly performed surgical procedure in the current era. **Seung-Ho Kim et al** compared the outcomes of repair of rotator cuff using arthroscopy for medium and large rotator cuff tears with the outcomes for mini-open repair of similar tears. They concluded the outcome scores were similar in both group and the results were equivocal<sup>14</sup>.

**Lana Kang et al**, in their study, compared the early functional outcome of mini-open and arthroscopic rotator cuff repair. A total of 128 patients were studied. At the end of 3 and 6 months, both MORCR and ARCR showed significant improvement in all patient-derived outcome parameters ( $P < .0001$ ) except for three SF-36 variables. The improvements in the SF-36 bodily pain score at the end of 3 months postoperatively ( $P = .041$ ) and the VAS pain score at the end of 6 months postoperatively ( $P = .03$ ) were better for ARCR. In the study it was found that the early functional outcomes of MRCR and ARCR of small- and medium-sized rotator cuff tears are nearly equivalent. In light of the advantages of ARCR that motivate its popularity, this is an unexpected finding. However, an equally important result of this study was the finding that ARCR was associated with statistically significant improvement in the SF-36 bodily pain score and VAS pain score at the end of 3 and 6 months respectively ( $P = .041$  and  $.03$ , respectively)<sup>15</sup>.

**Köse, K. Ç et al** compared all-arthroscopic cuff repair (ARCR) and mini-open rotator cuff repair (MORCR) methods with regard to clinical outcomes and costs. Tear sizes ( $P=0.68$ ), pre- and postoperative Constant–Murley and UCLA scores ( $P=0.254$ ) and satisfaction levels did not differ significantly between groups. However, the differences noted between pre- and postoperative Constant–Murley and UCLA scores were statistically significant within the two groups. The results suggest that ARCR shows similar clinical results but at a higher cost compared with MORCR<sup>16</sup>.

**Junji Ide et al** compared the results of all the arthroscopically repaired full-thickness rotator cuff tears including massive tear with those of open repair. The arthroscopic group consisted of 50 patients and the open group 50 patients. The UCLA score and the JOA score improved significantly in both groups postoperatively ( $P < .0001$ ). The outcomes were excellent in 78 patients (78%), good in 13 (13%), fair in 6 (6%), and poor in 3 (3%). Outcome and postoperative shoulder scores showed no significant difference between the arthroscopic and open groups<sup>17</sup>.

Transosseous rotator cuff repair techniques still remain the gold standard for tendon healing. Some studies have shown a greater contact and pressure distribution with superior tendon fixation and reduced motion at the tendon-to-tuberosity interface with a simple transosseous repair configuration in comparison to anchor-based suture anchor repair simple and mattress repair techniques.<sup>6</sup> **Tuoheti Y** studied and evaluated the contact area, contact pressure, and pressure patterns of the tendon bone interface after repair of the rotator cuff. They compared SR, DR and TO techniques have shown that the transosseous technique produced the second greatest contact area and the least contact pressure<sup>18</sup>. **Mazzocca AD** have also previously showed that a transosseous equivalent repair had higher contact pressure and force at all-time points during load to failure in comparison to SR, DR and TO repair techniques. Over the last decade, mini open transosseous anchorless repair techniques have been developed with comparable results to standard arthroscopic and open approaches. Superior tendon fixation with reduced motion at the tendon tuberosity interface is observed with transosseous techniques<sup>19</sup>. Recently, **Itoi** showed that bone tunnels through the footprint may contribute to biologic healing by increasing blood flow in the repaired rotator cuff.<sup>20</sup>

**Flanagin BA et al.** evaluated the clinical outcomes at midterm, following a novel arthroscopic TO (anchorless) rotator cuff repair of 109 shoulders. According to ASES scores, the results for 109 shoulders available for final follow-up were excellent in 95 (87.1%), good in 8 (7.3%), fair in 3 (2.8%), and poor in 3 (2.8%). There was no difference in ROM or outcome scores in the patients who underwent a concomitant biceps procedure (tenodesis or tenotomy) compared with those who did not. He concluded

with Arthroscopic TO rotator cuff repair leads to statistically significant midterm improvement in ROM and satisfactory subjective outcome scores with low complication/failure rates in patients with average medium-sized rotator cuff tears with minimal fatty infiltration<sup>21</sup>

**SG Krishnan *et al.***, studied arthroscopic transosseous repair of rotator cuff for full-thickness tears of the Rotator Cuff in Patients age less than 40 Years. All patients (100%) reported diminished pain, and 22 (95%) reported improvement with activities of daily living. Complications included superficial wound infection (1) and axillary nerve palsy after initial dislocation (1). Given the choice, 22 patients(95%)would have same procedure again<sup>22</sup>.

Several techniques for suture anchor repair of rotator cuff defects have been introduced over the past few years. Besides established single-row repairs, classical double row (DR), and suture bridge DR transosseous equivalent (TOE) technique has been developed.

At present, single row is the most frequently used repair, with suture anchors disposed in 1 row over the humeral head, at the native site of insertion of the tendon.<sup>8</sup>

Technically, SR technique is simpler, quicker, inflicts less trauma to tendon margins, cheaper, and easier to revise. On the downside, the SR technique has smaller contact area and pressures, and the repaired tendon is allowed to heal over the smaller area, which theoretically predisposes SR repair to poor healing potential.<sup>23</sup>

**Stoppani CA *et al*** evaluated the clinical and radiological outcomes of arthroscopic rotator cuff repair using 2 different techniques: single-row anchor fixation versus transosseous hardware-free suture repair. Sixty nine patients were enrolled in the study and the patients were evaluated clinically before surgery, during the 28 days after surgery, and at least 1 year after the operation by the use of validated rating scores (Constant score, QuickDASH, and numerical rating scale [NRS]).: No significant differences were found between the 2 arthroscopic repair techniques in terms of functional and radiological outcomes. However, postoperative pain decreased quickly after the transosseous procedure, which therefore emerges as a possible improvement in the surgical repair of the rotator cuff<sup>24</sup>.

**Garofalo R *et al.*** reviewed the structural and clinical outcomes of 96 cases rotator cuff tear, repaired arthroscopically, with a single row (SR) or transosseous (TO) anchorless technique. In 96 patients, 42 patients in the SR group and 54 patients in the TO group. In the SR group the Constant rating system showed significant improvement from a preoperative average rating of 44.8 to an average of 85.7. In the TO repair group the Constant rating system showed a significant improvement from a preoperative average of 46.1 to an average of 87.6 postoperatively. According to ASES index scores, the average total score improved from 42.8 to 92.0 in the anchor group and 40.4 to 94.6 in the TO group. There was no statistical difference between the two groups in clinical outcomes<sup>21</sup>.

**Randelli P *et al.*** demonstrated for the first time in a randomized double blind clinical trial, comparing anchorless transosseous versus anchored single-row repair similar results in regard to MRI assessed tendon healing (87% vs 88% Sugaya type I-III 1 year after surgery) and shoulder function assessed by Constant score, Quick DASH, and pain score. The difference in functional outcome between the intact and return patients, expressed by the Constant and QuickDASH scores, revealed no differences ( $P = .57$  and  $P = .56$ , respectively). The difference in strength between patients with an untorn rotator cuff and those with a return rotator cuff (7.02 vs 5.73 kg, respectively) was not statistically significant ( $P = .31$ ). The difference in pain between these 2 groups was statistically significant ( $P = .03$ ), with a mean NRS score of 1.11 in the patients with intact rotator cuffs and 2.75 in the group with return rotator cuffs. No postoperative complications, except for retears, occurred during the study period.<sup>24</sup>

In the “double row” configuration, 2 rows of suture anchors are placed over the articular cartilage margin of the anatomic neck (medial) and along the lateral edge of the tuberosity (lateral) to better restore the native rotator cuff footprint. Usually, a mattress configuration is used to tie the medial suture anchors, and a simple configuration is performed for the lateral anchors.

The suture bridge double- row technique as originally introduced by **Park et al**<sup>25</sup>. It was developed to maximize tendon-to-bone compression by bridging the medial suture limbs to lateral suture anchors. This results in compression of the tendon onto the rotator cuff footprint.

Classic DR is criticized for increased operative time, complexity of the procedure, and higher cost of more implants used without having any major added clinical advantage over SR. In addition, presence of excess implant at the footprint renders repair of re-tear difficult.<sup>26</sup>

**Francesco Franceschi et al** hypothesized that there was no difference in clinical and imaging outcome between single-row and double-row suture anchor technique repairs of rotator cuff tear. The authors recruited 60 patients. In 30 patients, rotator cuff repair was performed with a single-row suture anchor technique (group I). In the other 30 patients, rotator cuff repair was performed with a double-row suture anchor technique (group II). The UCLA rating system showed a statistically significant improvement from a preoperative mean rating of 11.5 (range, 6-14) to a mean of 32.9 (range, 29-35) postoperatively ( $P < .05$ ) in GROUP 1. The UCLA rating system showed a statistically significant improvement from a preoperative mean rating of 10.1 (range, 5-14) to a mean of 33.3 (range, 30-35) postoperatively ( $P < .05$ ) in GROUP 2<sup>8</sup>.

As per our review and as per our discussion above rotator cuff repairs give good to excellent results irrespective of the type of surgery performed. RCTs with larger number of patients may help to prove the superiority of one procedure over the other.

#### V. CONCLUSION

All surgical repair of complete rotator cuff tears gave equivocal results as evidenced by our review. All procedures gave good or excellent functional outcomes in most of the patients. Based on the patient convenience, surgeon's experience and monetary consideration, any surgical fixation of rotator cuff either transosseous or suture anchor fixation through any approach open, mini open and arthroscopic procedures may be performed.

I. APPENDIX

TABLE 1: CUMULATIVE TABLE SHOWING FUNCTIONAL OUTCOME SCORES OF THE VARIOUS ARTICLES VIEWED

S.No	AUTHOR	YEAR	SCORING SYSTEM	No. of shoulders	Surgeries compared	INTERPRETATION																								
1	Paulos L.E. and Kody MH	1994	UCLA	18	Mini open transosseous repair with sub acromial decompression	VAS scores improved from an average of 1.6 to 7.6. Average UCLA score : 33.33																								
2	Blevine FT et al	1996	Modified Hospital for Special Surgery Shoulder Score	78	arthroscopic assisted mini-open rotator cuff repair	.The modified HSS shoulder score in the 47 patients who completed a questionnaire and a physical examination increased from 44 of 100 preoperatively to 86 of 100 postoperatively (P < .05).																								
3	Seung Ho Kim et al	2003	UCLA score	76	arthroscopic repair of medium and large rotator cuff tears and mini-open repair of similar tears	<table border="1"> <thead> <tr> <th>score</th> <th>surgical technique</th> <th>Preop</th> <th>2 yrs</th> </tr> </thead> <tbody> <tr> <td rowspan="2">UCLA</td> <td>Arthroscopic Repair</td> <td>19+/-4.3</td> <td>33+/-2.8</td> </tr> <tr> <td>Mini-Open Repair</td> <td>18+/-2.6</td> <td>33+/-3.4</td> </tr> <tr> <td rowspan="2">ASES</td> <td>Arthroscopic Repair</td> <td>61+/-16</td> <td>95+/-7.2</td> </tr> <tr> <td>Mini-Open Repair</td> <td>59 +/-12</td> <td>95+/-7.3</td> </tr> </tbody> </table>	score	surgical technique	Preop	2 yrs	UCLA	Arthroscopic Repair	19+/-4.3	33+/-2.8	Mini-Open Repair	18+/-2.6	33+/-3.4	ASES	Arthroscopic Repair	61+/-16	95+/-7.2	Mini-Open Repair	59 +/-12	95+/-7.3						
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4	Junji Ide et al	2005	-UCLA score -JOA score(Japanese Orthopaedic Association)	100	all-arthroscopic repair of full-thickness rotator cuff tears including massive tear and open repair	<table border="1"> <thead> <tr> <th>score</th> <th>surgical technique</th> <th>Preop</th> <th>49 m</th> </tr> </thead> <tbody> <tr> <td rowspan="2">UCLA</td> <td>Arthroscopic Repair</td> <td>16.1</td> <td>32.0</td> </tr> <tr> <td>Open Repair</td> <td>15.5</td> <td>31.6</td> </tr> <tr> <td rowspan="2">JOA score</td> <td>Arthroscopic Repair</td> <td>58.7</td> <td>94.0</td> </tr> <tr> <td>Open Repair</td> <td>56.9</td> <td>92.1</td> </tr> </tbody> </table>	score	surgical technique	Preop	49 m	UCLA	Arthroscopic Repair	16.1	32.0	Open Repair	15.5	31.6	JOA score	Arthroscopic Repair	58.7	94.0	Open Repair	56.9	92.1						
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5	S.G. Kreshnan et al	2007	ASES score	24	arthroscopic suture anchor repair of full-thickness tear	Mean preoperative American Shoulder and Elbow Surgeon's (ASES) self-report score was 42 (range, 22 to 60); the mean postoperative score was 92 (range, 65 to 100; P < .01).																								
6	Lana Kang M.D. et al	2007	-VAS score -SF-36 -SST -DASH	128	Mini-open and arthroscopic rotator cuff repair.	<p>Mini open rotator cuff repair</p> <table border="1"> <thead> <tr> <th>Score</th> <th>Preop</th> <th>3mon</th> <th>6mon</th> </tr> </thead> <tbody> <tr> <td>DASH</td> <td>40.7 +/-17.5</td> <td>29.1 +/-18.8</td> <td>18.8 +/-19.1</td> </tr> <tr> <td>SST</td> <td>5.2 +/-3.1</td> <td>7.4 +/-2.7</td> <td>9.3 +/-2.5</td> </tr> <tr> <td>VAS</td> <td>5.9 +/-2.2</td> <td>3.0 +/-1.9</td> <td>2.5 +/-2.3</td> </tr> <tr> <td>SF-36</td> <td>73.9 +/-20.4</td> <td>73.2 +/-21.4</td> <td>79.2 +/-21.4</td> </tr> </tbody> </table> <p><a href="http://dx.doi.org/10.29322/IJSRP.10.04.2020.p10035">http://dx.doi.org/10.29322/IJSRP.10.04.2020.p10035</a></p> <p>Arthroscopic rotator cuff repair</p> <table border="1"> <tr> <td>S</td> <td>Pr</td> <td>3</td> <td>6</td> </tr> </table>	Score	Preop	3mon	6mon	DASH	40.7 +/-17.5	29.1 +/-18.8	18.8 +/-19.1	SST	5.2 +/-3.1	7.4 +/-2.7	9.3 +/-2.5	VAS	5.9 +/-2.2	3.0 +/-1.9	2.5 +/-2.3	SF-36	73.9 +/-20.4	73.2 +/-21.4	79.2 +/-21.4	S	Pr	3	6
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7	Köse, K.Ç., Tezen et al	2008	Constant Murley score UCLA score	50	all-arthroscopic cuff repair (ARCR) and mini-open rotator cuff repair (MORCR) methods	score	surgical technique	Preop	Postop
						Constant Murley score	All arthroscopic cuff repair	46.2+/-11.8	83.56+/-11.45
							Mini-open rotator cuff repair	45.6+/-12.4	79.56+/-13.64
						UCLA score	All arthroscopic cuff repair	11.2+/-5.6	29.76+/-4.5
Mini-open rotator cuff repair	10.6+/-4.5	28.8+/-3.42							
8	Flanagan BA et al	2016	ASES • Forward flexion • External rotation • Internal rotation N=56	109	novel arthroscopic TO (anchorless) rotator cuff repair technique	American Shoulder and Elbow Surgeons (ASES) score post operatively at an average 38.0 months was 94.6 showing			
						Scores		No of shoulder	
						Excellent		95	
						Good		8	
						Fair		3	
Poor		3							
9	Randelli P et al	2017	Constant score Quick DASH Numerical rating scale N=69	69	arthroscopic rotator cuff repair using 2 different techniques: single-row anchor fixation versus transosseous hardware-free suture repair	Score	surgical technique	Preop	1 yr
						Constant score	Anchor (single row)	65.1	72.3
							Transosseous	64.3	69.9
						QuickDASH	Anchor(single row)	45.4	2.3
Transosseous	55.6	4.5							
10	Dinsha BS et al	2017	Constant Score N=31	31	rotator cuff repair using all-suture anchors	Of the 31 patients who underwent rotator cuff repair using all-suture anchors the average Constant score was 77 at the end of 1 year follow up.			
11	Carlo Stoppani et al	2017	Constant score Quick DASH N=96	69	Arthroscopic suture anchor repair and transosseous repair	score	surgical technique	Preop	15 m
						Constant score	Anchor	65.1	72.3
							Transosseous	64.3	69.9
						QuickDASH	Anchor	45.4	2.3
Transosseous	55.6	4.5							
12	Garofalo R et al	2018	ASES 96 patients who underwent an arthroscopic repair for superior or posterosuperior rotator cuff tear using TO (n:54) or a SR (n:42) were retrospectively enrolled in this study after	96	arthroscopic repair for superior or posterosuperior rotator cuff tear using TO or a SR	score	surgical technique	Preop	15 m
						ASES score	Anchor (single row)	44.8 ± 4.1	85.7 ± 6.1
							Transosseous	46.1 ± 7.2	87.6 ± 4.1
						QuickDASH	Anchor(single row)	40.4 ± 7.2	92.1 ± 4.3
Transosseous	42.8 ± 8.2	94.6 ±							

			evaluation of clinical and surgical notes. N=96						6.1
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Table 2: Showing only Excellent and good results by the end of study period for the most commonly performed procedures for mini open rotator cuff repair.

Surgical procedure	Excellent	Good
Mini open rotator cuff repair	120	25
Arthroscopic suture anchor repair	181	207
Arthroscopic transosseous repair	167	91

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# An investigation into the maintenance practices in engineering workshops in senior high technical schools in western part of Ghana: A case study

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**Abstract-** This paper presents a study to identify the various types of maintenance practices employed in engineering workshops in the Senior High Technical Schools in the western part of Ghana. The study also explores the effects of management of materials, tool and stores control system on the maintenance practice in the engineering workshops. The study was based on a case study survey through which views and opinions were sampled from headmasters, teachers and students in the Sefwi Wiawso municipality. Both qualitative and quantitative approaches were employed in conducting the research study. The data was collected using a structured written questionnaire and interviewing guides. We also utilized the SPSS version 19 software to analyze the data. We found that most of the selected institutions had technical workshop maintenance department at their schools. We also observed that these technical maintenance departments in the schools were consulted in the selection of new equipment, replacement of old and outmoded equipment and spare parts. From the survey and interviews with the respondents, the selected schools had an incentive policy for the workshop maintenance staff. We also observed some major challenges the schools were facing. These challenges were mainly financial challenges because most of the workshop maintenance strategies were capital intensive. The schools also didn't have enough maintenance training programs and seminars to educate their workshop maintenance staff. The study recommended that the Ministry of Education should provide the necessary logistics to sustain the technical workshop maintenance department in various technical institutes.

**Index Terms-** Maintenance practices, maintenance management, quality, productivity, profitability, effectiveness, Proactive maintenance, downtime maintenance.

## I. INTRODUCTION

Over the past decades, a lot of papers have been reported on the maintenance practices in industries, companies and workshops. These effective maintenance practices ensure stability of equipment and promote the lifespan of the machines and its proper functioning in industries and workshops. It also avoids any unnecessary breakdowns, improves the safety practices in the workshops, and increases the profitability. Most workshops and industries' internal efficacy is strongly affected by the maintenance role and the impact on other working areas such as production, quality, production cost, and working environment [1, 2]. Maintenance is often viewed as a costly centred [3] venture rather than a competitive resource, mainly within the manufacturing industries [2]. Nowadays it has been acknowledged by numerous researchers and engineers that maintenance is a key contributor to the performance and profitability of industrial and manufacturing systems [4, 5]. There have been so many challenges that have confronted maintenance, some of which are capacity expansion, set-up time, quality improvement, cost reductions, and related environmental problems. Ineffective maintenance planning affects the quantity and quality of production, the process variability which in turn results in insufficient production cost and customer displeasure [6-8].

To achieve excellent maintenance, the gap between risk, cost and maintenance must be considered in order to achieve high-quality solutions [9]. Wang [10] stated that maintenance plays an important role in maintaining availability and reliability levels, product quality and safety requirements [11]. Therefore the importance of developing maintenance management has brought an increased concern in research academically [12]. Maintenance effectiveness [13] is critical to several operations [2], in maintaining constant productivity, high quality and competitive industries. Swanson [14] reported that maintenance extends the lifespan of equipment, improves the availability of equipment and keeps it in good state. Poppe [15] also reported that the maintenance policies that are commonly encountered both in practice and in academia are, regular maintenance, condition-based maintenance and corrective maintenance or preventive maintenance strategies [16-18]. And Wireman [19], also stated the five basic categories of maintenance

practices; The Reactive Maintenance, Corrective Maintenance, Preventive Maintenance (PM), Predictive Maintenance, Maintenance Prevention and Breakdown Maintenance. Reactive maintenance refers to the fixation of items by periodic inspection or on-site observation when needed. If you prioritize these unplanned fixes, you need time away from planned maintenance [20, 21]. Proper maintenance practices can improve overall business performance by affecting the quality, efficiency, and effectiveness of company operations [3]. These operations can take many forms, such as fault maintenance, preventative maintenance (PM), which replaces components with statistical models based on collected historical fault data at pre-specified times, or state-based maintenance (CBM) by monitoring conditions of the component that uses one (or more) condition monitoring (CM) technology [22]. Therefore both Maintenance on corrective and preventive has an impact on the cost and availability of the facility [23]. Emami-Mchrgani [24] also addresses the production planning and control of strategic optimization issues that combines strategic and operational decisions related to production, corrective and preventive maintenance, and inventory [25]. Fumagalli also stated that planning the reliability of a preventive maintenance system by maximizing system reliability depends on many factors. One of them is arranging maintenance interventions within a certain timeframe [26]. Most companies and industries have already recognized and appreciated the importance of investment maintenance as it affects all aspects of business development. According to Isabel, cost maintenance accounts for 15 to 40% of production costs [27, 28]. Also in 1971, the concept of Total Productive Maintenance (TPM) was introduced in Japan, to solve maintenance issues by giving employees and operators more responsibilities [29].

Although several papers have been successfully reported on maintenance practices in industries and companies, there are several areas that need more attention to be investigated.

Mwanza reported a study on the maintenance practices in the effectiveness of equipment maintenance practices in public hospitals. And their reports indicated that the maintenance practices at the hospitals were not effective. This was as a result of lack of appropriate labour management system and lack professional training programs [30]. Arslankaya also did work on maintenance and manufacturing practices in an industry that produces dairy products. Their result showed that the service life of the machine ensures the safety of employees and it also reduces maintenance and repair costs [31, 32]. Sharma predicted a study on the maintenance of Artificial Turf and after its data analysis, he indicated that the importance of regular and proper maintenance of Artificial Grass Pitches (AGP), enables it to continue to operate effectively and it also increases its life expectancy [33]. According to Verhagen who did a study on maintenance on predictive for aircraft machinery with a proportional risk model. And their data for nine components of the unplanned gap indicated that the new maintenance plan derived from the proposed reliability model can reduce the number of unplanned events [34]. Leong also studied the maintenance practices on quality management. And their findings predicted the potential to combine all the theoretical, technical and non-technical methods in quality management maintenance [35].

In this work, we shall investigate the various types of maintenance practices employed in engineering workshops in the Senior High Technical Schools in the Western part of Ghana. This study aims to bring out and formulate an excellent practice that can help improve the maintenance practices of these workshops. We believe that proper maintenance of machines and equipment can significantly reduce the overall operating cost, and it can also boost the lifespan of the machines. We also discuss how to maximize the potential benefit of maintenance activities. The idea which might be very different from the conventional philosophy of maintenance, but this might be something that could be worth a thought for a new perspective in a new millennium.

## II. METHODOLOGY

### 2.1 Case Study

The case study was conducted in Sefwi Wiawso and Asankrangwa Senior Technical schools in the Western part of Ghana, where views and opinions were sampled from Headmasters and teachers in the municipality. The two schools were selected because they are the Secondary Technical Schools that have technical workshops in the municipalities. These schools are well equipped with machines that can help the survey to be conducted effectively. These schools were also selected because of their large population. The study was conducted at the various workshops of the schools. Therefore, in response to the purpose of this study, data relating to these studies were obtained.

Again, information gathered from the case study can be meaningful or useful in diagnosing the situation. Since it involves describing, recording, analyzing and interpreting the conditions that exist. The study is basically aimed at gathering useful data on those conditions and variables that cannot be manipulated and which would help to identify the effects of maintenance practices adopted by the various workshops. The effects of such practices on the production level, facilities life span, workers (students) and operators as well as the reasons for using a particular maintenance practice [36].

### 2.2 Data Collection and Analysis

Data was collected using a structured written questionnaire and interviewing guide.

#### 2.2.1 Questionnaire

A questionnaire was designed in order to obtain data for the analyses of the study, such as biographic information of respondents, manpower development in the engineering workshops, the types of maintenance being practiced in engineering workshops and the effects of management of materials, tools and stores control system on the maintenance practice in the engineering workshops. Table 1 depicts the data obtained from the study.

### 2.2.2 Interview

The study obtained information from the headmasters using face to face interview; this was aimed at finding out certain information needed, of which satisfactory response may not be obtained through a written questionnaire. The interview guide contains information regarding the effects of maintenance practices.

### 2.3 Population

According to [37] population is used to refer to the entire group of individuals to whom findings of a study apply. In this study the targeted population was from Asankragwa Senior High Technical School and Sefwi Wiawso Senior High Technical School, in the Western part of Ghana. The entire targeted population for this study was three hundred (300) teachers and ten (10) headteachers.

### 2.4 Sample Size

The study considered one hundred participants which consist of ninety technical teachers and ten headmasters.

### 2.5 Sampling Technique

In the sampling of respondents for the administration of questionnaires, the study used the random sampling technique to select technical teachers. The random sampling approach involves the selection of respondents without an identifiable pattern or plan. This approach was to enable the study to solicit varying perception in relation to the study without any prejudice. The random approach was thus selected because it's unbiased and gives outputs which are not partial. The random approach was used by Yanker [38], Obeng [39], and Clark [40] in similar studies, and thus, it was considered relevant for this study. However, the headmasters were selected using purposive sampling method.

### 2.6 Piloting the Instruments

The instrument was piloted using 10 technical teachers and 2 headmasters as a pilot study to gather their views and responses. Their comments were considered before the actual administration of the questionnaire, based on the issues emerge from the questionnaire data a semi-structures interview was piloted at the place and with the same participants.

### 2.7 Validating the Findings

Triangulation is a useful way of validating the findings of case studies. Two types of triangulations data and respondent were employed in this study. Data triangulation was achieved by using both the semi-structured questionnaire and interview to gather data from the participants. The findings from both data sets were compared for validation. Respondent triangulations were achieved by using each of the technical teachers and headmasters.

**Table 1. Data for the case study analysis (Biographic Information of Respondents)**

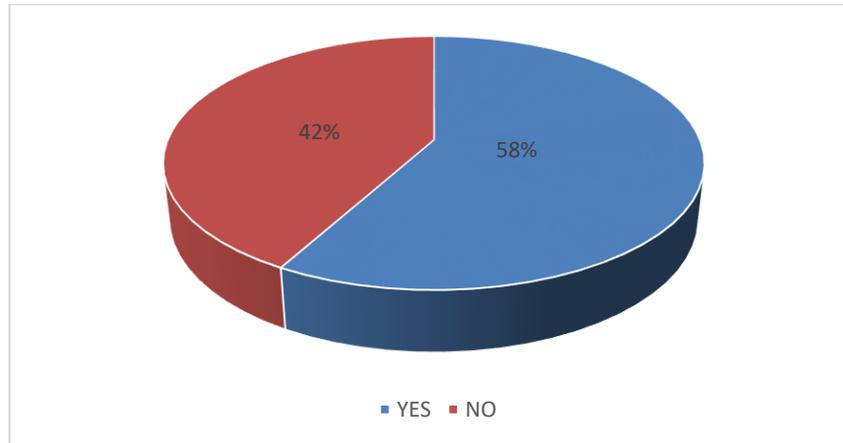
Biographic Information	Frequency	Percentage
<b>Age</b>		
28-32 years	65	65
33-37 years	19	19
38-42 years	16	16
<b>Total</b>	<b>100</b>	<b>100</b>
<b>Sex</b>		
Male	52	52
Female	48	48
<b>Total</b>	<b>100</b>	<b>100</b>
<b>Highest qualification</b>		
Bachelor's degree	73	73
Master's degree	17	17
Diploma	10	10
<b>Total</b>	<b>100</b>	<b>100</b>

### III. DATA ANALYSIS AND RESULTS

According to Table 1, majority of the respondents (65%) were in the age group 28-32 years, 19% of the respondents were in the age group 33-37 years and the minority of the respondents (16%) were in the age group 38-42 years. Majority of the respondents (52%) were males and 48% were females. Majority of the respondents (73%) had bachelors' degree as their highest qualifications, 17% had Master's degree as their highest qualification and 10% of the respondents had Diploma qualifications.

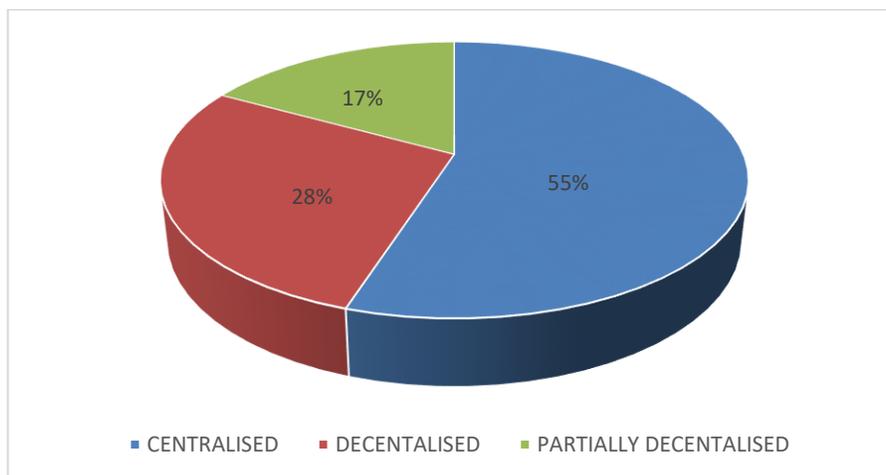
#### 3.1 Manpower Development in the Engineering Workshops

From Figure 3.1, 58% of the respondents confirmed that they have technical workshop maintenance department at their school and 42% of the respondents also confirmed that they do not have technical workshop maintenance departments. It is very important for every organization to have a maintenance workshop. This may be an area where machines and equipment are repaired or tested.



**Figure 3.1: Technical workshop maintenance department source.**

Figure 3.2 indicates that majority of the respondents (55%) said that their schools have a centralized workshop maintenance department, 28% of the respondents have decentralized technical workshop maintenance department and 17% have partially decentralized technical workshop maintenance department. In large plants located at different places, where inter-unit communication is difficult, the decentralized system of organization is practised.

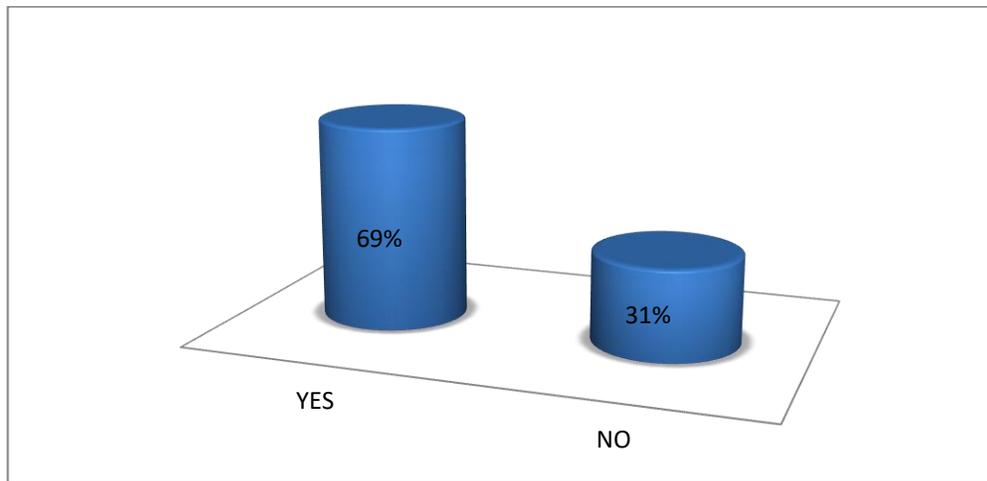


**Figure 3.2: The type of workshop maintenance department used in schools.**

Figure 3.3 shows that majority of the respondents (69%) confirmed that the technical maintenance department is consulted in the selection of new or replacement equipment or spare parts. 31% of the respondents said that the technical maintenance department is not consulted in the selection of new or replacement equipment or spare parts.

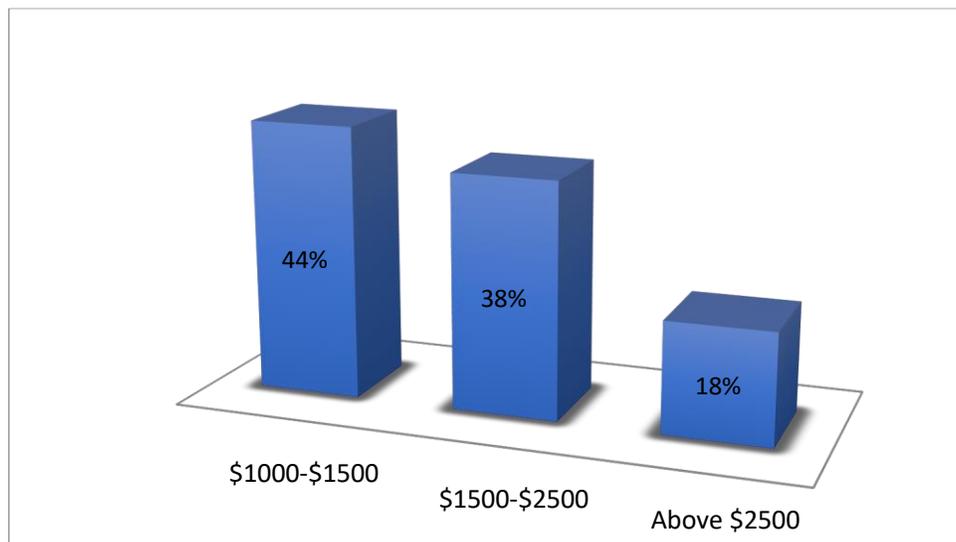
Materials are the basic items needed in every engineering workshop production, repair or replacement of component parts and manufacturing. According to Khanna, most manufacturing workshops spend more than 60% of their budgets on materials [41]. This

means that the cost of materials consumes a substantial portion of the capital investment in an industry (workshop). This emphasizes the need for adequate materials control. For maintenance work to be effective and efficient, more emphasis must be placed on the materials, stock management and control, because even a small saving in materials can reduce the production cost to a fair extent and thus add to the profit. Materials management involves controlling the type, amount, location, movement, timing of purchasing of various materials for use by the workshop/industry [41].



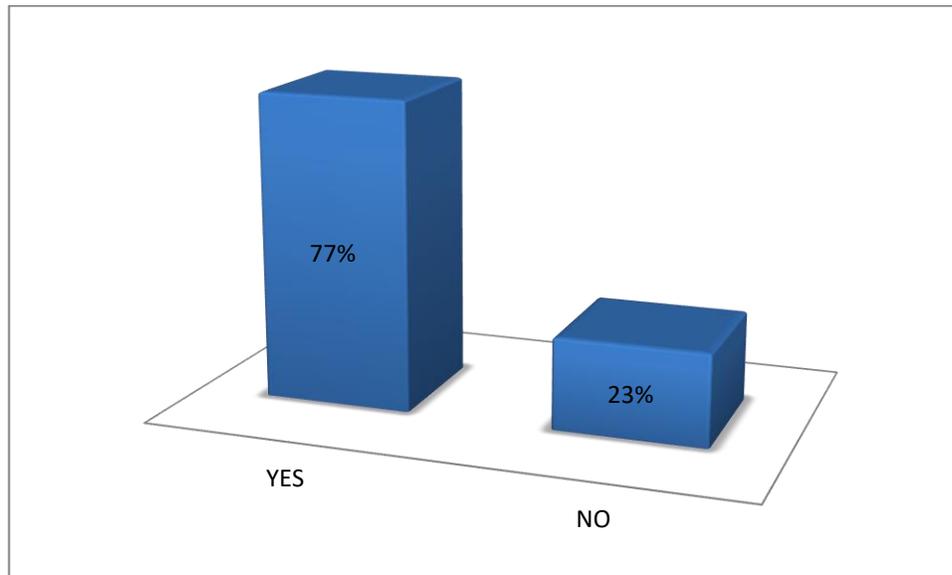
**Figure 3.3: Maintenance department by the technical workshop.**

Figure 3.4 portrays that most of the respondents (44%) confirmed that the annual maintenance budget incurred by the schools is between \$1000–\$1500, 38% of the respondents said that the annual maintenance budget incurred by the schools is between \$1500–\$2500 and 18% of the respondents confirmed that the annual maintenance budget incurred by the schools are above \$2500. According to Mishra, the optimal performance of machinery is a must for economic viability of any capital-intensive industry. Maintenance practice plays a vital role in achieving higher production targets. However, the cost of production operation must be within the laid down limits. Therefore, every industry must establish a maintenance department to achieve its required efficiency [42].



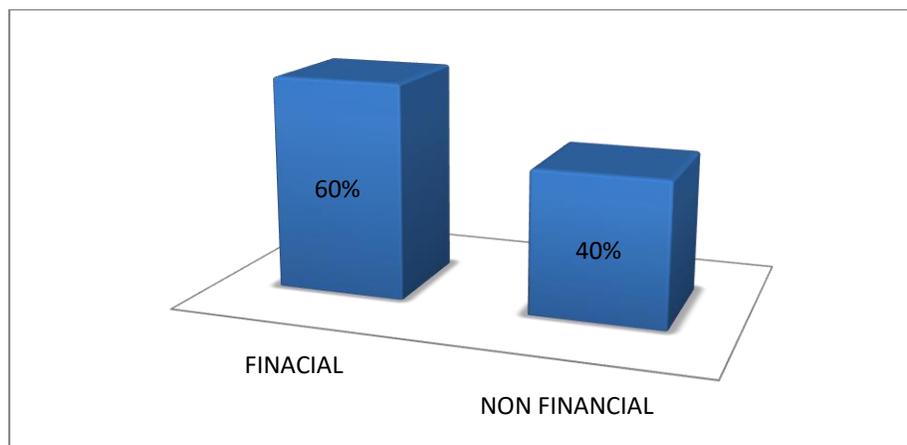
**Figure 3.4: Annual maintenance budget incurred by the Schools.**

According to Figure 3.5, 77% of the respondents confirmed that their schools have an incentive policy for workshop maintenance staff and 23% said that their schools do not have an incentive policy for workshop maintenance staff. Reducing cost is sometimes an overlooked aspect of maintenance. However, a maintenance organization/department can help a workshop reduce cost in many ways. For example, a change in maintenance policy may lengthen production times without damaging the equipment. This change reduces maintenance cost and at the same time increases production capacity. Maintenance can usually make adjustment in tools training, repair procedures and work planning, all these can reduce the amount of labour or materials that may be required to perform a specific work.



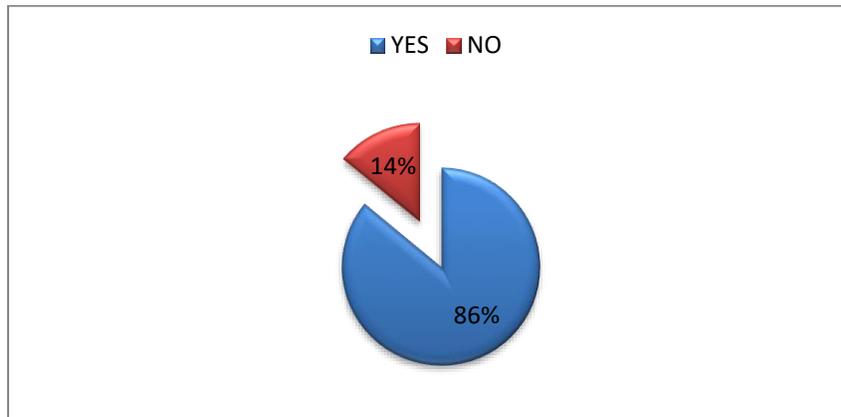
**Figure 3.5: Incentive policy for workshop maintenance staff**

From Figure 3.6, 60% of the respondents confirmed that their schools are given financial incentives and 40% of the respondents confirmed their maintenance staff receives nonfinancial incentives. The cost of maintenance may differ from one workshop to another, or from one organization to another depending on the value the organization place on the maintenance practices and its implications. The maintenance cost includes the cost of spares, cost of materials, personnel, expenditure incurred on utilities such as electricity, water, air, gas, etc. The other dimension of maintenance cost is the downtime of the equipment. Practical experience reveals that the downtime cost can be much higher than the actual maintenance cost. It may even double the cost of maintenance for some specific type of equipment depending on its utility and requirement. The demand for products being manufactured by the workshop or the services rendered by the workshop plays an important role as far as downtime cost is concerned. To maximize production, all the equipment needed for the production must be available. The downtime of the equipment can be minimized through planned maintenance, by increasing the lifespan of the components and the subassemblies of the equipment. This can be achieved by monitoring the condition of the equipment within an appropriate time interval.



**Figure 3.6: The various forms of incentives: Financial and non-financial incentives.**

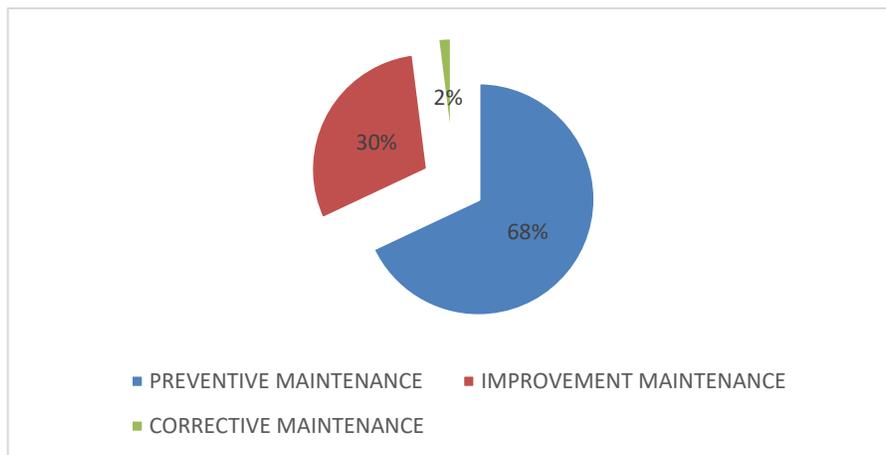
Figure 3.7 suggests that 86% of the respondents believe that the implementation of the incentive policy has resulted in improving the maintenance output preferred by their schools and 14% confirmed that the implementation of the incentive policy has not improved the maintenance output preferred by their schools. It has often been a common observation that after the overhauling of a machine, the faults and breakdowns might reoccur. This phenomenon is known as maintenance induced problems.



**Figure 3.7: Implementation of the incentive policy.**

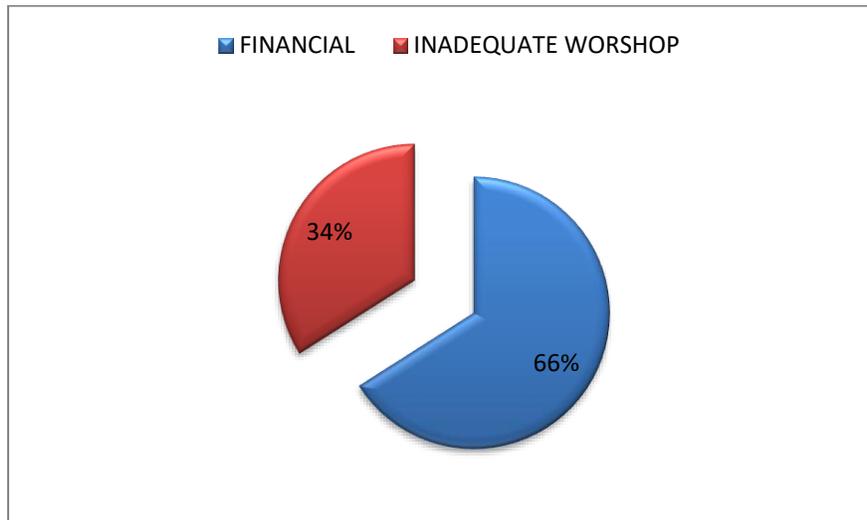
### 3.2 The types of maintenance practices in engineering workshops

According to Figure 3.8 majority of the respondents (68%) confirmed that they practice preventive maintenance system in their schools, 30% of the respondents said their schools practice improvement maintenance system and 2% confirmed that their schools practice corrective maintenance system. The services required from a machine/equipment, and its resultant cost, will determine the type of maintenance philosophy a workshop will adopt.



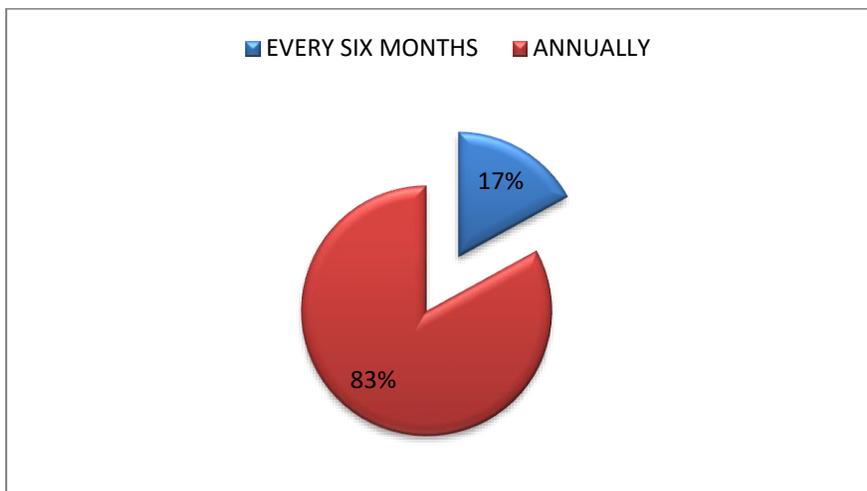
**Figure 3.8: The types of maintenance practices in engineering workshops in the schools.**

Figure 3.9 suggests that 66% of the respondents believe that the major challenges their schools are facing in applying the chosen technical workshop maintenance strategies are financial challenges and 34% of the respondents said that their schools' inability to implement the maintenance strategies are as a result of inadequate workshops [42].



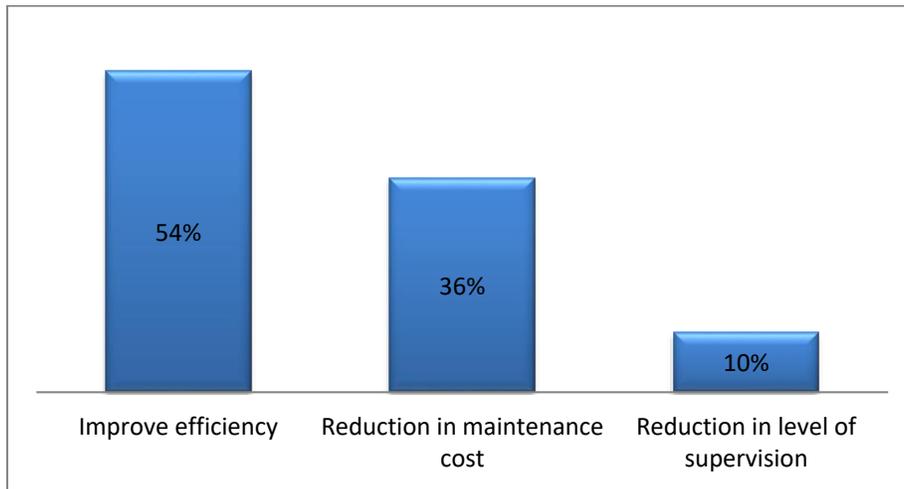
**Figure 3.9: Major challenges the schools face in applying the chosen technical workshop maintenance strategies.**

According to Figure 3.10 majority of the respondents (83%) confirmed that their schools train maintenance staff annually and 17% said that their schools train maintenance staff every six months.



**Figure 3.10: Training programs for technical workshop staff.**

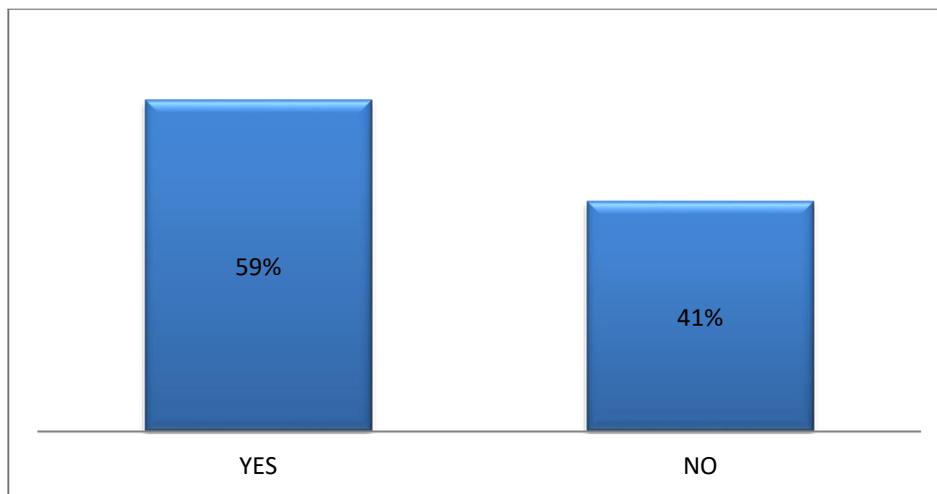
Figure 3.11 shows that 54% of the respondents affirm that their schools have benefitted from improved efficiency as a results of effective workshop maintenance, 36% of the respondents affirms that their schools have benefitted from reduction in maintenance cost and 10% of the respondents declared that their schools have benefitted from reduction in level of supervision. Rivenbark [43], explains some of the symptoms of ineffective maintenance planning. He said planning is one of the main processes of effective maintenance departments.



**Figure 3.11: The benefits of technical workshop maintenance training.**

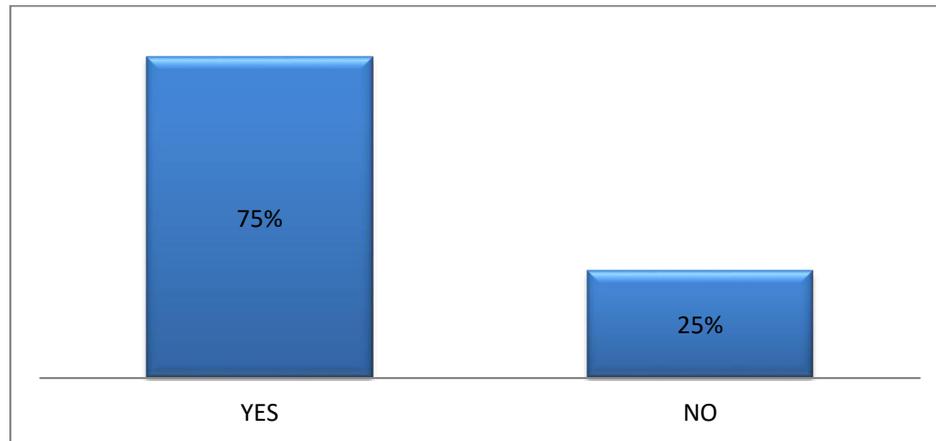
### 3.3 The Effects of Management of Materials, Tool and Stores Control System on the Maintenance Practice in the Workshops.

According to Figure 3.12, 59% of the respondents confirmed that their schools have a safety policy and 41% said that their schools do not a safety policy. Reducing cost is sometimes an overlooked aspect of maintenance.



**Figure 3.12: School Safety Policy**

Figure 3.13 suggests that majority of the respondents (75%) confirmed that it's a requirement for all workers in their school to wear protective clothing and equipment during technical workshop maintenance and 25% said it's not a requirement for all workers to wear protective clothing and equipment during technical workshop maintenance.



**Figure 3.13: A requirement for all workers to wear protective clothing and equipment during technical workshop maintenance.**

#### IV. CONCLUSIONS

At the end of our study, we observed that most of the selected institutions have technical workshop maintenance departments at their school. Majority of the school have a centralized workshop maintenance department. These technical maintenance departments in the various schools were consulted in the selection of new or replacement equipment and spare parts. The study also explored that the annual maintenance budget incurred by the schools was between \$1000–\$1500. The selected schools had an incentive policy for their workshop maintenance staff. The implementation of the incentive policy has resulted in improved maintenance output desired by their school. Preventive maintenance system, improvement maintenance system and corrective maintenance system was practised by the selected technical schools.

The major challenges the schools face in applying the chosen technical workshop maintenance strategies were mainly financial challenges. And also, we observed that the schools didn't have enough maintenance training programs for their maintenance staff. From the survey and interviews with the respondents, we analyzed that the schools had an improved efficiency as a result of the effective workshop maintenance practices. Most of the workshops had safety policies for their maintenance staff, which is a requirement for all workers at the workshops. Thus, to wear protective clothing and equipment within the workshop. The study recommended that the Ministry of Education should provide the necessary logistics to sustain the technical workshop maintenance department in the technical institutes.

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# A Study to Identify Sri Lankan Dialects of English- A Linguistic Exploration: Based on Tertiary level Students in SLIATE- Sri Lanka

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**Abstract-** This study aims at studying whether the concept of regional dialectal variations had the effect on English Language users in Sri Lanka and to which extent they differ from region to region when speaking and writing in English as a second language. In order to identify this phenomenon, 125 (hundred and twenty five) students ( five groups) of Sri Lanka Advanced Technological Education were randomly chosen from six regions and surveyed with twenty five structured questionnaire and an interview. Questionnaires tested formal written expressions while the interview tested formal oral expressions. Thereby the researcher examined to which extent the participants deviated from standard Sri Lankan dialect. The researcher conducted a methodical analysis of the collected data linguistically. It enabled the researcher to identify how and why each group differs from the other dialectically. They are logically treated after thorough analysis under particular linguistic categories. The combinations of the findings of the study and the knowledge gained in the process of study are used to draw conclusions of the factors that contributed to those dialectal variations. Finally the researcher has made some suggestions to go for Identical Sri Lankan Dialect rather than trying to promote regional dialectal variations since the researcher could not elucidate substantial variations among the participants of the study

**Index Terms-** Sri Lankan Dialect, second language, dialectical variation, first language, language interference

## I. INTRODUCTION

Learning English has become an integral part of many Sri Lankans with the arrival of Englishmen to Sri Lanka in 1796. They were the third colonizers who were able to establish their administration in Sri Lanka. Though Englishmen left Sri Lanka officially they left their language behind us. Therefore, Sri Lankans happened to study English willingly or unwillingly for economic, social, political and economic purposes. Thus English was spread all over the country and many had to learn English from local English teachers who had their education in their mother tongue either in Sinhala or Tamil. Depending on the nationality of the teacher the way of speaking in English underwent a lot of phonological and morphological changes.

That is the first language interference. Moreover, the regional dialectal variations also influenced their English

speaking a lot. Though there existed a standard variety of English many English speakers tend to use English in a way that goes with their regional social identity. Some distinctions could be seen especially in speaking from region to region. The researcher attempts to examine some of those dialectal differences having a sample of five different groups of tertiary students from five different Advanced Technological Institutes in Sri Lanka. So far a lot of researches are done on dialectal variations in English in Sri Lanka which failed to find out the exact reasons for these variations.

Of the four micro skills, speaking has become the second which is a little bit flexible and very hard and fast rules are not applied when it comes to Sri Lankan dialectal variations. Dr. Arjune Parackrama, Shiromi Fernando, Prof. Menique Gunasekara and Thiru Kandiah have contributed a lot in promoting the Sri Lankan variety of English along with other standard varieties used by elite class in Sri Lanka. What they advocate is the Sri Lankan variety and not the particular regional varieties. Menique Gunasekara in her “Post Colonial Identity” defines Sri Lankan English as the variety of English used by Sri Lankans whose first language is English or those who are bilingual in English and Sinhala or Tamil. But the researcher found out that many Sri Lankans tend to use English on their own way due to the influence of their colloquial languages that have their regional accent, sentence patterns. For example, Poyadaya, nelekadala (ground nut) sambol. Other than that they use broken English such as “you no there no”, “you come go”, “take money to eat”, “we eating rotti”, “you not born near school” “I like to eat samba rice” etc..

However, it is noteworthy to agree to the view that some researchers have done studies on Sri Lankan English but they are insufficient for the learners of English to meet their academic and social demands. Sri Lankan English still has no distinctive identity in the international forum like the other Englishes have. Though Sri Lanka is geographically small, dialects of native people differ from area to area. For example, southern Sinhala dialect is different from upcountry Sinhala dialect. In the same way, Batticaloa Tamil differs from Jaffna Tamil. This dialectal variation can be seen in English they speak along with the influence of their first language. Thus the identification of those dialectal variations will pave the way for the learners, researchers and the scholars to get to know the typical socio-cultural and socio-linguistic features of English that they use in their locality. Therefore, the researcher in this study will find socio-linguistic

factors for those dialectal variations separately though English links all nationalities together. This is the point where the researcher hopes to find the answers for the following questions. Do Sri Lankans really have a language called Sri Lankan English? Have they adhered to British model? Is it possible them to line up with one alley? For sure, solid answers for the above questions are not to be found within the existing English dialects framework in Sri Lanka. Thus it is significant for the researcher to examine the existing English dialects in Sri Lanka and find out valid and justifiable solutions for these unanswered problems. Therefore, the researcher in this study attempts to find new knowledge to bridge the gaps left by earlier researchers to date.

A lot of researches have been done on "Sri Lankan English" but there is no universally accepted definition for it. It means that it demands a lot of research. This study will revive the existing knowledge in the area that is still under investigation. Therefore, this empirical study is based on the hypothesis that the Sri Lankan speakers of English use different dialectal variations of English in different locations. To test the above hypothesis the researcher frames two questions. 'How does non-standard Sri Lankan English differ from Standard Sri Lankan English?', 'What are the distinctive socio linguistic features of those dialects that are used in the multi-national and multi-cultural Sri Lankan English speaking community?' A face to face interview using a questionnaire is conducted with a sample of students who speak English as a second language in Sri Lanka institute of Advances Technological Education to collect the data for the study. The analysis of the recorded data is done using auditory systems in order to examine the various pronunciation of each participant of the study separately. This study is mainly based on linguistic theories incorporating ethnographic information of the participants. Further, the phonological variations of the dialects used by the participants will be given the priority in the analytical discussion. The researches done on this field to date reveal the fact that there is no single form of English universally accepted to be adopted standard. But there are a lot of English dialects and they are correct and accepted by their respective communities. None can deny this phenomenon and speakers/learners of English should be promoted to learn the most suitable and appropriate dialectal form for them which finally upgrades their English language proficiency in speech and writing. Some scholars have done researches in this field to test how dialectal variations influence in Sri Lankan speakers of English. Rajiva Wijesinghe stated (1998) that the writers who have made their mark, like their predecessors tend to use standard English. They did not purposely represent English as a second language or foreign language but used local flavour and materials to define Sri Lankan English. Hypothesis based on Lardo's suggestions reveal that, "comparison between native and foreign language lies the key to all difficulties in foreign language learning" Lardo (1957) In fact, it is the first language knowledge that makes it difficult to acquire the structure of the second language. Manique Gunasekara (2005) stated that the dialect used by the Sri Lankan elites for whatever the purpose in Sri Lanka is recognized as Sri Lankan standard English. It is a sociolinguistic term used to refer to a prestige variety of language used within a prestige community. It clearly shows that the Sri Lankans have two dialectical variations of English. They are non-standard and standard Sri Lankan English. However, Mayler(2005) says that Sri Lankan English is the language used

by Sri Lankans who speak English as their first language or second language.

Manique Gunasekara (2005) further stated that the kind of English used by Sri Lankans is not the English used by the colonizers. It is a mixer of colonizers' English and local borrowings from Sinhala and Tamil. Many Sri Lankans prefer to use this mixed variety of English which is inferior to standard British English. But it is distinctive to Sri Lankans according to her. Siromi Fernando (2008) distinguished Sri Lankan dialects on the basis of phonology, morphology, syntax and orthography. According to Passe(1948) different dialectical versions emerged due to mother tongue translations in Sri Lankan English since Sri Lankans preferred it. Thiru Kandiah(1981) distinguished different dialects in relation to vocabulary usage. The same phenomenon could be seen in morphology. Even standard Sri Lankan English speakers tend to pluralize nouns which is not done in standard British English. Chithra Fernando(1977) stated that there are a lot of dialectal differences in pronunciations among Sri Lankan sub-varieties since Sinhala and Tamil dialects differ from area to area. Other than the two varieties identified by Manique Gunasekara and Mayler, Chithra Fernando states that there is another variety called Not-pot which is used by speakers who are less exposed to English. It is noted that the same affluent English speaking community changes their attitudes to dialectal variety they use, while particular ethnic varieties remain unchanged. The post Bloomfieldians stated that the same phone functions differently at different positions in standard British English which is called allophonic variation. This phenomenon is not found in Sri Lankan variety, It justifies that Sri Lankan English differs from British standard English. Moreover, Dr.Dushanthy states "...it is important to recognize that affluence speaker of the Sri Lankan English is the switch between Sri Lankan mode and international mode when the context demands it". What it suggests is that Sri Lankan speakers of English have their own two-fold Englishes, standard and non-standard. Gamini Fonseka in one of his research papers (2003) stated that there is a particular style of writing and speaking which is subjected to its ethnocentricity. It is applicable to Sri Lankan speakers/writers as well since the community to which the individual belongs determines his/her dialectical form.

Thus the researcher in his study found it very difficult to apply internationally accepted theoretical perspectives since the participants' first language is either Tamil and Sinhala. The influence of the first language cannot be measured quantitatively because of these two languages. Moreover the participants of the research is very limited and it is very difficult to validate the findings to all dialectical variations prevailing in Sri Lanka. The study is an experimental research which is analytical and deductive. To get it done the researcher has used five different groups of tertiary level students whose first language is not English for the sample to collect data for the research.

Thus the findings of this study will benefit learners at least to minimize the linguistic, cultural and first language barriers when speaking or writing in English deviating from regional dialectical influences. Besides, the academics, researchers, curriculum developers, teachers and speakers will be able to identify the dialectical variations along with the causes behind them and to find practical solutions for the problems speakers of English face when speaking and writing in English in Sri Lanka.

## II. METHODOLOGY

The empirical study was conducted at five ATIs ( Badulla [Group A], Rathnapura [Group B], Ampara [Group C] , Kandy [Group D and Trincomalee [ Group E]) in Sri Lanka with the sample 125 students (Sinhala and Tamil/ male and female.) The researcher as a participant conducted two types of tests.

- a. Personal interview ( same questionnaire for all individual participants)
- b. Written test. (same test paper for all participants)

Students were free to express using their own English dialects while the researcher recorded each individual's interview with the researcher and to do a quantities analysis of their interview paying attention to the dialectical variation from one locality to another. And thereby the researcher expects to observe how target language (Tamil or Sinhala) influenced their expressions morphologically , syntactically , semantically etc.. Especially , to check how standard language features like consonant clusters and diphthong are replaced by their own language components. This is to be done by comparing and contrasting the participants of the same institute and participants of different institutes in order to see how their dialects differ from one region to another. The finding will help the researcher to examine to which extent their first language interferes with their second language speaking which marks their dialectical variation.

The same process is to be applied to the writing activity as well. In here the researcher expects to analyze the answers written( objective) logically to determine the facts how each participant forms sentence structures with the influence of their first language on one hand how the same or different language in the same or different region influences their dialects.

Thus the same individual is tested twice in speech and writing which will help the researcher to test his hypothesis based on the facts found in the research. Besides, the main aim of this study is to identify the dialectical variations of spoken and written language in English that determines all Sri Lankans do not use the same variety of English throughout Sri Lanka.

This is a need of hour since there are controversies over the concept of Sri Lankan English for the last couple of decades.

## III. DATA ANALYSIS

Having used single group and individual method in this study the researcher attempted to facilitate the validation and the triangulation of the data collected. The recordings and the written sentences of each participant categorized and labeled under different headings. They are further sub- divided depending on the Sri Lankan and RP productivity. The researcher expects the categorization of those data collected will help him find the typical expressions and their variation that reflect the particular regional identity of the dialect they use due to the influence the first language. Further the researcher expects that the categorization of the data will help him test the hypothesis logically influence them a lot. When the researcher compares Dialectical Variations are analyzed according to Manique Gunasekara (2005) and Shiromi Fernando (2008) in this study since they have emphasized the facts that the Sri Lankan dialectical variations are mainly influenced by phonology, morphology syntax and orthography. In this study, this researcher found out that the variations occur due to many factors.. Among them, the influence of the first language is vital since almost all (except a few) learnt and learning English from books through local teachers and not from native speakers. Those local teachers come from different parts of Sri Lanka who have their own first languages. They have their own dialectical variations based on their regions, especially in speaking. Other than variations common linguistic features such as lack of clusters, altered consonants, syntactical constructions etc. and contrasts those linguistic dialectical variations of each group, it shows some similarities in some linguistic areas. Besides, the percentages of dialectical variations of the five groups do not show a vast distinction among one another. It justifies that the dialectical differences play a very minor role while Sri Lankan English is compared with other Englishes. However, the researcher attempts to pay his attention to those minute differences to see how those variations occur within this small island country.

Table 01: Dialectical differences of five sample groups(spoken & written)											
Linguistic category	Group A	%	Group B	%	Group C	%	Group D	%	Group E	%	Dialectical category
Morphology	21	81	22	88	16	64	15	60	14	56	Use L1 affixes
Spelling	9	36	11	44	16	64	13	52	13	52	Replace consonants
First Language construction	18	72	16	64	17	68	16	64	12	48	Use L1 sentence patterns
Alternative syntax	17	68	17	68	14	56	15	60	16	64	Double adjectives/wrong tags
Alternative vowel sound	15	60	18	72	13	52	12	48	13	52	Repeat vowels not sounds
Non-RP additions	12	48	21	84	16	64	15	60	14	56	Adding extra prepositions
Replacement of English words	17	68	16	64	15	60	16	64	15	60	Use synonyms
Altered consonants	14	56	11	44	08	32	07	28	08	32	Neglect voice quality
Words pronounced differently	13	52	14	56	18	72	16	64	14	56	Go by the spellings
Group wise total	136	60.1	146	67.1	133	59.9	125	55.6	119	53	

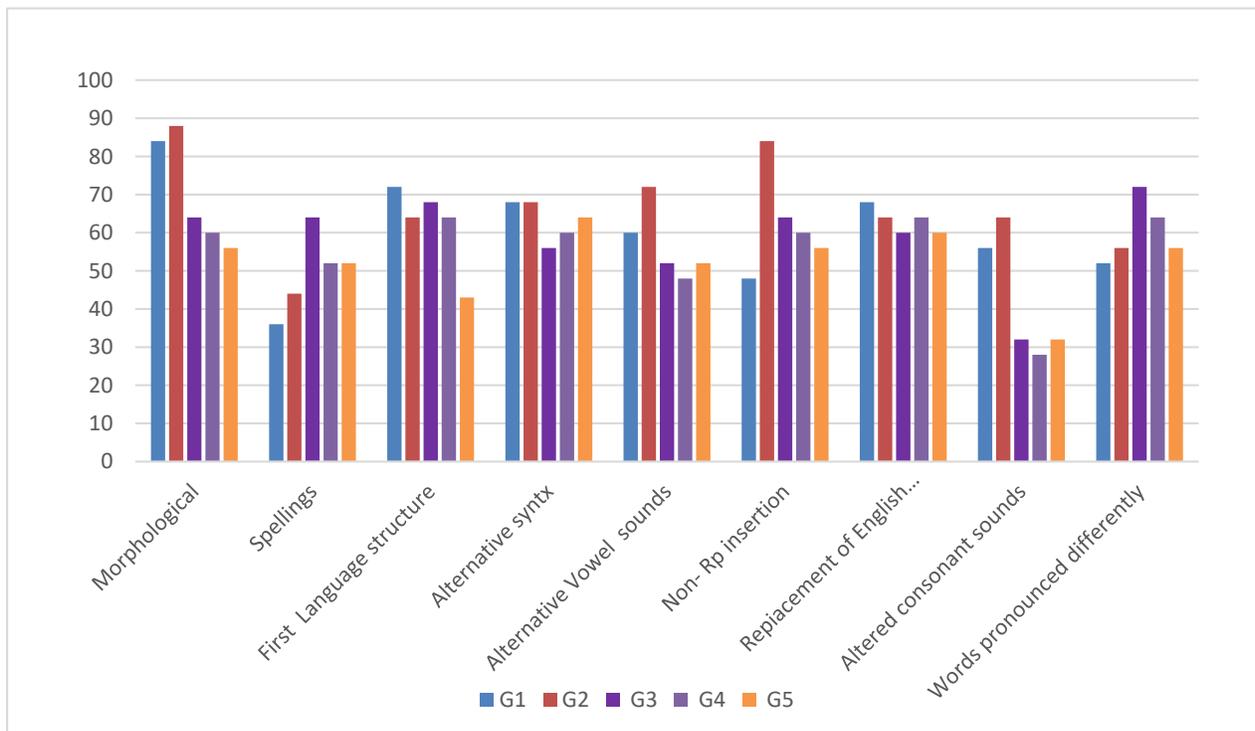


Figure 1: Percentage of dialectical variations of linguistic categories of each group

The analysis of the data collected in this study mostly influenced by the researches done on Sri Lankan English and its extension of regional dialects by Sri Lankan researchers. The selection of the corpus of dialectical variations was done and different variations and similarities of regional expressions and writings were recognized. Those data are tabled under different linguistic categories and quantified where the researcher could trace how each group responded to the same set of questionnaire in different ways both in speaking and writing. Further, the researcher calculated the percentage of the correct utterance and sentences of each group separately. Thereby the researcher expects to see the correlation of five groups of the sample in line with the analysis James Taxonomy and categorized them into different linguistic parts studying the frequency of the variations. The above chart very clearly shows the frequencies occurred in speaking and writing of all five groups. When compared the speaking and writing of the above five groups, it shows that the differences from region to region is very little. For example, the group wise total dialectical differences both in speaking and writing between Group A and group B is ten. It marks the percentage difference as 07. The dialectical variation between group C and Group D marks as 08 while the percentage appears roughly 07. In the same way, the dialectical difference between group A and Group E shows a marked distinction. It is 17 while overall percentage difference is 07. These minute dialectical differences shows the fact that the participants who are close to urban areas (group C and D) uses little variations which are closer to Sri Lankan Standard English variety. The reason that the researcher finds is that they are more exposed to English educated community who uses English more fluently than less urban community. For example participants from Kandy and Ampara show a little difference in dialectical variation.

The main reason the researcher finds here is that the university of Peradeniya in Kandy and Hardy Institute at Ampara and other universities in the Eastern province influenced the speaking community. The other factor is more than ninety percent of government officers in Eastern province are from Colombo and Kandy who are fluent in English. Even the Muslim community does matter since they are more fluent in English than local Sinhalese. But the participants from Badulla and Trincomalee are different since they are less exposed to English speaking community and less urbanized. It affects their second language fluency. They tend to use more colloquial or regional ways of speaking and writing of their first language. Therefore the standard Sri Lankan variety of English is low while in other areas it is higher. What is evident here is that the less exposure to urban community means their English is localized.

#### IV. DISCUSSION

The interview method and test based data collection method enhanced the researcher to identify the dialectical variations of English speaking and writing communities of different regions in Sri Lanka. Though there is a form called Sri Lankan English, it differs from region to region due to socio-economic, cultural and educational factors that influence them along with the linguistic factors. The main reason behind this phenomenon is the influence of the first language, both Sinhala and Tamil. Thus the main purpose of the researcher in this chapter is to examine how the

above mentioned factors contribute to their identical dialectical variations. They are discussed under different linguistic categories paying attention to how far those factors affect their individual regional dialects in English

#### 4.1. Morphological factors

The analysis of the data collected in this study shows the manipulation of different first language affixes to form new words that deviate from Sri Lankan English variety. But the researcher sees very little difference from region to region. Almost all participants had a uniformity of using Lankanized spellings in their writings. They go by the pronunciation and not by English spellings since Sinhala and Tamil languages do not have any difference in writing and pronunciation, they pronounce what they write. Eg. Blakbod., lisen etc..

The participants never thought twice to replace English words by Sinhala or Tamil words. This is a special characteristic of Sri Lankan English. It is further extended in regional dialects. They use Sinhala and Tamil loanwords which differ from region to region according to their first language. For example, Kithul tree (farm tree), Amma (mother), Appa (father)

Kadalas (grams). Some of the features mentioned above could be seen among all the participants who came from different regions in Sri Lanka.

#### 4.2. Phonological factors

This is a very distinctive language area which is locally Sinhalized or Tamilized English without paying any attention to Sri Lankan Standard form. The participants of the sample groups consisted three nationalities: Sinhalese, Tamils and Muslims of whom the first language of Tamils and Muslims is Tamil. There were a lot of deviations from region to region in pronunciation, replacement of English diphthongs, consonant clusters and individual consonants as well. In Sinhala and Tamil languages, what is written is pronounced in the same way but in English. Excepts six participants from Badulla and Kandy regions, almost all never pronounced diphthongs. They straight away replaced them by their Sinhala or Tamil equivalent long vowel sound/s. For example, ,go - /au/ replaced by - /go:/ Sinhala and Tamil do not have the diphthong so they use long /o:/. Instead of /ei/ they used long /e:/. Some pronounced women /wimen/ as /women/ etc. etc. In the same way many participants (except a few) were not worried about /f/, they replaced it by /p/ eg. photo – pote etc. . At times they used the total Sinhala or Tamil word in their English speaking. For example, nelakadala for groundnut, poosari for priest, maulavi for muslim priest etc. The analysis of those phonological constructions depicts the facts that they are very flexible in using regionalized vocabulary on one hand and using common Sri Lankan characteristics of speaking and writing tools in English on the other hand. These linguistic features could not be seen among the English educated few. Further some Tamil participants pronounced some words in a total different way that could be understood only by the participants of that region. It is another evidence to support the regional dialectical variations.

#### 4.3. Syntactic factors

In here the researcher could trace a lot of grammatical constructions. At times the participants totally deviated from Standard Sri Lankan variety. Many participants were confident

and relaxed to use their regional constructions directly in English mainly due to first language interference.

For example; 'You know who I?', 'Come and sit here' 'You can write to this address.' etc..

These constructions mainly depend on their first language either on Tamil or Sinhala. Another feature is the repetition of the adjectives and nouns. This feature could be seen both in speaking and writing. Eg. 'We visited different different places.', 'You are very very good.' 'Think not small small things.' Also some used the question form in their indirect questions too. Eg. 'She asked me why did I come?' These constructions are syntactically wrong when compared with Standard English. But regionally they are accepted and the message is well communicated. It clearly shows that Sri Lankan variety has regional dialectal variations to some extent.

Another feature is the wrong use of tags. It is found in every region equally. It clearly indicates our Sri Lankan identity rather than dialectal identity eg. 'You are going home no'

'You understand, are you?', 'You did it, no?' etc. However the writings of all participants had somewhat similar patterns with minor deviations It shows that writing very rarely differs from region to region except some expressions that are relevant only to that area.

## V. CONCLUSION

The main purpose of this study was to identify the dialectal variations of tertiary level students in their speaking and writing in Sri Lanka. Though there are a lot of arguments about the identity of Sri Lankan English, many scholars Prof. Menique Gunaseka, Michael Meylor, Shiromi Fernando, Dr. Arjuna Prakrama Prof. Thiru Kandiah etc strongly believe that Sri Lankans use English language deviating from standard British Model like other commonwealth countries in the world that are greatly influenced by their first languages. According to them, there is no argument on Sri Lankan variety of English. In this study the researcher attempted to see the further deviation from that language category by selecting a sample of 125 students from five different regions, each group consisting 25 students (both male and female) The data collection method was giving a questionnaire and conducting an interview. The collected data (spoken and written) were analyzed under different linguistic categories. The frequency of data under each linguistic category is tabled and the percentage is worked out. The discussions of analysis was done by comparing and contrasting among the groups. The researcher's main purpose was to find out solutions that arose from the research problem.

- a. How do these dialectal variations occur?
- b. How can they be minimized?
- c. How does the first language influences the regional dialects?

The researcher was able to form some hypotheses to test the validation of the research set above.

a. The students are book- based learners and they are exposed to many local teachers who learnt English as a second language from local teachers.

b. By levelling the unequal facilities and resources for all students in Sri Lanka, the existing little dialectal variations can also be minimized.

c. When learning a second language, the influence of the first language is unavoidable unless they are exposed to a native community fully.

The main purpose further extended to investigate the significance of the dialectal variations when using a second language to express the needs and feelings of the speaker on one hand and the use of that particular language for academic purposes and professional careers. Paying attention to all above mentioned characteristics the researcher attempted to find out the facts as to why the tertiary level students knowingly or unknowingly adhered to a kind of English dialect with minor deviations from the existing Sri Lankan variety of English.

## VI. FINDINGS AND RECOMMENDATIONS

The analysis of data collected in this study helped the researcher recognize the typical characteristics of regional dialectal variations in Sri Lanka to some extent. Based on the findings, the researcher wishes to suggest some recommendations to preserve the Sri Lankan dialects on one hand and to go for a world recognition of Sri Lankan English on the other hand. According to Manique Gunasekara, Sri Lankan English is the language used by Sri Lankans who choose to use English for whatever purpose in Sri Lanka. Regional dialect is the further deviation of it who use English as their second language who are generally bilinguals. Their first language is either Sinhala or Tamil. The researcher found that they who use English as second language are influenced by their first language in every aspect of speaking and writing. Therefore, their dialects are a little different from Sri Lankan English from region to region. The main reason behind it is the local flavour of the communities. They use a lot of loanwords, phonological and morphological structures in both writing and speaking. These features were visible when analysed their writing and speaking. According to David Crystal a prestige variety of language used within a speech community is a dialect and those who deviate from it is a sub-dialect. Among the regional dialects these evidences could be traced but a total deviation from the main dialect could not be traced. In general, most of the minute dialectal variations can be ignored since the researcher found a lot of similarities among the regional dialects. The researcher feels honest to suggest the respective authorities to take initiatives to promote Sri Lankan variety rather than going for regional dialectal variations. This would definitely pave the way for Sri Lankan identity like our sister country India has already earned its identity though she is one year older to Sri Lanka's freedom from British empire.

In conclusion, the researcher aimed at recognizing the regional dialectal variations in Sri Lankan English selecting a sample group of 125 students from five different ATIs from different regions of Sri Lanka and analysed them under different linguistic features. But the researcher could not find vast variations of language use except a few dialectal differences depending on the first language (Tamil or Sinhala) of their locality. What it shows is that many Sri Lankan communities who speak English as their first language or second language have similar linguistic features in pronunciation, such as, breaking clusters, replacing diphthongs by Sri Lankan long vowels, using loanwords etc. etc. Those who use English as the first language have exposure to language while others do not have. Therefore

they have very little variations. Little bit of culture and religion have influenced them a little as well. The researcher accounts them as good signs since they may pave the way for Sri Lankan identity. Thus the researcher suggests to promote a variety of Sri Lankan English instead of promoting regional dialectical variations since Sri Lankans have their own first language dialectical variation depending on their localities

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# Effect of Seed's Age on Some Treatments' Efficiency for Breaking of Dodder (*Cuscuta campestris* Yunck.) Seed's Dormancy.

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**Abstract-** The experiment was conducted in Kahramanmaraş Sütcü Imam University, in the laboratory of the plant protection department, Faculty of Agriculture. On 14 Feb 2020 to 27 Feb 2020. The experiment tested 8 treatments (chemical and biological) using seeds from three different ages. Dodder (*Cuscuta campestris*) seeds were planted in Petri dishes by using double filter paper (Whatman Filter paper) where 30 dodder seeds were put in each Petri for each treatment in CRD design with three replications. The results showed the superiority of seeds aged one-year over seeds aged two-year and seeds aged three-year in germination test values, where it recorded 26.81% for the seed germination percentage, 1.81 for the speed of germination, 4.95 for the mean germination time, 0.67 for the mean daily germination, 0.14 for the peak value, and 0.12 for the germination Value. H<sub>2</sub>SO<sub>4</sub> treatment recorded the highest germination percentage reached 34.81% followed by 25.56% in KNO<sub>3</sub> treatment. The speed of germination was recorded the highest value reached 2.55 for H<sub>2</sub>SO<sub>4</sub> treatment. The mean germination time in seed recorded the maximum 6.06 for H<sub>2</sub>SO<sub>4</sub> treatment. The mean daily germination has recorded a maximum of 0.87 for H<sub>2</sub>SO<sub>4</sub> treatment followed by 0.64 for KNO<sub>3</sub> treatment. The peak value was observed a maximum of 0.17 in H<sub>2</sub>SO<sub>4</sub> treatment followed by KNO<sub>3</sub>, gibberellic acid, and indole butyric acid treatments where it recorded 0.15, 0.13, and 0.13 respectively. The germination value has recorded a maximum of 0.16 for H<sub>2</sub>SO<sub>4</sub> treatment and a minimum of 0.01 for control. The interaction between the seed's age and the different treatments impacted on the seed germination test values, where the interaction of the seeds aged one-year with the treatment of H<sub>2</sub>SO<sub>4</sub> recorded the highest germination percentage reached 60%, while the Speed of germination was recorded the highest value reached 4.95 for the interaction of seeds aged one-year with the treatment of H<sub>2</sub>SO<sub>4</sub>. The mean germination time in seed recorded a maximum of 9.94 for the interaction of the seeds aged one-year with the treatment of H<sub>2</sub>SO<sub>4</sub>. The mean daily germination was recorded maximum value reached 1.50 for the interaction of the seeds aged one-year with the treatment of H<sub>2</sub>SO<sub>4</sub>. The peak value was observed maximum in the interaction of the seeds aged one-year with the treatment of H<sub>2</sub>SO<sub>4</sub> reached 0.22. The interactions of seeds aged one-year with the treatments of H<sub>2</sub>SO<sub>4</sub> recorded the highest germination value reached 0.34.

**Index Terms-** Dodder, Dormancy, Efficiency, Seeds, Turkey

## I. INTRODUCTION

Dodder (*Cuscuta campestris* Yunck.) is one of the Dooders (*Cuscuta spp.*) that belongs to Convolvulaceae family. There are more than 200 species and over 70 varieties of dodders (*Cuscuta spp.*) throughout the world [2], all of them a holoparasite weed get all of its food and nutrients from a host plant. There are 55 plant hosts of *C. campestris* that were identified in Anatolia region, 27 of them are Cultivated crops, the most common being are Eggplant, Beetroot, Alfalfa, Clover, Faba bean., Pepper, Onion, Carrot., Anise, Caraway, Tobacco, Common vetch, Chickpea, Asparagus, Grapevine, Melon, Potato, and Tomato [12,15]. It is reported that *C. campestris* caused significant damages to sugar beet, eggplant, carrot, pepper, garlic, onion, tomato, legumes, melon, watermelon, potato, and clover, the damage ranges between 50-90% according to the crop type in the absence of control measures [4, 8, 9, 11]. In Iraq was reported 64.11% eggplant yield reduction caused by *C. campestris* [1]. In USA conditions, it has been reported that alfalfa yield decreased 57% caused by *C. campestris* [4]. It has been determined that *C. campestris* caused a 63% decrease in sugar beet seed yield and 18.7-55.4% in sugar content [13]. In India, *C. campestris* caused significant losses in some crop yields reached 60-65% in red pepper, 86% in chickpeas, 60-70% in clover and 87% in lentils [10]. Some researchers reported that the one of dodder plant can produce 2000 seeds per year [10], and other researcher reported that this number may be up to 3,000 - 25,000 seeds per year [15]. It's pretty hard to control dodder species effectively because its seeds have a hard seed coat, as well as it has the potential to remain viable in the soil for many years [10]. An important factor for dodder's success as a parasite is seed dormancy, whereas many studies reported that seeds dormancy period in dodder may for up to 50 years or more [1, 2]. Under field conditions, dodder seeds can remain dormant for more than ten years, when the dormancy is broken the dodder seeds immediately germinate on optimal temperature and humidity [10]. The agricultural lands that contaminated by dodder contain a large stock of seeds, which required an integrated approach to mitigate this stock, accordingly, it's important to study breaking dormancy of seeds to reduce seed banks in the soil and reducing the damage of dodder in cultivated fields. This study aims to investigate the effect of seed's age in the

efficiency of some treatments in breaking the seed dormancy of *C. campestris*.

## II. MATERIALS AND METHODS

Dodder seeds were collected within 3 years in October 2017, 2018, and 2019 from agricultural lands of East Mediterranean Cross Region Agricultural Research Institute in Turkey. The experiment was conducted in the plant protection laboratory of Sütcü Imam University, Kahramanmaraş State, Turkey. The germination study of *Cuscuta campestris* was conducted at 25°C. Dodder seeds have been used in three different ages, and within each age, the dodder seeds were treated with the following treatments:

- A. Submerging seeds in sulfuric acid (H<sub>2</sub>SO<sub>4</sub> 98%) for 10 minutes, then washing it with running water for 5 minutes.
- B. Submerging seeds in potassium nitrate (KNO<sub>3</sub> 0.2%) for 24 hours, then washing it with running water for 5 minutes.
- C. Submerging seeds in gibberellic acid (200 ppm) for 20 minutes.
- D. Submerging seeds in indole butyric acid (200 ppm) for 20 minutes.
- E. Submerging seeds in normal water for 24 hours.
- F. Submerging seeds in hot water (80°C) and left it in water until it cools off.
- G. Cooling seeds at (2°C) for 10 days.
- H. Control (not treating the seeds with any treatment).

On date 14 Feb 2020, dodder seeds were planted in Petri dishes by using double filter paper (Whatman Filter paper) where 30 dodder seeds were put in each Petri dish in three replications for each treatment in a completely randomized design (CRD). Where the germinating dodder seeds had calculated in 12 days except for planting day and the following day. The water requirement of Petri dishes was daily given about five milliliters to each Petri dish. The following indications were calculated:

1. Seed germination percentage (GP) was calculated according to [7] using the following way: Germination % = Number of germinated seeds / Total number of seeds × 100.
2. Speed of germination (SG) was calculated according to [7] using the following way: Speed of germination =  $n_1/d_1 + n_2/d_2 + n_3/d_3 + \dots$

Note, n = Germinated seed's number, d= Day's number.

3. Mean germination time (MGT) was calculated according to [5] using the following way:  $MGT = n_1 \times d_1 + n_2 \times d_2 + n_3 \times d_3 + \dots / \text{Total number of days}$ . Note: n= Germinated seed's number.
4. Mean daily germination (MDG) was calculated according to [7] using the following way: MDG = Total number of germinated seeds/ Total number of days.
5. Peak Value (PV) was calculated according to [7] using the formula: PV = Highest seed germinated/ Number of days.
6. Germination Value (GV) was calculated according to [7] using the following way: GV = PV X MDG.

Collected data were analyzed using SPSS and analysis of variance (ANOVA) at 1% level of probability.

## III. RESULTS AND DISCUSSION

Through the conduct of germination tests on dodder seeds, it turns out that there were differences in germination tests values, these differences related to seed's age and treatments at the same time which clear as the following:

- A. The effect of seed's age on breaking of dodder seed's dormancy:

The results of data analysis showed differences in germination test values according to the seed's age as the table (1). The seeds aged one-year surpassed the seeds aged two-year and three-year in terms of germination percentage, where it recorded 26.81%, 14.86%, and 10.97% respectively. Also, the speed of germination in seeds aged one-year was higher than other age groups, where it recorded 1.81, 0.84, and 0.49 for the seeds aged one-year, two-year and three-year respectively. Along similar lines, the Mean germination time has recorded a maximum of 4.95 in seeds aged one-year followed by 2.81 in seeds aged two-year and a minimum of 2.20 in seeds aged three-year. The mean daily germination in seeds at different seed's age varied from the minimum 0.27 for seeds aged three-year topped by 0.37 for seeds aged two-year to the maximum 0.67 for seeds aged one-year. The peak value was noticed a maximum of 0.14 in seeds aged one-year followed by 0.11 in seeds aged two-year and a minimum of 0.10 in seeds aged three-year. Regarding germination percentage, speed of germination, mean germination time, mean daily germination, and peak value the differences across the seed's age were statistically highly significant at 0.01% level. The seeds aged one-year surpassed the seeds aged two-year and three-year in terms of Germination value where it recorded 0.12, 0.04, and 0.03 respectively, the difference in germination value was statistically highly significant at P<0.001 significance level for seeds aged one-year, whereas, has been found non-significant differences between the seeds aged two-year and three-year at P<0.001 significance level.

**Table (1) shows data about germination test values according to the seed's age:**

Seed's Age	GP %	SG	MGT	MDG	PV	GV
<b>Seeds aged one-year</b>	26.81 <sup>a</sup>	1.81 <sup>a</sup>	4.95 <sup>a</sup>	0.67 <sup>a</sup>	0.14 <sup>a</sup>	0.12 <sup>a</sup>
<b>Seeds aged two-year</b>	14.86 <sup>b</sup>	0.84 <sup>b</sup>	2.81 <sup>b</sup>	0.37 <sup>b</sup>	0.11 <sup>b</sup>	0.04 <sup>b</sup>
<b>Seeds aged three-year</b>	10.97 <sup>c</sup>	0.49 <sup>c</sup>	2.20 <sup>c</sup>	0.27 <sup>c</sup>	0.10 <sup>c</sup>	0.03 <sup>b</sup>
<b>LSD at 0.01</b>	1.67	0.28	0.49	0.04	0.03	0.02

Values followed by the same letter(s) in the same column are not significantly different from each other at 0.01 level of probability. GP % = Seed germination percentage, SG = Speed of germination, MGT = Mean germination time, MDG = Mean daily germination, PV = Peak Value, GV = Germination Value.

- B. The effect of the different treatments on breaking of dodder seed's dormancy:

According to data analysis and values shown by the table (2). All treatments outperformed the control in the percentage of germination. H<sub>2</sub>SO<sub>4</sub> treatment recorded the highest germination percentage reached 34.81% followed by 25.56% in KNO<sub>3</sub>

treatment, the differences between the H<sub>2</sub>SO<sub>4</sub> and KNO<sub>3</sub> treatments were significantly at P<0.001 significance level, whereas the treatments gibberellic acid and indole butyric acid recorded 20% and 18.89% germination percentage respectively and the differences between them were not significant at P<0.001 significance level. As well as the treatments of water immersion and Cooling recorded germination percentage of 12.96% and 13.70% respectively and the differences between them were not significant at P<0.001 significance level. The lowest percentage of germination was in the hot water treatment where it was recorded at 9.63%. The speed of germination was recorded highest value reached 2.55 for H<sub>2</sub>SO<sub>4</sub> treatment and the lowest value reached 0.34 for hot water treatment and the differences between H<sub>2</sub>SO<sub>4</sub> treatment and other treatments were significant at P<0.001 significance level. The mean germination time in seed at different treatments varied from the maximum 6.06 for H<sub>2</sub>SO<sub>4</sub> treatment to the minimum 1.18 for control and the difference between the H<sub>2</sub>SO<sub>4</sub> treatment and all the treatments was statistically highly significant at P<0.001 level. The lowest mean germination times in seed were in treatments of hot water and cooling were recorded 2.21 and 2.47 respectively and the differences between them were not significant at P<0.001 significance level. Similarly, the mean daily germination has recorded a maximum of 0.87 for H<sub>2</sub>SO<sub>4</sub> treatment followed by 0.64 for KNO<sub>3</sub> treatment and a minimum of 0.12 for control. Differences in mean daily germination between H<sub>2</sub>SO<sub>4</sub> treatment and other treatments were statistically highly significant at P<0.001 significance level, as well as the mean daily germination, has recorded 0.50 and 0.47 respectively for gibberellic acid and indole butyric acid treatments, differences between them were statistically not highly significant at P<0.001 significance level. The peak value was observed maximum in H<sub>2</sub>SO<sub>4</sub> treatment and the differences between it and the treatments of KNO<sub>3</sub>, gibberellic acid and indole butyric acid statistically not highly significant at P<0.001 significance level, were recorded 0.17, 0.15, 0.13, and 0.13 for these treatments respectively, and minimum 0.08 in the control. The germination value was recorded a maximum of 0.16 for H<sub>2</sub>SO<sub>4</sub> treatment and a minimum of 0.01 for control and the differences in germination value between H<sub>2</sub>SO<sub>4</sub> treatment and other treatments were statistically highly significant at P<0.001 significance level, while the treatments of water immersion, hot water, and cooling were recorded 0.03 for every one of them and the differences between them were statistically not highly significant at P<0.001 significance level.

C. The effect of interaction between the seed's age and the different treatments on breaking of dodder seed's dormancy:

Table (3) shows the results of the interaction between the seed's age and the different treatments on the seed germination test values. Regarding the seed germination percentage, the interaction of the seeds aged one-year with the treatment of H<sub>2</sub>SO<sub>4</sub> followed by the interactions of seeds aged one-year with KNO<sub>3</sub>, gibberellic acid, indole butyric acid, and seeds aged two-year with H<sub>2</sub>SO<sub>4</sub>, where it recorded 60%, 45.56%, 31.11%, 27.78%, and 26.67% respectively. The Speed of germination was recorded the highest value reached 4.95 for the interaction of seeds aged one-year with the treatment of H<sub>2</sub>SO<sub>4</sub> followed by the interactions seeds aged one-year with the treatments KNO<sub>3</sub>, gibberellic acid, and seeds aged two-year with H<sub>2</sub>SO<sub>4</sub> were recorded 3.24, 2.29,

and 1.96 respectively, and lowest value reached 0.10 for the interaction of seeds aged two-year with control. The mean germination time in seed at different interactions varied from the maximum 9.94 for the interaction of the seeds aged one-year with the treatment of H<sub>2</sub>SO<sub>4</sub> followed by the interactions of seeds aged one-year with KNO<sub>3</sub>, gibberellic acid, indole butyric acid, and seeds aged two-year with H<sub>2</sub>SO<sub>4</sub>, where it recorded 8.19, 5.64, 5.53, and 4.75 respectively, and the minimum 0.89 for the interaction of seeds aged two-year with control. Although mean daily germination was recorded maximum value reached 1.50 for the interaction of the seeds aged one-year with the treatment of H<sub>2</sub>SO<sub>4</sub> followed by the interactions of seeds aged one-year with KNO<sub>3</sub>, gibberellic acid, indole butyric acid, and seeds aged two-year with H<sub>2</sub>SO<sub>4</sub>, where it recorded 1.14, 0.78, 0.69, and 0.67 respectively, and the minimum value reached 0.08 for the interaction of seeds aged two-year with control. The peak value was observed maximum in the interaction of the seeds aged one-year with the treatment of H<sub>2</sub>SO<sub>4</sub> reached 0.22, and the minimum value reached 0.08 for the interaction of seeds aged two-year with control. Regarding germination value, the interactions of seeds aged one-year with the treatments of H<sub>2</sub>SO<sub>4</sub>, KNO<sub>3</sub>, gibberellic acid, indole butyric acid, and seeds aged two-year with H<sub>2</sub>SO<sub>4</sub> treatment showed significantly different from the lesser value which was the interaction of seeds aged two-year with control treatment at 0.01 level of probability, where it recorded 0.34, 0.22, 0.13, 0.13, 0.09, and 0.01 respectively, while the other interactions showed no statistically, differences from the interaction of seeds aged two-year with control treatment at 0.01 level of probability.

**Table (2) shows data about germination test values according to the treatments:**

Treatments	GP %	SG	MGT	MDG	PV	GV
<b>H<sub>2</sub>SO<sub>4</sub></b>	34.81 <sup>a</sup>	2.55 <sup>a</sup>	6.06 <sup>a</sup>	0.87 <sup>a</sup>	0.17 <sup>a</sup>	0.16 <sup>a</sup>
<b>KNO<sub>3</sub></b>	25.56 <sup>b</sup>	1.54 <sup>b</sup>	4.64 <sup>b</sup>	0.64 <sup>b</sup>	0.15 <sup>ac</sup>	0.11 <sup>b</sup>
<b>Gibberellic Acid</b>	20.00 <sup>c</sup>	1.25 <sup>bcd</sup>	3.86 <sup>bc</sup>	0.50 <sup>c</sup>	0.13 <sup>abcd</sup>	0.07 <sup>bc</sup>
<b>IBA</b>	18.89 <sup>c</sup>	1.00 <sup>cd</sup>	3.60 <sup>c</sup>	0.47 <sup>c</sup>	0.13 <sup>abcd</sup>	0.07 <sup>cd</sup>
<b>water immersion</b>	12.96 <sup>df</sup>	0.73 <sup>de</sup>	2.53 <sup>de</sup>	0.32 <sup>df</sup>	0.09 <sup>bed</sup>	0.03 <sup>d</sup>
<b>Hot water</b>	9.63 <sup>e</sup>	0.34 <sup>eh</sup>	2.21 <sup>e</sup>	0.24 <sup>e</sup>	0.11 <sup>cd</sup>	0.03 <sup>d</sup>
<b>Cooling</b>	13.70 <sup>f</sup>	0.80 <sup>f</sup>	2.47 <sup>e</sup>	0.34 <sup>f</sup>	0.09 <sup>d</sup>	0.03 <sup>de</sup>
<b>Control</b>	4.81 <sup>h</sup>	0.15 <sup>h</sup>	1.18 <sup>f</sup>	0.12 <sup>h</sup>	0.08 <sup>d</sup>	0.01 <sup>d</sup>
<b>LSD at 0.01</b>	2.72	0.45	0.80	0.07	0.05	0.04

Values followed by the same letter(s) in the same column are not significantly different from each other at 0.01 level of probability. **GP %** = Seed germination percentage, **SG** = Speed of germination, **MGT** = Mean germination time, **MDG** = Mean daily germination, **PV** = Peak Value, **GV** = Germination Value.

**Table (3) shows data about germination test values according to the interaction between the seed's age and the treatments:**

Seed's age	Treatments	GP%	SG	MGT	MDG	PV	GV
Seeds aged one-year	H2SO4	60.00**	4.95**	9.94**	1.50**	0.22**	0.34**
	KNO3	45.56**	3.24**	8.19**	1.14**	0.19**	0.22**
	Gibberellic Acid	31.11**	2.29**	5.64**	0.78**	0.17**	0.13**
	IBA	27.78**	1.41**	5.53**	0.69**	0.19**	0.13**
	water immersion	18.89**	1.07**	3.72**	0.47**	0.08**	0.04
	Hot water	12.22**	0.40	2.97**	0.31**	0.11**	0.03
	Cooling	12.22**	0.86**	2.03**	0.31**	0.08**	0.03
	Control	6.67**	0.23	1.56**	0.17**	0.08**	0.01
Seeds aged two-year	H2SO4	26.67**	1.96**	4.75**	0.67**	0.14**	0.09**
	KNO3	17.78**	0.76	3.42**	0.44**	0.11**	0.05
	Gibberellic Acid	16.67**	1.03**	3.17**	0.42**	0.11**	0.05
	IBA	17.78**	0.74	3.53**	0.44**	0.11**	0.05
	water immersion	13.33**	0.91**	2.19**	0.33**	0.11**	0.04
	Hot water	7.78**	0.25	1.83**	0.19**	0.11**	0.02
	Cooling	15.56**	0.97**	2.72**	0.39**	0.11**	0.04
	Control	3.33	0.10	0.89	0.08	0.08	0.01
Seeds aged three-year	H2SO4	17.78**	0.75	3.50**	0.44**	0.14**	0.06
	KNO3	13.33**	0.63	2.31**	0.33**	0.14**	0.05
	Gibberellic Acid	12.22**	0.43	2.78**	0.31**	0.11**	0.03
	IBA	11.11**	0.85**	1.75**	0.28**	0.08**	0.02
	water immersion	6.67**	0.21	1.67**	0.17**	0.08**	0.01
	Hot water	8.89**	0.35	1.83**	0.22**	0.11**	0.03
	Cooling	13.33**	0.57	2.67**	0.33**	0.08**	0.03
	Control	4.44	0.14	1.08	0.11**	0.08**	0.01
<b>LSD at 0.01</b>		4.7	0.779	1.38	0.11	0.067	0.067

(\*\*) Significantly different from the lesser control value (Seeds aged two-year\* control) at 0.01 level of probability.

GP % = Seed germination percentage, SG = Speed of germination, MGT = Mean germination time, MDG = Mean daily germination, PV = Peak Value, GV = Germination Value.

#### IV. CONCLUSION

The seed's age in dodder plays an important role in the ability of the dodder's seeds to germinate, as it was found that the dodder's seeds aged one-year are more capable of germination and therefore they are a major source of infection for the fields planted with crops, that was probably because the seeds are newly formed and did not enter the second stage of dormancy. Pre-planting germination of dodder's seeds is technologically achievable by using some treatments and the most effective is H2SO4 at 98% followed by treatments of KNO3 at 0.2%, gibberellic acid at 200 ppm, indole butyric acid at 200 ppm.

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# Ecofriendly Dyeing of Silk using *Ficus elastica* Roxb. Extract

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**Abstract-** Natural dyes are a class of colourants extracted from vegetative matter and animal residues. The natural dyes derived from plants material represent a more sustainable source of colourants. A vast array of natural colourants obtained from natural sources such as plants, insects and microbes have been scrutinized in recent past for their use in different kinds of applications. Plants are the major source of natural colorants and almost all their parts such as stem, leaves, fruit, seeds and peels are used for extracting natural colour. Therefore present investigation is an attempt to introduce new shades to the colour palette of natural dyes by exploring parts of locally and abundantly available plants. Present investigation was focused on dyeing of silk fabric with *Ficus elastica* Roxb extract. Metal mordants ferrous and tin were used. Pomegranate rind and harda were used as natural mordants. Good to excellent fastness properties were obtained with antimicrobial properties.

**Index Terms-** Silk, *Ficus elastica*, Pomegranate rind, Harda

## I. INTRODUCTION

With the present awareness on environment, a lot of interest is being generated in recent years to use eco-friendly dyes on fibers. Natural dyes are sought and used for their much intrinsic value.



It is considered that natural dyes yield luster, soft light colours which are soothing to human eyes and have aromatic smell (Sharma 2005). Local plants are one source of natural colourant which is grouped

under plant sources. They are easily available in the country and can be considered as zero cost dyes as they are planted for other purposes. Plants are the major sources of natural colourants and almost all their parts such as stem, leaves, fruits, seeds and pills are used for extracting natural colour and they have antimicrobial, antifungal, insect repellent, deodorant, disinfectant and other medicinal values. (Jihad 2014). *Ficus* contains a huge tropical, deciduous and evergreen tree with more than 800 species. All *ficus* species contains latex like material within their vasculatures affording protection and self healing from physical assaults (Lansky 2008). *Ficus elastica* is a large, evergreen tree belonging to Moraceae family. It has dense crown of dark green foliage, epiphytic in early stages upto 30 m tall, aerial roots numerous and leaves elliptic. The plant contains a flavonoid, which exhibits anti-inflammatory activity. (Pullaiah 2006). *Ficus elastica* Roxb. is also known as rubber tree, its leaves possesses antimicrobial activity (Kiem 2012). The plant contains a flavonoid, which exhibits anti-inflammatory activity (Gupta 2009).

## II. MATERIALS

### • Textile substrate:

Silk offers a wide colouration possibility covering almost the entire spectrum of colours and hues due to its ready acceptability for a large range of dyestuffs. Hence 100% mulberry silk fabric is used for the present study.

- Ritha powder was used 20% owf for degumming of silk.
- **Mordants:**

Alum was selected as a sole mordant for the present investigation. According to literature search, it was found that Tin and Ferrous can give good results in terms of colour shade. Therefore pomegranate rind and harda were used as natural mordants. Tin and ferrous were selected as metal mordants for the present study.

- Leaves of *Ficus elastica* Roxb. were collected from local area.

### Methods:

- ❖ Mordanting was done with Alum as a sole mordant in binary combination with tin and ferrous as metal mordants with different proportions and alum in combination with pomegranate rind and harda as natural mordants with three different proportions. Pomegranate rind and harda was also used as a single mordant.

Mordanting was carried out for 45 minutes for each experimental silk sample.

- ❖ Leaves of *Ficus elastica* were collected from the local area and washed thoroughly with water. Dye extract was prepared by adding water and heating the solution for 60 minutes. Mordanted samples were transferred in to the dye bath. Dyeing was carried out for 60 minutes.

### III. RESULTS

Fastness of dyed or printed textile fabrics denotes the resistance which the fabrics opposes to varying or losing its shade when subjected to the action of various agents such as light, washing, rubbing, human perspiration etc. which can give rise to loss/change of shade and to staining of the other textiles.

#### Washing fastness of *Ficus elastica* Leaves dyed silk

Mordant	Mordant Concentration	Fastness Properties					
		Change in Colour	Staining on Acetate	Staining on Cotton	Staining on Nylon	Staining on Polyester	Staining on Acrylic
Alum	10:0	2	5	5	5	5	5
A + T	9:1	3	5	5	5	5	5
A + T	7:3	3	5	5	5	5	5
A + T	5:5	3	5	5	5	5	5
A + F	9:1	3	5	5	5	5	5

A + F	7:3	3	5	5	5	5
A + F	5:5	3	5	5	5	5
P	10:0	3	5	5	5	5
A + P	9:1	2	5	5	5	5
A + P	7:3	2	5	5	5	5
A + P	5:5	2	5	5	5	5
H	10:0	4	5	5	5	5
A+ H	9:1	4	5	5	5	5
A+ H	7:3	4	5	5	5	5
A+ H	5:5	4	5	5	5	5

Table represents washing fastness of wool and silk samples dyed with *Ficus elastica* leaf extract. Poor washing fastness i.e. 2 was recorded for dyed samples mordanted with 10% Alum. Tin and ferrous with its all proportions (9:1), (7:3) and (5:5) showed moderate wash fastness rated 3 for colour change. The natural mordant harda gave good results i.e. 4 with all combinations. (10:10) (9:1) (7:3) and (5:5) proportions for silk dyed samples.

The staining on adjacent acetate, cotton, nylon, polyester, acrylic mordanted with harda showed excellent results. In case of (A+T) with all its proportions (9:1), (7:3) and (5:5) mordanting with alum with all its proportions showed good results compared to other mordants, mordant combinations and

#### Perspiration fastness of *Ficus elastica* Leaves dyed silk

Mordant	Mordant Concentration	Fastness Properties					
		Acidic			Alkaline		
		Change in Colour	Staining on Cotton	Staining on Silk	Change in Colour	Staining on Cotton	Staining on Silk
Alum	10:0	5	5	5	5	5	5
A+T	9:1	4	5	5	4	5	5
A+T	7:3	4	5	5	4	5	5
A+T	5:5	4	5	5	4	5	5
A+F	9:1	4	5	4	4	5	5
A+F	7:3	4	5	4	4	5	5
A+F	5:5	4	5	4	4	5	5
P.	10:0	5	5	5	5	5	5
A+P	9:1	4	5	5	5	5	5
A+P	7:3	4	5	5	5	5	5
A+P	5:5	4	5	5	4	5	5
H	10:0	5	5	5	5	5	5
A+H	9:1	4	5	5	5	5	5
A+H	7:3	4	5	5	5	5	5
A+H	5:5	4	5	5	5	5	5

The rating of acidic and alkaline perspiration fastness for silk samples dyed with *Ficus elastica* leaves observed in the present investigation are summarized in the above table.

#### Acidic Perspiration Fastness

10% alum as a sole mordant recorded excellent acidic perspiration fastness rated 5 for silk samples dyed with *Ficus*

*elastica* leaf extract. Negligible staining was observed on adjacent cotton and silk fabric. Good colour fastness towards acidic perspiration with absolutely no staining was observed on dyed silk samples. Both the natural mordants showed similar results. The results highlights the good to excellent performance of metal mordants, (Tin and Ferrous) and natural mordants (Pomegranate

rind and Harda) when used in combination with alum as a binary combination.

fastness towards alkaline perspiration rated 5. Negligible staining was recorded on adjacent cotton and silk fabric rated 5 in case of silk samples dyed with *Ficus elastica* leaf extract.

### Alkaline Perspiration Fastness

Data represented in the table indicates that 10% Alum, pomegranate rind and harda as a single mordant showed excellent

### Rubbing fastness of *Ficus elastica* Leaves dyed silk

Sr. No.	Mordant	Mordant Concentration	Fastness to Light	
			Dry	Wet
1.	Alum	10:0	4	4
2.	A + T	9:1	4	4
3.	A + T	7:3	4	4
4.	A + T	5:5	4	4
5.	A + F	9:1	4	4
6.	A + F	7:3	4	4
7.	A + F	5:5	4	4
8.	P	10:0	5	5
9.	A + P	9:1	5	5
10.	A + P	7:3	5	5
11.	A + P	5:5	5	5
12.	H	10:0	5	5
13.	A + H	9:1	5	5
14.	A + H	7:3	5	5
15.	A + H	5:5	5	5

The rating for dry and wet rubbing fastness was recorded for the silk samples dyed with the leaves of *Ficus elastica*. Alum in binary combination with tin and ferrous with all proportions showed good results towards dry and wet rubbing fastness. In case

of natural mordants pomegranate rind and harda (A+P) and (A+H) with all proportions exhibited excellent dry and wet rubbing fastness.

### Light fastness of *Ficus elastica* Leaves dyed silk

Sr. No.	Mordant	Mordant Concentration	Fastness to Light
1.	Alum	10:0	3
2.	A + T	9:1	3
3.	A + T	7:3	3
4.	A + T	5:5	3
5.	A + F	9:1	3
6.	A + F	7:3	3
7.	A + F	5:5	3
8.	P	10:0	3
9.	A + P	9:1	3
10.	A + P	7:3	3
11.	A + P	5:5	3
12.	H	10:0	2
13.	A + H	9:1	3
14.	A + H	7:3	3
15.	A + H	5:5	3

Table highlights the degree of light fastness of wool and silk samples dyed with leaves of *Ficus elastica*. It can be stated from the data that silk samples dyed with *Ficus elastica* leaf extract exhibited moderate light fastness rated 3 towards almost all the

samples. Only the sample mordanted with harda as a single mordant recorded poor light fastness.

### Antimicrobial properties of silk dyed with *Ficus elastica* Roxb against selected microbes.

Dyed Samples with Code	Diameter of Inhibition Zone - 38 (mm)	
	Tested Microbes	
	<i>Staphylococcus aureus</i>	<i>Klebsiella pneumonia</i>
FLSF7	No growth	No growth

The antimicrobial property of silk dyed with *Ficus elastica* leaf extract was assessed. During the assessment, silk sample mordanted with only Alum+Ferrous in binary mordant combination with (7:3) proportion was selected and inhibition zone was recorded against *Staphylococcus aureus* and *Klebsiella pneumoniae*. Table clearly indicates that silk samples when dyed with leaf extract indicates the presence of antimicrobial activity against both the tested micro-organisms.

#### IV. CONCLUSION

*Ficus elastica* Roxb. produced variety of dark and pale brown colour with using metal mordants. Drastic change was noticed in case of natural mordants. Both the natural mordants produced pale colours. Fastness properties observed were good to excellent for all the fastness agencies. It can be stated that *Ficus elastica* Roxb. can prove a new source in field of natural dyeing. Silk fabric can be dyed and produces good colour range using different mordants and their combinations.

The dyed samples showed good to excellent fastness properties. Dyed samples also recorded anti microbial properties.

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# Performance Evaluation of Single-Path and Multipath MANETs Routing Protocols using Random Mobility Model

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**ABSTRACT:** Mobile Ad Hoc Network (MANET) is a multi-hop wireless network in which fixed infrastructure is not used. A single-path routing protocol is mainly proposed as a single route between a source and destination node, while a multipath routing protocol uses multiple routes between a source and destination node. This paper evaluates the performance of single-path routing protocols which are Cluster Based Routing Protocol (CBRP) and Ad hoc On-demand Distance Vector (AODV) along with a multipath routing protocol which is Ad hoc On-demand Multipath Distance Vector routing (AOMDV) in MANET environments using Random Mobility Model. For this purpose, the efficiency of each protocol was analyzed to verify their behavior in Random Mobility Model environments to determine the protocol, which is more efficient based on average end-to-end delay, normalized routing load (NRL) and Packet Delivery Ratio (PDR). Network Simulator (NS2) was used to evaluate the performance of these protocols. Our experimental simulation results show that: AOMDV protocol is better than AODV and CBRP in terms of Delay and Packet Delivery Ratio (PDR) with all traffic sources.

**Index Terms-** MANET, Routing Protocols, Node Density, Random Mobility Model, Single path, Multipath, AODV, AOMDV and CBRP.

## I. INTRODUCTION

Mobile Ad hoc Network (MANET) is a collection of wireless Amobile nodes that connect with each other without using any existing network infrastructure. MANETs can be used in classrooms, battlefields and disaster recovery [1].

Routing protocols play the most important role in the communication and connection within a network. A primary goal of routing protocols is to establish and maintain a route between a pair of nodes so that messages are delivered in a reliable and timely manner [2,3].

According to the scheme of discovering and maintaining routes, MANET routing protocols can be categorized into three categories: proactive, reactive and hybrid [4]. The routing protocols in MANETs can also be distinguished as single or multipath, unicast or multicast, and distance vector or link state [4]

Multipath routing is a technique that is used to solve problems of the link variability and recurrent topological changes. Because using multiple paths could reduce the effect of possible link failures between the mobile nodes, multipath routing protocols for MANETs are superior over conventional single-path routing protocols [5].

This paper evaluates the efficiency of single-path routing protocols (CBRP and AODV) along with multipath protocol (AOMDV) in Random Mobility Model. Based on the simulation results, we can identify the best protocol type (single path or multipath).

## II. OVERVIEW OF MANET ROUTING PROTOCOLS

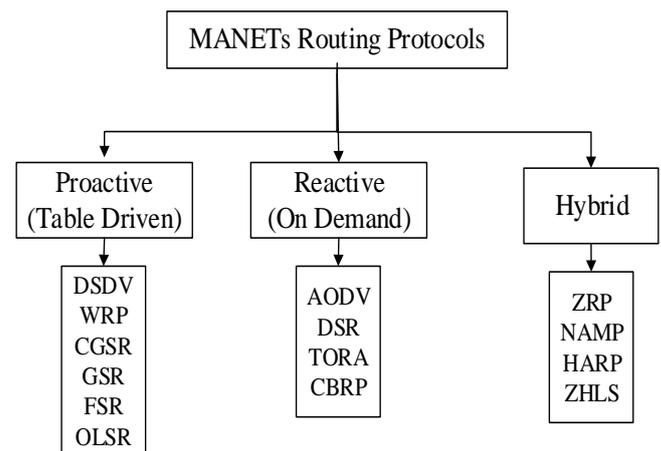


Figure 1. MANETs Routing protocols Taxonomy

Based on the schemes of discovering and maintaining paths, MANETs routing protocols are classified into three classes: proactive, reactive, and hybrid [6]. Each routing protocol reacts differently to node density and mobility. In addition, MANETs routing protocols can be distinguished in terms of reactivity (reactive or proactive approach) and number of paths (single or multi-path). The reactive approach is more efficient than proactive approach because it only discovers and maintains paths between the mobile nodes. This section explains the most

well-known reactive single-path and multipath MANETs routing protocols. Figure 1 shows the taxonomy of MANETs routing protocols.

### A. MANET Single Path Routing Protocols

MANET single-path routing protocols are mainly intended to discover a single route between a source and destination node. The most popular of these routing protocols in MANET are AODV and DSR. In the following subsections we will briefly review two MANETs single-path routing protocols (AODV and CBRP) which are on-demand reactive routing protocols.

#### Ad hoc On-demand Distance Vector (AODV)

AODV [7] is an on-demand routing protocol that enables dynamic and multi-hop routing between mobile nodes that are needed to establish and maintain MANETs. AODV is principally a combination between of DSR and DSDV (Destination Sequenced Distance Vector) protocol. Similar to DSR protocol, AODV uses the basic on-demand mechanism of route discovery and route maintenance. Furthermore, similar to DSDV protocol, AODV uses the next hop routing model with sequence numbers and cyclic beacons to find out routes and maintain them. AODV uses sequence numbers to avoid long-term loops when the topology of network changes.

Although AODV allows mobile nodes to obtain paths quickly for new destinations, it does not need nodes to maintain paths to the destinations that are not in active communication.

#### Cluster-Based Routing Protocol (CBRP)

CBRP [8,9] is a hierarchical on-demand routing protocol that uses source routing, like to DSR, to avoid creating loops and route packets. CBRP groups the nodes in a network into many clusters. Each cluster has a cluster head which manages data transmission within the cluster and with other clusters. An example of grouping nodes in three clusters can be seen in Figure 2.

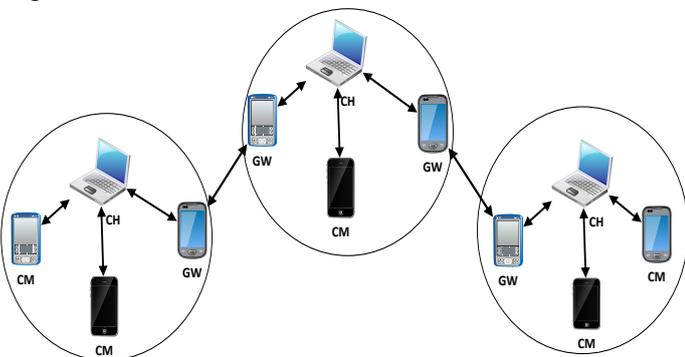


Figure 2. Cluster Based Routing protocol (CBRP)

In CBRP only cluster heads exchange routing data, thus the number of control overheads is less than the traditional flooding approaches. Nevertheless, as in any another hierarchical protocols, there are overheads that are related to cluster formation and maintenance. This is because some nodes may carry varying topologies data due to the long broadcast [6]. The

CBRP intends to discover a shortening path for performance optimization because the CBRP uses a source routing scheme. A node when receiving a data packet can obtain all information about the path. Nodes employ path shortening to select the most neighboring node in a route as the next hop to minimize the number of hop and to adapt network topology changes. Another optimization scheme that is used in CBRP is the local route repair, where broken paths could be repaired locally without rediscovery.

### B. MANET Multi Path Routing Protocols

Multipath routing protocols in MANETs are proposed to discover and use multiple routes between source nodes and destination nodes. Multipath routing addresses frequent topological changes and link instability because the use of multiple paths can reduce the effect of possible broken links between nodes [10]. Thus, multipath routing protocols in MANETs are superior to conventional single-path routing protocols because they can distribute traffic among multiple routes to reduce the average delay, increase transmission reliability, provide load balancing among multiple routes, and improve the security and overall Quality of Service [11].

Some multipath routing protocols have been proposed for wireless ad hoc networks. Multipath routing protocols based on the Ad hoc On-demand routing scheme are found as Ad hoc On-demand Multipath Distance Vector routing (AOMDV) [12]

#### Ad hoc On-demand Multipath Distance Vector routing (AOMDV)

AOMDV [12] extends the AODV protocol to compute numerous paths between the source nodes and the destination nodes through route discovery. AOMDV uses multiple paths by generating various loop-free and link-disjoint paths. Some of the features of AOMDV are: it provides disjoint paths through distributed calculation without the use of source routing, it generates multiple paths in single route discovery procedure, and it calculates replacement paths with minimal additional routing overhead over AODV. AOMDV protocol calculates multiple loop-free paths, where every node maintains an advertised hop count for each destination node to accomplish loop freedom, where the advertised hop count represents the maximum hop counts for all multiple paths.

## III. SIMULATION EXPERIMENTS

The simulation setting is based on the NS-2 network simulator version 2.35 [13]. The IEEE 802.11 DCF (Distributed Coordinated Function) MAC was used as the source for the tests with a channel capacity of 2Mb/sec. The transmission range of each node was set to 250 m using the Two-Ray Ground Propagation model.

### A. Mobility and Traffic Model

Random Waypoint mobility model is used for all experiments. The nodes are moving with 0 pause time and difference node mobility (1, 2, 4, 6, 8, 10, 12 and 15) m/s in. These node speeds are used to see the behavior of the protocols

with low mobility and high mobility. The total simulation time is 500 seconds.

The constant bit rate (CBR) data source running with UDP is used as the traffic pattern in all experiments in this paper [14]. 128 bytes is used as the data packet size because the research focuses on VOIP that needs low packet size. Four packets per second are used as data packet rate, where four packets is the medium value for the bit rate. The numbers of traffic sources are set to 10 and 40 sources. This is done to see the behavior of protocols with both low traffic sources and high traffic sources. The overall configurations setting for the simulation are explained in Table 1 below.

TABLE 1. SIMULATION CONFIGURATION

Parameters	Value
Simulation duration	500s
Topology	1000x1000 m
Number of Nodes	50
Traffic Model	CBR
Numbers Traffic Source	10 ,40
Mobility speed	1,2,4,6,8,10,12,15
Routing Protocols	AOMDV,AODV,CBRP
Pause Time (Sec)	0
Bandwidth	2Mb
Transmission range	250m
Packet rate	4 packets/second.
Packet size (Bytes)	128

**A. Performance Evaluations**

MANETs routing protocol is usually evaluated in terms of performance metrics. These metrics include Packet Delivery Ratio (PDR), Average Delay, and Normalized Routing Load (NRL). Specifically, these metrics are used in this paper to measure the efficiency of the three routing protocols: CBRP, AODV and AOMDV. These metrics can be described in brief as follows:

- **Normalized Routing Load (NRL):** The proportion of the number of control packets that are sent from the source node to the number of data packets that are received at the destination node.
- **Packet Delivery Ratio (PDR):** The ratio of number of data packets sent from the source to the number of data packets received at the destination.
- **Average Delay (Delay):** The average time from the beginning of a packet transmission (including route acquisition delay) at a source node until packet delivery to a destination.

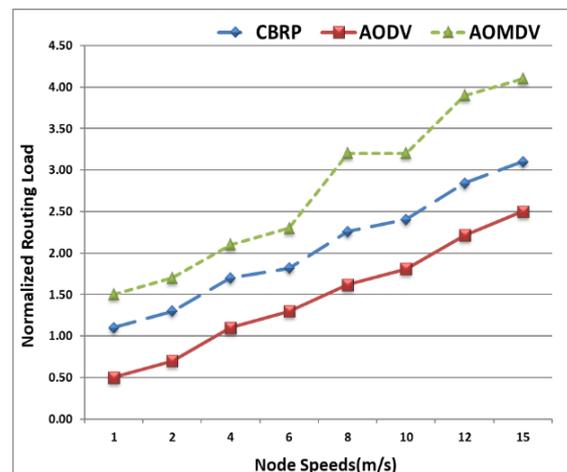
**IV. ANALYSIS RESULTS AND DISCUSSIONS**

This section deals with the analysis and discussion of the simulation results. The results are shown in form of graphs. The graphs show the comparison results among the three protocols (CBRP, AODV and AOMDV) in Random Mobility Model along with the performance metrics and different traffic source numbers.

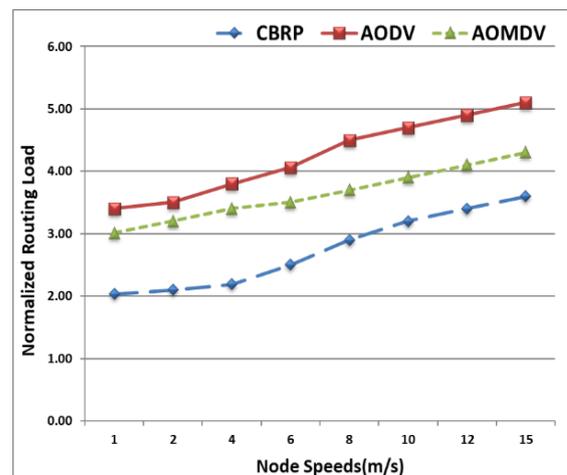
Figures from 3 to 5 represent the performance metrics (NRL, PDR and Average Delay) for (CBRP, AODV and AOMDV) routing protocols for 50 nodes in Random Mobility Model with 10 and 40 traffic sources.

**A. Normalized Routing Load**

Figure 3 shows that AODV has the lowest NRL with 10 sources and has the highest NRL with 40 sources, whereas CBRP has the lowest NRL with 40 sources. Also, figure 3 shows that AOMDV has the highest NRL between of the other two protocols (AODV and CBRP) with 10 sources.



10 Sources

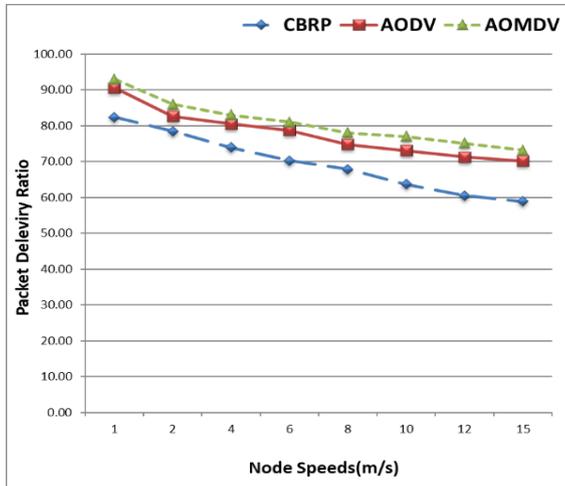


40 Sources

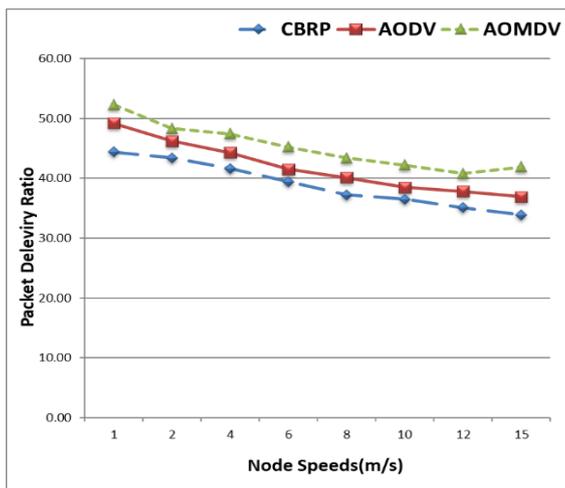
Figure 3. Normalized Routing Load for 50 nodes with 10 and 40 sources

**B. Packet Delivery Ratio (PDR)**

Figure 4 reveals that PDR in AOMDV protocol is higher than the other two protocols (AODV and CBRP) with 10 and 40 sources and CBRP has the lowest PDR between of the other two protocols (AODV and AOMD) with 10 and 40 sources.



10 Sources

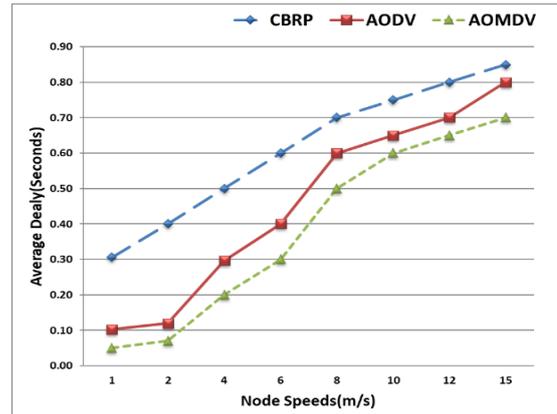


40 Sources

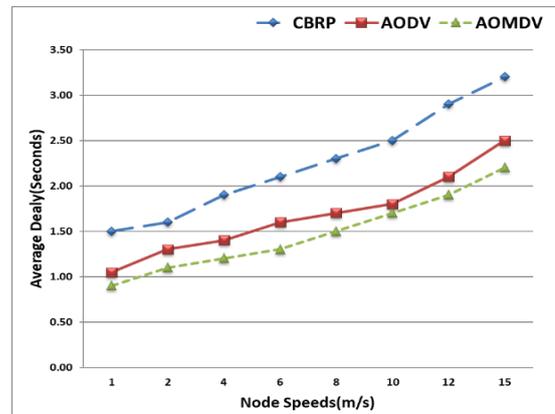
Figure 4. Packet Delivery Ratio for 50 nodes with 10 and 40 sources

**C. Average Delay**

Figure 5 shows that AOMDV is better than the other protocols (AODV and CBRP) in terms of Delay, where AOMDV has the lowest Delay for all traffic sources (10 and 40). Also, figure 5 shows that CBRP has the lowest Delay between of the other two protocols (AODV and AOMD) with 10 and 40 sources.



10 Sources



14 Sources

Figure 5. Average Delay for 50 nodes with 10 and 40 sources

**V. CONCLUSION**

This paper evaluated the performance of single-path (CBRP and AODV) and multipath (AOMDV) MANETs routing protocols in Random Mobility Model. The experiment simulation results show that AOMDV protocol is better than AODV and CBRP in terms of Delay and Packet Delivery Ratio (PDR) with all traffic sources. The results also reveal that CBRP has the lowest NRL with 40 sources. Thus, it can be concluded that the non-uniform density in MANET has effects on the performance of AODV, AOMDV and CBRP protocols. It can also be concluded that AOMDV protocol is the best in the Delay and CBRP is the lowest. For further research, we will plan to investigate and study the efficient performance for CBRP, AODV and AOMDV protocols in MANETs using difference mobility models using NS3 simulator.

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# Exploring the Status of Employee Empowerment in the Commercial Banking Sectors in Nepal

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**Abstract-** Employee empowerment is an act of enabling or authorizing an individual to think, behave, take action, and control work and decision-making in autonomous ways. It involves giving employees skills, resources, authority, freedom, opportunity, as well as holding them responsible and accountable for their actions. This study is aimed at exploring the present scenario of employee empowerment in some of the commercial banks at Kathmandu. It is based on a qualitative survey in Kathmandu valley, comprising five commercial banks and 150 sampled respondents selected by the random sampling method. The interpretation of data is done by the theories empowerment. Regarding the findings of the study, the gender gap among working staffs in the commercial banking sector is the greatest challenge to maintain workforce diversity and inclusive democratic practices in the banking sector here. Besides, due to void any employee empowerment provisions in some banks, it has become a matter of hindrance to the professional growths of employees. Likewise, regarding satisfaction level in the status of employee empowerment, in the dimensions: structural empowerment, employees' perceptions of higher management, management of change and psychological empowerment, all the average views are in between neutral and disagrees. Among these components, the respondents have provided consistent data on the structural empowerment component because it is comparatively important to them and is relevant in the Nepalese commercial banking sector. Also, the majority of the views on recommendations to the bank are oriented towards providing various capacity building related training to the staff for their empowerment. Thus, the status of employee empowerment, from the perspectives of the employees is not satisfactory in the case of Nepalese commercial banking sector. Finally, the study has implications on enhancing the capacity and skills of the employees working in the Nepalese commercial banking sector for promoting their knowledge, attitude, and performances.

## I. INTRODUCTION

Globally, the organizations today are facing frequent developments and technological changes that need to be adopted with financial and human resource capital. The employees have to be assigned more work than their prescribed job description. Therefore, concepts of job performance and organizational citizenship behavior-organization are of utmost importance and organizations are encouraged to structurally empower their employees so that a sense of worth could be created

in all employees. In such a scenario, where employees are propelled to inculcate more effort than their job description requires, job burnout often occurs which in turn affects the overall job performance of an employee (Jaffery & Farooq, 2015). To get the desired result in a competitive manner, employer needs to supply with the training and the workshops for the enhancement of their employee.

The banking industry has been emerging at a fast pace in Nepal (Dhungel & Dhungel, 2013). Globalization, downsizing, and re-engineering have been transferring banks to lean and mean operations and with an ever-larger to employee-manager ratio. Globalization has opened up various opportunities and challenges for Nepalese organizations to compete internationally. Challenges, such as a fluctuating environment and sophisticated technology, the need for quick decision making and the importance of frequent changes, have established the need among organizations to change their traditional management practices (command and control) into democratic structures that offer employees greater autonomy, confidence, and freedom to make decisions (Ehambaranathan, Samie, & Murugasu, 2014). However, such democratic structures will not be effective unless employees have a sense of empowerment. The concept of empowerment has received a great deal of attention during the past twenty years, due to its strong influence on organizational success and innovation. Employee empowerment has widely been recognized as a vital contributor to organizational success with many authors observing a direct relationship between the level of employee empowerment and employees' performance. Empowering employees enables organizations to be more flexible and responsive to change and can lead to improvements in both individual and organizational performance. In today's competitive world employee empowerment plays the eminent role in their performance or we can say that, to get the updated version of their job, comes within their right.

In Nepalese context, there is a concept, like, empowering employee is yet another financial burden and which ultimately benefits the employee rather than employer. In this era of globalization, there is a need for employee empowerment in organizations so that employees will be in a position to make quick decisions and respond quickly to any changes in the environment (Johnson, 1993). Organizations that are committed to employee empowerment are in a position to motivate and retain their employees, although it is a complex management tool, which needs to be nurtured and handled with a lot of care. Today, Employee empowerment is considered an important issue in

human resource management organizations and this regard, it is important that each of the individuals feel about their competences. Empowerment practices are not yet common in the Nepalese banking industry. A study on employee empowerment in the context of Nepalese banking sector, however, is still lacking. Without in-depth information on how employees view empowerment and how it relates to their performance, Nepalese banks' employers may not be able to harness fully the potential of their employees (Gautam, 2018). Hence employee empowerment is a motivational technique that is designed to improve the overall organization as well as individual performance if managed properly through increased level of employee participation in decision making, setting goals and objectives, self-determination, information sharing, open communication and so on. Empowerment in an organization is very crucial for the creativity of employees, and management benefits such as management time and effort can be focused more on external changes and less on internal problem-solving. Besides technological advancement, a developed, competent and empowered workforce will give Nepalese banking organization an edge over its competitors because human resource is the means to mobilize all the available resources in an optimum level.

Thus, employee empowerment has been emerging as a concern for all. Many institutions and individuals are working on the research of empowerment throughout the global arena. However, limited work has been conducted in our country in this arena. In this present scenario, the policy level documents have not focused on the empowerment of the working staffs of commercial banks in Nepal. Even the policymakers do not know the status of the empowerment practices, being provided to the bank employees. The expansion of banking services has been more prioritized rather than building the capacity of working staff but these two factors need to go simultaneously. Thus, this research aims to study the status of employee empowerment in the

commercial banking sector in Nepal which has a close connection with the macro-level economic growth in Nepal. To orient and to fill such a gap, this research has been conducted.

#### *Theoretical Insights*

A theoretical framework is used in research to outline possible courses of action or to present a preferred approach to an idea or thought that may lead to change. A combination of both qualitative and quantitative approach has been used to get the data for this research. In this research, employee empowerment is the dependent variable for the study. Whereas, the independent variables are structural component and psychological component, management of change and employees' perceptions of higher management (Honold, 1997; Zani, 2014, Wilson, 1992; Korkmoz, 2012). Some of the indicators under these have been derived from the discussions with the experts of the banking sector in Nepal. Employee empowerment is the process of enabling or authorizing an individual to think, behave, take action, and control task and decision-making in an independent way. Empowerment is a process that provides employees with autonomy through sharing of the correct information and the provision of control circumstances that affect the work performance of the organization, by rewarding employees for contributions made and with the power to make influential decisions being vested in employees (Lashley, 1999 as cited in Tajuddin, 2013). The employees need to be empowered structurally (delegation of authority, participative management and decision-making, job freedom, information sharing, and open communication, employee education, training, and development), psychologically (Mindfulness, Choice, Impact, Ability, Trust), management of change (participatory discussion of any new ideology in the organization) and developing a positive perception of the employees towards employers and the organization as a whole. These four factors lead to employee empowerment.

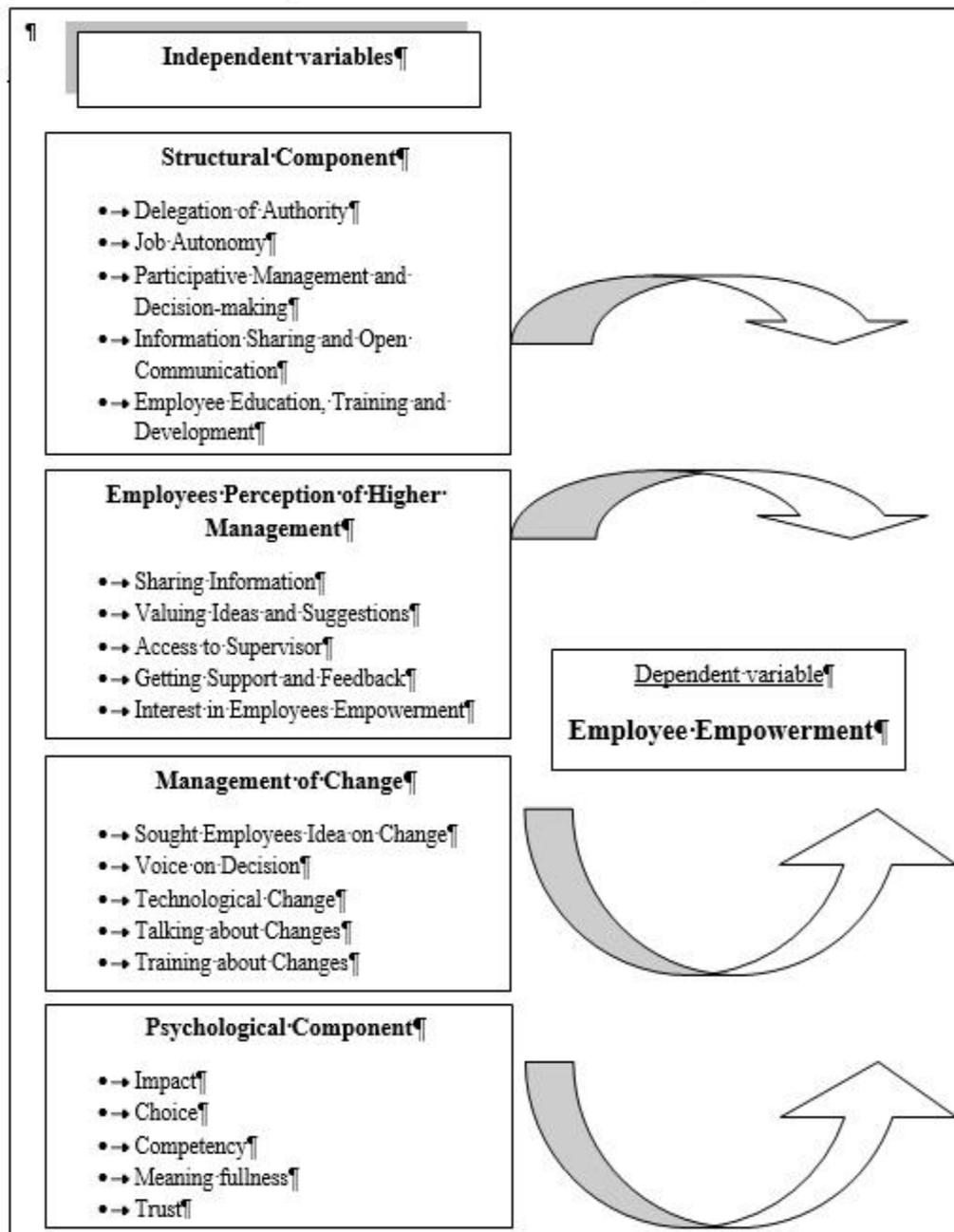


Figure 1: Theoretical representation of the inputs of the employee empowerment in a commercial institution (Source: self-designed)

## II. RESEARCH ACTIVITIES

The purpose of this study is to ascertain the state of employee empowerment in Nepalese banks. Also, it aims to fill the gap of exploring the status of employee empowerment and what should be done to enhance it. In total, it determines the extent to which Nepalese banks practice employee empowerment in their organizations. It addresses the following three research questions: How do bank employees perceive the state of employee empowerment in their organization? What is the most influencing factor of employee empowerment? What the bank can do to enhance employee empowerment in Nepal?

## III. METHODOLOGY

A descriptive, as well as exploratory research, was carried out for this research. Further, the data used in this research was qualitative as well as quantitative (Creswell, 2014). For this, the survey method was used to collect the information needed from employees working in different banks using a structured questionnaire specially designed for this study. The secondary data was also obtained from various sources such as the internet, books, journals, and articles but the findings were based on the data and facts provided by the respondents. Here, five sample banks were selected using the convenience sampling method, as the banks were located in a convenient place and would save time, cost and effort of the researcher. The sample was selected by a random sampling method and the size for the study comprises 150 respondents coming from all functions and divisions of the sample banks such as Trainee Assistant Level, Junior Assistant Level, Senior Assistant Level and Officer Level.

The main data collection instrument for this survey research is a questionnaire (Fowler, 2014). The researchers have formulated a structured questionnaire with altogether 33 questions comprising of open-ended, close-ended and multiple response questions. The questionnaire was developed based on literature as well as discussing with the subject experts. The first section of the questionnaire seeks information on the profile of the respondent with their gender, age, educational qualification, number of years working in the bank, and current position. The second section seeks information on the Likert scale about the perception of employees towards training, development, advancement opportunities and others. Finally, the third section seeks information about the suggestions and recommendations to the banks on enhancing employee empowerment. The questionnaires were distributed to the respondents and were collected after a given period. Most of the questionnaires were filled up under the researcher's supervision to ensure the reliability and validity of data. Following that, a pilot study was conducted by distributing questionnaires to a certain group of people who represented sample respondents to see if there were any questions not understood or misunderstood by them and to identify if any important questions needed to be asked were not included or missed. However, according to their responses, the questions were clear and understandable to be easily responded to. To carry out the analysis, Microsoft Excel and SPSS were used. After the coding, the appropriate analysis was done on the data collected. Mean, Standard Deviations and Frequencies were calculated and

analyzed to draw inferences from the collected responses. Quantitative data was tabulated and simple percentages were derived. Necessary tables and charts were drawn using Microsoft Excel to draw the conclusion, which was required to meet the research objectives. So far, a full analysis of the data was performed.

## IV. FINDINGS AND DISCUSSIONS

### *Profile of the Respondents*

The respondent's profile is all about the details about the demographic analysis of respondents and their interpretation collected through the primary source of the questionnaire. Among 150 respondents, 61.3% were male and 38.7% were female. The number of males is more than that of females, which indicates that fewer females are interested or have got chances of working in the Nepalese commercial banking sector. However, these situations should be transformed. When an organization has more women on the board, the diversity will trickle down faster (Macheel, 2016).

Similarly, the majority of the respondents are from the age group 26-30 that is 44.7% of the total respondents. Surprisingly, the respondents of age group 36 and above are in fewer numbers, which is 9.3% of the total respondents. This signifies that more young aged people below 35 years old are engaged in Nepalese commercial banking sectors. However, the reduction of matured people in this area is due to the reasons such as they have been promoted to the senior positions, as these categories have not been surveyed in this research. Other reasons might be the change in the profession after getting lots of stress in the work.

The educational level has been categorized into four levels namely S.L.C, Intermediate, Bachelor's and Master's degree. Here the majority of the respondents are at least a Bachelor's degree passed, which is 57.3% of the total respondents. None of them has only completed SLC or SEE exam. 25% of them have passed plus two-level. Surprisingly, only 18% of the respondents have completed a master's degree. Hence, it indicates that most of the respondents who have completed a Bachelor's degree level are pursuing a banking career. Interestingly, it seems that highly qualified people are not interested to work in the Nepalese commercial banking sector.

The work tenure indicates the employee's period of working in the organizations. From the survey, the work tenure of employees was categorized into six different categories namely less than 1 year, 1 year, 2 years, 3 years, 4 years, 5 and above. A large number of people are working in banks for 2 years which is 32.7 % of the total respondents. Interestingly, nearly one-third of the respondents are newly recruited. However, there are only 9.3% of respondents are working in their 4 years and only 8.7% of respondents are working for five years or more time. The changing of jobs by the experienced staff has become a major challenge to the management team of Nepalese commercial banks. Employee resignations or staff turnover ratio is the reality for any business. However, if the situation isn't handled properly, key staff members' departures can lead to a downturn in productivity. Co-workers may question sticking with a current employer who risks losing them to competitors. Managers often attribute resignations to promise for better compensation. In reality, employees point out two factors that readily fall within managerial control - including

poor rapport with supervisors and a lack of advancement opportunities (Heibutzki, 2019).

Job title or designation is the official title of employees working in the organization, which makes them distinct from others. They carry out their duties and responsibilities that come along with the job titles. From the survey, it was found that nearly one-third of respondents are from the junior assistant category. The involvement of the trainee assistant is also praiseworthy. However, the senior assistants and officer levels counted to just 18% each, participated in the survey which indicates that the number of respondents working in junior assistant level is higher than those working in other levels which means that most of the respondents are in the early stage of their banking career.

#### *State of Employee Empowerment in Nepalese Banking Sector*

The status of the employee empowerment in Nepalese commercial banking sectors have been revealed through different indicators as the provision of capacity development programs, adequacy of such programs, its relevancy with the current jobs, the relationship between the known skill of the staff and the job performance and organization policies on the promotion of employees. This section gives a clear view of the banking organization's training and development, advancement opportunities for employees, consistency, and practicability of employee advancement policies. The data are presented below with their respective subject.

Most of the organizations have training and development programs and conduct them periodically to enhance their employees' skills, knowledge and abilities so that timely objectives and goals are achieved. In this section, the scenario of training and development programs in the Nepalese Banking Sector is shown. The opinions of respondents regarding the provision of capacity enhancement programs in the Nepalese commercial banking sector. The data shows that nearly three-quarters of the respondent agree that their banks have the provision of training and development programs. Nonetheless, 27% of the employees do not have this facility yet. The banks need to rethink this and orient their programs to build the capacity of their staff. It shows that there is still room for improvement for the training and development of employees. Employees cannot be empowered until and unless they have proper knowledge, skills, and abilities. Regular training and development programs will increase employees' knowledge, skills, and abilities and that the target goals and objectives set by the organization can be achieved.

The provisions of sufficient training and development programs will help in the capacity building of the employees in an organization. A total of 110 respondents, said that their banks have the provisions of capacity building programs, 30% still believe that the training and development programs are not adequate. It means the banks, who have been operating such pieces of training need to focus on professional growth related skills to its staff.

Providing training is not effective if it is not relevant to the requirements and needs of employees' present job. Therefore, training must be conducted in such a way that is relevant or significant which the job requires or necessities. From the survey on 150 respondents, it was found that the majority of the respondents perceive that the skill enhancements and development programs are extremely relevant to perform their present job. This figure counted for 28.7%. Surprisingly, more than 46% of the

respondents still believe that they do not need the capacity development programs for easing their daily job works. This could be due to the reason that most of the college courses or internship programs that the employees have received also incorporate such skill enhancement ideas, both theoretical and practical.

Employee skills should match the job to achieve targeted goals and objectives. Employees with high competency and skills can excel if they are given a job according to their qualifications and skills. It is said that organizational outcome is higher when there is the proper utilization of skills, knowledge, and abilities of human resources in the organization. Here, 42% of the respondents believe that they are already overqualified with the academic courses and through certain professional skills. Their saturated feelings signify that they are no more interested in getting new ideas in performing their assigned jobs. However, nearly one-third portion of the respondents still believe that they feel under-qualified or lack certain skills they need to perform their jobs professionally and contextually.

People are always concerned about the opportunities for advancement and promotion in the organization where they work. They stay for the long term if they see that there are many opportunities for their career advancement in the organization. Here, nearly one-quarter of the total 150 respondents believe that there are many opportunities at their bank for enhancing their careers. However, there are some pessimistic views that at least 18% of the respondents do not think that there are any opportunities available at the bank for getting systematic promotions. This point indicates that still, some banks have not prepared the policies regarding the periodic or system-wise promotion of its staff. It seems that this has hindered the empowerment of the working staff and increased frustrations among them.

From the survey, it can be said that there are not many opportunities for the advancement of employees in the banking sector. More competent human resources can be attracted if banks provide lots of opportunities in this sector such as promotion, career advancement and so on. Without the formulation of new policies and laws to strengthen employee empowerment, there will not be many opportunities for individuals and employees who are looking forward to pursuing a banking career.

To our dismay, the data shows that 18% of the respondents believe that there are no such policies in their bank. Likewise, 37.3% of them argue that, although there are policies, they are not reasonable or applicable in present-day conditions. However, a large number of the respondents, which is 44.7%, believe that the policies are contextual and reasonable. This could be sensed as the bank needs to revise its promotion policies and make it systematic and applicable to the present banking scenario of our country. There is a need to reinforce laws and policies regarding employee empowerment for employees' development and career advancement in the Nepalese banking sector.

An organization can only take extra miles when there is consistency in its policies. This section deals with the consistency or stability in the promotion and advancement policies of Nepalese commercial banks. Here, 48% of them believe that there is consistency in the implementation of the policy regarding employee empowerment. Interestingly, 19.3% of them are unaware of this. Surprisingly, 32.7% of them believe that the policy implications are not consistent in their banks. It can be said

that the Nepalese Banks Promotion policy is consistent and stable. It could be made more consistent and stable to the bank's promotion policy so that more competent human resources can be attracted and retained for the long term. Consistent and stable policies for career advancement bring positive energy to employees.

#### *Factors Influencing the Employee Empowerment*

Several factors affect employee empowerment in the commercial banking sectors. From the review of literature, I have traced five of them whose data presentation and analysis are presented and discussed below. The dimensions are structural empowerment, psychological empowerment, employees' perception of higher management and management of change.

#### *Structural Empowerment*

Regarding the structural empowerment at the commercial banks in Nepal, the following data of the total 150 respondents have shown that the average score of the views is 2.38, which means the average view of the respondent is in between neutral and disagree. Likewise, the median 2.40 means, 50% of the respondents' view that the structural empowerment is in between strongly agree and disagree and 50% have viewed that it is in between disagree and strongly disagree. Similarly, mode 2.4 means the largest repeating views is in between neutral and disagree. The data has shown that the employees perceive that the structural empowerment is not satisfactory in the commercial banking sector. The mechanism to empower the staff is urgently needed to be reactivated. With more organizations looking for employees who take the initiative and respond creatively to the challenges of the job, empowerment becomes important at both individual and organizational levels. Empowered employees are generally more satisfied with their work, committed and effective at work (Ramos & Ales, n.d).

Regarding the delegation of authority, a large number of respondents (30%) have said that they strongly disagree on the various job-related powers awarded to them. Similarly, in job autonomy, the large number of them (52%) said that they disagree on the fact that their institutions have delegated them autonomy to perform their job. Surprisingly, under the headings participative management decision making, the majority of the respondents (47%) agree that it is provisioned at their institutions. However, data shows that the components, such as employee education, training, and development for career development and information sharing and open communications are dismal at the banks in Nepal. These components need immediately reforms for empowering the employees there.

#### *Employee's Perception of Higher Management*

Regarding the employee's perception of higher management in the employee empowerment practices at the commercial banks in Nepal, the data has shown that the average score of the views is 2.27, which means the average view of the respondent is in between neutral and disagree. Likewise, the median 2.40 means, 50% of the respondents' view that the supporting role of the management team is in between strongly agree and agree and 50% have viewed that it is in between disagree and strongly disagree. Similarly, mode 2.40 means the largest repeating views is in between neutral and disagree. The data has shown that the

employees perceive that the support of the management team is not satisfactory in the commercial banking sector. The collaborative and supportive management team is needed at the commercial banks to promote employee empowerment at the commercial banks in Nepal.

Regarding the interest of the higher management for the advancement of the professional development of its employees, and respecting the values of the employees by the management team, the majority of the employees perceive that they are strongly disagreed on the fact by 41%, and 30% respectively. Likewise, the disagree tower is the highest in the headings such as getting support and feedback from the superiors (41%), access to the supervisor when needed (30%) and shares of the job-related problems and information by the seniors to their junior counterparts (39%).

The gloomy picture of the management team shows support to enhance the skills of the employees, respect the values of the working staffs by the seniors, sharing information, access to the supervisors when needed and getting support and feedback, are signaling that these important factors have been underestimated by the management teams of the commercial banks in Nepal. Thus, these components need immediately reforms for empowering the employees there.

#### *Management of Change*

Regarding the management of change components in the employee empowerment practices at the commercial banks in Nepal, the data has shown that the average score of the views is 2.46, which means the average view of the respondent is in between neutral and disagree. Likewise, the median 2.40 means, 50% of the respondents view that the progressive teamwork is in between strongly agree and agree and 50% have viewed that it is in between disagree and strongly disagree. Similarly, mode 2.40 means the largest repeating views is in between neutral and disagree. The data has shown that the employees perceive that the support of the management team is not satisfactory in the commercial banking sector. The management of change for addressing the changes occurred in daily works is needed at the commercial banks to promote employee empowerment at the commercial banks in Nepal. Globally also, empowerment is perceived as one of the critical issues confronting the managers in the process of transforming organizations. Theoretically, it is accepted as a democratizing function with employee involvement and commitment as the key factor (Sharma & Kaur, n.d).

Interestingly, a large number of them (43%) have responded that they strongly disagreed on the fact that employees are provided enough and appropriate training to deal with the changes happened in their professional lives. There are some positive signs of discussions of the upcoming changes within the team that, 26.6% of them have agreed. Surprisingly, the employees in the largest number (50%) have a neutral view that the impact of the technological change on people is always considered. Unfortunately, regarding the presenting the voice in decision making when changes are planned and employee's ideas and opinions are sought when changes are considered, a large number of the respondents (43%) disagree that this provision prevails at their banks.

Whenever a change is being brought in any organization, there is a high chance of resistance from its employees, therefore, the organization has to participate in everyone to discuss the change, manage change and its likely consequences on people, organization, society, and environment at large to avoid resistance. An empowered organization is where the management participates and welcomes the ideas and suggestions from every level of the organization. The depressing pictures of the management of the change component to deal with changes are signaling that the management teams of the commercial banks in Nepal have underestimated these important factors. Thus, these components need immediately reforms for empowering the employees there.

*Psychological Empowerment*

Regarding the psychological perspectives in the employee empowerment practices at the commercial banks in Nepal, the following data has shown that the average score of the views is 2.44, which means the average view of the respondent is in between neutral and disagree. Likewise, the median 2.60 means, 50% of the respondents' view that psychological empowerment is in between strongly agree and agree and 50% have viewed that it is in between disagree and strongly disagree. Similarly, mode 3 means the largest repeating views are in between neutral. The data has shown that the employees perceive that psychological empowerment is not satisfactory in the commercial banking sector. The collaborative and supportive management team is needed at the commercial banks to promote employee

empowerment at the commercial banks in Nepal. The psychologically empowered state was considered to be a cognitive state characterized by a sense of perceived control, perceptions of competence, and internalization of the goals and objectives of the organization (Menon, 1999).

Regarding the personal control on outcomes, the largest number of the respondents (43%) strongly disagree with the fact that they can do so at their institutions. Likewise, the majority of them have a neutral view that they enjoy the job activities and want progress on it (46%). Similarly, more numbers of them (40%) disagree on the fact that they have a feeling of efficacy to perform the job responsibilities and freedom in decision-making.

The gloomy picture of the psychological empowerment to enhance the skills of the employees, respect the values of the working staffs by the seniors, sharing information, access to the supervisors when needed and getting support and feedback, are signaling that these important factors have been underestimated by the management teams of the commercial banks in Nepal. Thus, these components need immediate reforms for empowering the employees there.

*The Most Influencing Factor on Employee Empowerment*

From the analysis of the data, we have come across the following standard deviation table, which has become helpful in identifying the most influential factors of employee empowerment in the commercial banking sector in Nepal.

**Table 1: Statistical data on comparing the standard deviations**

<u>S.N</u>	<u>Headings</u>	<u>S.D</u>
1	Structural Empowerment	0.14349
2	Perceptions about the management team	0.27555
3	Management of Change	0.37201
4	Psychological Empowerment	0.59715

Table 1 shows that structural empowerment has the least standard deviation value (0.14349) among all other indicators, such as perception about the management team, management of change and psychological empowerment. This shows the respondents have provided consistent data on the structural empowerment component. The view of the respondents is not scattered and close to the mean in this component (Livingstone, 2015). It could be analyzed as this component is comparatively important to them than other components of empowerment and is relevant in the Nepalese commercial banking sector. Thus, it needs high intervention in reforming the structural empowerment component such as delegation of authority, job autonomy, participative management decision making, information sharing and open communication and employee education, training and development for career advancement. Thus, structural empowerment is the most influencing factor of employee empowerment in the Nepalese commercial banking sector.

*Suggestions and Recommendations to Enhance the Employee Empowerment*

Regarding getting the suggestions and recommendations for the effectiveness of empowerment in the commercial banking sector in Nepal, the open question was asked with the respondents. Out of a total of 150 respondents, 88 responses have been thematized under the following 15 headings. The multiple views of them have been presented below.

**Table 2: Recommendations for the employee empowerment**

<u>S.N</u>	<u>Category</u>	<u>Suggestions and recommendations</u>	<u>Frequency</u>
1	Establishing new departments	Establishing knowledge management and sharing units at banks to be updated with the latest empowerment practices globally and locally and other purposes	5

<u>S.N</u>	<u>Category</u>	<u>Suggestions and recommendations</u>	<u>Frequency</u>
2		Provisions of grievance hearing and handling mechanism	9
3		Establishing a research cell at banks for exploring new opportunities of empowering the staffs	6
4	Trainings related	Provision of safety and security training to the staff	5
5		Recruiting a focal person for facilitating periodic training to the staffs	5
6		Managing official exposure visits of the staffs (at both private and government banks)	6
7		Provision of stress management training to the staffs	7
8		Provide IT training	9
9		Organizing several guest lecture programs at banks (during off-hours)	8
10		Exposure visits	3
11		Others	Encouraging and funding the qualified and competent employees to engage in organizational research and writing and publishing the papers
12	Leadership development of the employees through promotion of the best employees as the branch managers		4
13	Organizing a meeting among employees and management at least once a month		4
14	Apolitical employee's union		5
15	Reducing the burden of works of the employees by hiring the unpaid interns from the colleges		8
	Total		88

From above table 2, we can see that the majority of the views of the respondents are focused on providing the training to the staff (49%). The majority of them have pointed towards providing Information Technology (IT) related training to them. Likewise, 28% of them have suggested some interventions in banks such as leadership development, promoting the research writing and publishing skills of the staff, establishing a union, recruiting interns and so on. Similarly, the remaining 23% have pointed on establishing new departments at the banks such as research cell, grievance desks, and knowledge management desks at the banks that could help in empowering the employees working there.

## V. CONCLUSION AND IMPLICATIONS

In the Nepalese Commercial Banking Sector, more than 22% of males are working than their female counterparts. The gender gap among working staffs in the commercial banking sector is the greatest challenge to maintain workforce diversity and inclusive democratic practices in the banking sector here (Saxena, 2014). Likewise, the age group of below 30 is more engaged signifies the recent college graduates have opportunities to work in the banking sector here. Similarly, the figure pointing towards less involvement of the highly qualified personals (such as master's degree and above) points that the bank should encourage its Bachelor's degree passed staff to join the Master's degree classes during evening or morning times. Surprisingly, the changing of jobs by the experienced staff has become a major challenge to the management team for retaining its staff in Nepalese commercial banks. Thus, banks need to rethink their policy provisions so that it could hold their senior staff.

Likewise, regarding the state of employee empowerment in the Nepalese Banking Sector, the data shows that still, 27% of the banks do not have such provisions, which has become a matter of hindrance to the professional growths of employees. Also, still, one-third of such banks having the policy provisions have inadequate one. With this also, the staff are perceived clearly that the skill enhancements and development programs are extremely relevant to perform their present job. Job satisfaction is an important aspect, needed for the professional growth of the employees and benefits of the employers as well (Pathak, 2016). However, the problem is not with the bank only as a large number of the employees at the commercial banks still view that they are overqualified on their jobs and they do not need any further empowerment programs. Likewise, the consistent policy on employee promotions is also needed for enhancing the knowledge, attitudes, and skills of the employees.

Similarly, regarding the factors of employee empowerment, in all four dimensions researched, structural empowerment, perceptions on the higher management team, management of change and psychological empowerment, all the average views are in between neutral and disagree. The dismal picture of the data collected on this component signifies the defined factors are weak in the Nepalese commercial banking sector. Among these components, the respondents have provided consistent data on the structural empowerment component because it is comparatively important to them and is relevant in the Nepalese commercial banking sector. Thus, the most influencing factor in employee empowerment is structural empowerment, which needs immediate reform as pointed by the data.

Finally, the majority of the views recommendations to the bank are oriented towards providing various capacity building related training to the staff for their empowerment. Also, the need for the various strategies like leadership development, promoting the research writing and publishing skills of the staff, establishing a union, recruiting interns have been explored through this research. Similarly, the opening of new units at the banks such as research cell, grievance desks, and knowledge management desks could help in empowering the employees working there.

In conclusion, the status of employee empowerment, from the perspectives of the employees is not satisfactory in the case of Nepalese commercial banking sector. The employees are seeking various capacity development programs for the enhancement of skill, knowledge, attitude, and performance. The revisions in the banking policy procedures for effective intervention in the structural empowerment of the employees such as delegation of authority, job autonomy, participative management and decision-making, information sharing and open communication and employee education, training and development for career advancement should be primarily addressed for empowering the working personals at the banks.

#### *Recommendations*

Based on the literature review and field survey and in the light of the above-mentioned findings and conclusions, this study proposes the recommendations that may help in promoting the effective application of empowerment in different organizations, primarily the Nepalese commercial banking sector. The following recommendations may be useful to create other research areas and may have benefits for both the researchers and the organizations.

The revision of the policies to attract more females in the Nepalese commercial banking sectors can be done through positive discrimination policies. Likewise, the retaining of senior and experienced staff at the institutions is very important for its professional growth. So the attractive policies including incentives and more benefits should be launched to hold such staff at the organizations. Similarly, the lowest academic qualifications to fight for officer level at the banks should be a Master's degree passed, so that qualified personals become attracted to work in this sector. Also, the banks need a consistent policy for the promotion of its staff, so that the systematic career growth policy of the staffs will reduce the nepotism and favoritism at the banks.

Out of different components of the empowerment, structural empowerment is quite relevant in our context. Its dimensions such as delegation of authority, job autonomy, participative management and decision making, information sharing and open communication and employee education, training and development for career advancement should be prioritized by the Nepalese commercial banking sectors. Likewise, the establishment of research cells, grievance hearing and handling desks, knowledge management and sharing units can help in the professional growth of the institutions as well as can contribute to employee empowerment.

Organizing and carrying out more theoretical and practical activities: Theoretical and practical activities should be organized and carried out regarding empowerment to promote awareness of empowerment concept, important tools and mechanism of effective application in real-life of organizations. This includes more research, training, and changes that promote employee

empowerment. New technology, skills building, adequate training and development programs should be introduced in organizations to foster and increase overall organizational performance.

Updating empowerment policies, procedures, laws, and regulations: Policies, procedures, laws, and regulations should be updated regularly with special and direct attention for reinforcing empowerment practices. These empowerment policies, procedures, laws, and regulations encourage employees to behave according to the norms of the organizations and also assure them of equal and impartial treatment from their organization. New policies, procedures, laws, and regulations should be communicated and disseminated to all levels of employees as soon as they are updated.

Restructuring organizational culture and structure: There should be decentralization, delegation of power and authority, effective and advanced training and development programs, effective communication systems and the establishment and promotion of a corporate culture that enhances employee performance to create empowerment friendly environment. Organizational resources and power (access and utilization) should be re-allocated to make fair and balanced empowerment throughout organizational hierarchy. More emphasis should be given to participative management and decision-making and freedom (choice) on the job so that employees will be able to think out of the box and create beautiful and innovative ways of doing the tasks, decision-making, and problem-solving methods.

Empowerment teams can be formed and implemented in the organizations by finding the time to ask for and listen to employees' suggestions, providing consistent feedback to those suggestions, allowing them to be part of the decision-making process in situations requiring immediate actions and planning of changes. Empowerment teams seek to provide support and fairness to employees who feel organizations have not treated them fairly. Further researches are recommended to extend the boundaries of the current study with additional geographical populations, larger sample size, more demographics factors, and more organizations or different types of organizations to test the results of the research. Furthermore, it can be expanded to all types of industries to examine if there has been or has not been any difference in the application of empowerment in those industries.

Performance management system should be put in place in organizations to establish a framework for performance improvements and also assess employee's aptitude and competency for future roles that carry greater responsibilities and accountabilities. It will help to evaluate employee's level of performance according to standards set so that strengths and weakness on the part of employees can be identified and proper corrective actions can be taken for effective outcomes. Organization, which has a successful performance management system, creates the elite employees, retains them and also improves those who are performing inadequately or not meeting the expected standards.

#### *Scope for the Further Study*

The study confined itself to Kathmandu valley only, so choosing one or two cities may not represent the empowerment practices in the Nepalese commercial banking sector in the entire country. Therefore, similar research should be repeated in other regions, to extend the bounds of the current study into additional

geographical populations, choosing more organizations or different types of organizations that have also implemented the employee empowerment practices and the results should be compared to determine whether there is consistency among the studies. Since all banks couldn't participate in the research, a case-by-case study would help bring out some of the unique findings of specific banks because such studies are in-depth and hence very detailed. This will also increase the chances of getting qualitative data, which were not captured during this study. It is also suggested that studies on other dimensions of employee empowerment be carried out among Nepalese banks such as the impact of employee empowerment on employee retention and employee morale to establish a culture that enhances innovativeness and creativity in employees.

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# FinTech Business Models: an Investigation of Thai Banks

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**Abstract** FinTech stands for the combination of “financial” and “technology”. FinTech is not new, it has a long way of innovations. Information technology has been used by financial service industry to deliver solutions to consumers for half a century. Technology has always change the financial industry. Since 2008, this change accelerated greatly both in terms of disruptive and quantifiable. FinTech has disrupted financial industry in both the developed and developing world. Many new financial solutions have emerged from rapid developing technology. This evolution of FinTech poses challenges for institutions and consumers in harnessing the potential benefits of innovation. The research aims to contribute to a better understanding of FinTech development and diffusion. This paper uses the predefined taxonomy to identify business models of FinTech-based innovations. The paper uses the case of four major commercial banks in Thailand to obtain better understandings of FinTech development and diffusion.

**Index Terms** FinTech, digital business model, taxonomy, financial technology

## I. INTRODUCTION

FinTech stands for the combination of “financial” and “technology”. FinTech is not new, it has a long way of innovations [1]. Information technology has been used by financial service industry to deliver solutions to consumers for half a century. Technology has always change the financial industry. Since 2008, this change accelerated greatly both in terms of disruptive and quantifiable. FinTech has disrupted financial industry in both the developed and developing world. Many new financial solutions have emerged from rapid developing technology at the retail and wholesale levels. This evolution of FinTech poses challenges for institutions and consumers in harnessing the potential benefits of innovation.

FinTech has introduced novel financial service models [2], new business structures [1], as well as enable financial firms to improve structures, processes, technologies and personnel in order to be able to survive in the dynamic financial services industry [3]. In banking industry, technology has been used to innovate financial services to provide cheaper, faster, and more reliable service solutions. Traditional financial services as payments, investment, lending, and insurance, are being innovated by cryptocurrencies, crowdfunding services, AI, big data and analysis, and block chain technology [4]. These innovations make financial transactions less bureaucratic, less expensive, more convenient, and more secure [5]. They also simplify consumers’ experience for financial services.

This study aims to contribute to a better understanding of FinTech business models. It is set out to address the research question: “What business model the traditional banks use to respond to FinTech?” This question was motivated because of two reasons. First, literatures argue that start-ups along with their innovations such as block chain pose a threat to traditional banks [6]. In the past, PWC proposed that by 2020, more than 20% of global financial institution earnings will be lost to new entrants [7]. However, others suggested that traditional banks are considered the dominant institutions who have opportunities in FinTech ecosystem. It is evidenced that the traditional banks, and telecommunication service companies are creating a new ecosystem of financial services [8] [9]. Thus, investigating the innovative FinTech business model of banks provides important insights into the nature and the future financial ecosystems.

Second, emerging FinTech literature have covered several aspects such as the evolution of FinTech [10], recognizing the banks’ opportunities [11], understanding start-up [12]. However, literature on understanding the phenomenon is still emerging. It was suggested that the banks should develop new digital infrastructure, or adopt cooperative approaches such as partnership [13] [14]. Nevertheless, there still lack of empirical evidences.

This research uses the predefined taxonomy of FinTech to identify business models of FinTech-based innovations. The study uses the case of four major commercial banks in Thailand to obtain better understandings of FinTech development and diffusion. The data are collected from public media texts. The study makes the following contributions. First, the study contributes to information systems research an emerging topic of research. Second, the study contributes to FinTech research, in particular a better understanding of FinTech business models. The remaining parts of the study are structured as follows: Theory, Methodology, Result, Conclusion and Limitation and Future research.

## II. THEORY

This research employs two information systems theories: 1) the concepts of sensing and responding and 2) taxonomy of business model.

### A. The Concepts of Sensing and Responding

Sensing is the firm’s ability to obtain sufficient knowledge rapidly and the relevant transitions it introduces in the firm. Responding is the firm’s ability to take action towards technology-enabled transformation. It was suggested that the firm that is able to sense opportunities or threat, but unable to take actions is at risk and even failure [15]. This study adopts concepts of sensing and

responding proposed by Oshodin et al. to explore the initiatives that Thailand banks are taking [16]. [16] has reported how traditional Australian banks respond to the FinTech ecosystem. They conduct a review of literature including organization reports, newspaper articles, organization web pages and press releases. Their study identifies nine main initiatives the Australian banks are taking to respond to FinTech ecosystem: five sensing and four responding initiatives. The sensing the opportunities and challenges of FinTech that the banks are taking are 1.Deep engagement with customers: is to identify and recognizing customer desires, 2.Technology scanning: involves seeking knowledge on technology innovations, 3.Crowdsourcing of FinTech ideas: is defined as obtaining FinTech related ideas from various internal and external sources, 4.Channels for inbound knowledge: refers to obtaining knowledge from external specialist, and 5 Actively monitor activities of FinTech players: deals with an attempt to understand the characteristics of other FinTech firms. Table 1 shows these sensing initiatives along with their sub-categories.

Table 1: FinTech sensing initiatives.

SENSING INITIATIVES				
Deep engagement with customers	Technology scanning	Crowdsourcing of FinTech ideas	Channels for inbound knowledge	Actively monitor activities of FinTech players
SUB-CATEGORIES				
-Interact with customers -Use live chat on mobile services -Obtain customer insights -Monitor customer desires with mobile devices -Explore ways for better customer services	-Explore the use of voice biometrics -Trial emerging technologies -Test block chain and cryptocurrencies -Realizing the benefits of big data -Recognizing sentiment to digital assets -Recognizing sentiment towards cryptocurrencies -Participate in novel technology events	-Attracts ideas across the firm -Harvest ideas from society -Participate in Hackathons	-Setting up advisory panels -Engage consultancy service -Consult on modular finance -Organize training course -Recruit staff with FinTech insight -Integrate promising FinTech ideas	-Learn FinTech culture -Looking for firms with specific business focus -Observe evolving FinTech scope -Identify ecosystem leaders -Monitor threats posed by FinTech -Abreast of development -Monitor FinTech from inception

The response initiatives that the banks are taking include 1.Setting up innovation labs: setting up innovative labs for in-house innovation development, 2.Investment: providing venture capital and invest in FinTech start-ups, 3.partnership: collaborating with other banks and FinTech start-ups, and 4.platform design and development: building, designing or redeveloping digital platforms. Table 2 shows these responding initiatives along with their sub-categories.

Table 2: FinTech responding initiatives.

RESPONDING INITIATIVES			
Setting up innovation labs	Investment	Partnership	Platform design and development
SUB-CATEGORIES			
- to develop and test - to foster investment - to foster partnership	-Acquire emerging FinTech -Launch venture fund -Replicable test investment -Finance rival for innovative solutions	-Partner with incubators/accelerators -Foreign collaboration -Collaborate with start-up -Partner with promising FinTech -Collaborate with tech firm -Collaborative sharing of data -Partner to improve in-house capabilities -Partner to enable innovation -Partnership to share experience -Partner analytic firm -Partner with other banks -Trial partnership -Consortium to test blockchain and cryptocurrencies	-Release regular platform updates -Build open API -Launch new digital channel for service application -Improve platform appearance/functionality -Build feature on modern digital technology -Adopt cloud platforms -Develop new platform -In-douse solution development -Overhaul core system -Build blockchain

*B. Taxonomy of business model.*

The taxonomy of FinTech business model proposed by Eickhoff et al. is adopted in this study [17]. The taxonomy is developed based on Nickerson et al. [18]. In their research, the term “taxonomy” is defined as “a set of dimensions each consisting of a set of mutually exclusive and collective exhaustive characteristics”. This definition is presented as follows:

$$T = \{Di, i = 1, \dots, n \mid Di = \{Cij, j = 1, \dots, ki, ki \geq 2\}\}$$

Di (i=1, ..., n) defines the n dimensions  
Cij (j=1, ..., ki) ki (ki≥2) represents the mutually exclusive and collectively exhaustive characteristics.

The development of taxonomy is comprised of 4 iterations. For the first iteration, Matthias et al. purpose 6 dimensions for the taxonomy: D1=Dominant technology component, D2=Value proposition, D3=Delivery channel, D4=Customer segments, and D5=Revenue stream. The 2nd iteration draw a random sample of 150 companies that were labeled as FinTechs by the Crunchbase database. The sample was split into 50x3, and assigned to each of the authors to analyze 50 companies. The results of this iteration are the additional dimension, D6=Product/Service Offerings and the suitable characteristics for the dimensions obtained by the first iteration. The 3rd iteration draw on a random sample of 600 companies of which 200 per researcher. The objective of this iteration is to test whether the developed dimensions and characteristics are stable. The same as the 2nd iteration, the taxonomy involved significant changes. Then, the 4th iteration analyzed the remaining 1400 companies in the Crunchbase database with a FinTech label. The taxonomy required only marginal changes. The final taxonomy is presented in Table 3: FinTech Business Model Taxonomy.

Table3: FinTech Business Model Taxonomy.

DIMENSIONS					
D1: Dominant Technology Component	D2: Value proposition	D3: Delivery Channel	D4: Customers	D5: Revenue Stream	D6: Product/Service Offering
CHARACTERISTICS OF EACH DIMENSION					
-Blockchain -Digital Platform -Decision support system -Database -Marketplace -Transaction processing system	-Automotive -Collaboration -Customization -Insight -Monetary -Financial risk -Transparency -Unification/Consolidation -Security -Convenience -Usability	-API -App -Physical -www +App -Instant message	-B2B -B2C -B2B, B2C	-Kickback -Pay per use -Revenue share -Sales -Subscription -Unknown -Free -Hybrid	-Inform. aggregation -Brokerage -Currency exchange -Payment Service -Current account -Device -Financial education -Financing - Investments -Payment service -Personal assistant - Lending/Credit -Fraud prevention -User identification

The definition of each dimension is as follows:

*D1* Dominant technology component: Dominant IT artifact that is the driver for the IT-based business model

*D2* Value Proposition: The value the firm creates for its ecosystem. i.e., customers, partners, etc.

*D3* Delivery Channel: How the products and services are distributed to the customers

*D4* Customers: To whom the firm intends to offer its products and services

*D5* Revenue Stream: How the firm generates revenue from its products or services

*D6* Product/Service Offering: What the firm offers to customers

Table 3 FinTech business models contains six dimensions, each of which has several characteristics. The researcher noted that the taxonomy represents the state of the FinTech industry at that time. Thus, additional dimensions and/or characteristics could be added to the taxonomy. The researchers recommend that the taxonomy is useful to describe business models of a FinTech company. Thus this study uses the taxonomy to explore FinTech-based innovations of five major commercial banks in Thailand to obtain better understandings of FinTech development and diffusion.

### III. METHODOLOGY

#### A. Context of the study

Banks in Thailand are governed by the Bank of Thailand (BOT), the country's central bank. BOT is responsible for promoting monetary stability, and setting monetary policies [19]. BOT aims

to create FinTech-friendly ecosystems which support the use of advancement of FinTech innovations that enable the development of products and services that enhance institution efficiency and meet the need of customers. The central bank aims to promote the use of FinTech to improve efficiency and reduce costs of financial products and services. Its main policy revolves around FinTech development, the development of national financial infrastructure for free money transfers, data analyzing, cyber security, and interconnectivity. The central bank also plans to cooperate more with technology companies, to create financial and banking innovations. BOT has signed agreement with PBC (The People's Bank of China, the central bank of the People's Republic of China) to collaborate on FinTech including joint innovation projects and research, information sharing, and regulatory coordination. The World Bank reported that Thailand is regarded as an ASEAN country with rapid FinTech development [20]. There are 140 FinTech companies, which about half of them are new companies. The majority of them focus on developing digital transaction services. Most of these companies are under the supervision of large bank which purchase digital transactions system to innovate traditional financial products and services.

Few Thailand banks dominate the banking sector. They provide services including personal loans, home loans, payments, investment, and market capitalization. For this research, the author selects four major banks operating in Thailand. The banks selected offer comprehensive financial services. There has been a lot of news media publishing the bank activities. Thus, this study collects FinTech initiatives from practitioner literature and examined the literature for modelling business patterns indicating FinTech activities.

#### B. Research Method

IS Research suggest that practitioner literature from popular media is reliable in demonstrating business practices and ideas [16] [21] [22]. Besides, it is noted the practitioner literature present concepts which have not been addressed in academic [23]. Thus practitioner literature forms an important basis for analyzing FinTech initiatives. In order to provide substantial evidence on the activities of banks, this study examines media texts to identify FinTech business models.

#### C. Data Collection and Analysis.

This study uses Google search engine which cover variety of popular media. There are three stages of data collection and analysis which are Search, Selection, and Analyzing:

*Stage 1: Search.* The researcher searches on Google by using the bank's names and the term "FinTech". The years are limited to be between 2008 and 2020. The year 2008 is selected since it is the year that Bitcoin and blockchain, which are most important FinTech innovation are, introduced.

*Stage 2: Selection.* The hits are screened to identify sources that are relevant. The researcher screens every hit until the Google search message "If you like, you can repeat the search with the omitted results included". is reached. The irrelevant or reoccurring sources are excluded.

*Stage 3: Analyzing.* Each source is examined to identify business models of banks FinTech activities. The business models are identified based on the concepts of sensing and responding [16],

and the FinTech business models taxonomy [17]. The next section presents the results derived of the study.

IV. RESULT

Table 4 presents the results of stage 1 (search) and stage 2 (selection). The banks are referred to by using pseudonyms. Table 5 and Table 6.1-6.3 (in the Appendix) show the analyzing of banks' FinTech business models.

Table 4: Results of search and selection.

	BANK 1	BANK 2	BANK 3	BANK 4
<b>Stage 1 (Search)</b>	90	77	80	96
<b>Stage 2 (Selection)</b>	84	67	32	54

Table 5 Sensing initiatives. As shown in table 5, banks ensure proper knowledge in FinTech space. The author identifies four areas of sensing initiatives.

A. Deep engagement with Customers:

Banks try to understand the desires of customers to provide proper financial services. The results in tables 5 indicate that banks engage more deeply with their customers to understand more about their needs. The review of practitioner literature shows that banks are interacting more with their customers. For example, bank 2 uses chat bot on mobile devices to communicate with customers, while bank 1 uses facebook chatbox and line as channels for customer interaction. In addition, The results show that bank1 and bank3 are taking steps to obtain deep insights about their customers. Through user-generated content extracted from inquiry and transaction service, banks can have more and timely knowledge of their customers' expectations and attitude, thus can obtain regular insights about their customers' needs. This knowledge enables banks to learn new ways in which customers want to obtain financial services.

B. Crowdsourcing of FinTech ideas:

This indicate the sourcing for FinTech knowledge and supply of innovations. One approach is through hackathons. This enables young people to suggest future innovations. The participants in hackathons can use any available software to achieve business solutions. For example, bank 1 cooperates with academics to test the practical use of AI, block chain, and data analytics in areas such as robo advisor and lending and credit. Also, there is evidence bank 2, bank 3 and bank 4 attract novel ideas by setting up FinTech idea repositories to encourage bank employees to contribute and advocate for ideas to be implemented. Also, evidence associates bank 2 with harvesting ideas from the society as an approach to crowd-source ideas.

Besides the evidence shown in Table 5. The researcher also identifies the other two initiatives from the media text include:

C. Technology Scanning:

Banks attempts to learn novel financial technologies and their functionalities. Results indicate that the common approach is by participating in novel technology events to ensure technology scanning, in order to be able to indicate the functionalities of emerging technologies. The evidence show that all banks are

realizing the benefits of AI, block chain, and data analytic technology. There is also evidence that bank 4 are taking steps to recognize the use of agile development and develop skills for transformation leaders.

D. Channels for inbound FinTech knowledge:

Banks aim to obtain knowledge from external sources to be up-to-date with novel technologies. Evidence suggests that There is also evidence of bank 1, bank 2 and bank 4 recruiting professionals with knowledge of FinTech as well as the ability to address business change. There is also evidence of bank 3 setting up advisory panels to understand future strategies and obtain knowledge on FinTech to address business change.

In summary, Thai banks attempts to obtain knowledge and innovative ideas through customer engagement, technology scanning, crowdsourcing and channeling of inbound knowledge.

Table 6.1-6.3 Responding initiatives. Table 6.1-6.3 show that Thai banks respond to the FinTech by pursuing several approaches. The responding initiatives include

A. Setting up of innovation labs:

Innovation labs is for carrying out research and development in FinTech in order to enable the banks to adapt to the continuous changing FinTech ecosystem. he labs are used to develop and test financial technologies and solutions. Also, banks use their innovation labs to foster investment or partnership with other players in FinTech ecosystem. The results show that all banks have set up the innovation labs to foster innovation through development and test, investment and partnership. All banks have development and tested solutions for payment and lending/credit service. All banks involve technology as AI and modern mobile technology. In addition, bank 2 and bank 4 include blockchain, while bank 3 includes bio-metrics authentication in their scopes.

Investment: All banks have set up venture funds which fund either in their innovative labs or startups or external funds to find the innovative FinTech solutions. The outside funds are used to explore new market opportunities as well as prospects. In fact, the investment involves process of acquiring, trialing and replicating. The process ensure that innovation is continuous. Bank can respond to future needs by learn from prior knowledge. The four banks have hugely invested in innovative FinTech firms. The result shows that all banks have invested in FinTech startups and funds which provides better service delivery to customer through ease of use and faster transaction. Banks also focus on firms that provide flexibility and transparency. Also, the investments have gone to the firms that leverage on using new technology as blockchain. The result indicates that bank 1 and bank 4 have invested in both foreign and local firms, while bank 2 and bank 3 have focused more on local investment.

In addition, bank 1 has invested in a foreign FinTech start-up that has implemented blockchain on payment systems, while bank 4 has invested in another foreign fund which rivals on better trade finance service.

B. Partnership:

The results show several approaches that banks do to create partnership in response to FinTech including: bank with incubator,

bank with start-up, bank with FinTech firms, and bank with another bank. Some of the intended or actual purpose of various partnerships were not indicated in practitioner literature but can be explored in future studies. Despite the limitations resulting from using practitioner literature to understand bank partnership, the result reflects that the reasons for partnership are to share experience, improve in-house capabilities, and enable innovation. The result indicates that bank 1 partners with a local incubator, local and foreign start-ups, a local FinTech firm, bank 2 collaborates with a local and a foreign FinTech firm, and a local startup, bank 2 collaborates with local FinTech firms, and a local startup, and bank 4 collaborates with a local and a foreign start-up, a local FinTech and foreign firms. As such, all banks indicate their desire to partner with promising FinTech firms. There are also indications of collaboration efforts among bank 4 and two other banks as part of an online payment platform enhancing user experience.

### C: Platform design and development:

Banks use their innovation labs to foster in-house capability, as well as investment and partnership. The labs enable banks to develop and release innovative digital platforms. Most of the legacy systems are upgraded with modern technology. Results show that all banks have improved the systems for better customer service. This involves redesigning the system and integrating new digital technologies such as data analytics, modern mobile, biometrics, AI, and blockchain. The identified initiatives include the building of open API, and development of new features and platforms. Evidence shows that all banks have always released regular platform updates to improve platform features and functionalities, as well as set up new digital channels for personal payment and credit services.

In summary, all the four banks show efforts to harness the opportunities emerging in the FinTech ecosystem. All banks attempt to collaborate and partner with other firms to enhance innovativeness. In addition, banks try to utilize their competencies, which reflect in the development of in-house solutions. To respond to the phenomenon, the in-depth knowledge is required. Thus, industry experts have jointly developed solutions through obtaining access to data amongst peers, investment and collaboration with other players, or jointly developing platforms with other organizations. It is also evidenced that smaller firms are more open to radical technology and innovative culture. The responding through partnership, collaboration, investment, and setting up innovation hubs, show that the sensing and responding is a continuous process. Banks carry out ongoing in-house testing and trials of technology for better banking solution initiatives.

## V. CONCLUSION, LIMITATION AND FUTURE RESEARCH

The author conducts the research by collecting practitioner data from media text to answer "What business model do traditional banks use to respond to FinTech?" To address the research question, the research employs the concepts of sensing and responding together with the taxonomy of business model. The author identifies that deep engagement with customers, technology scanning, crowdsourcing of ideas, and channels for

inbound FinTech knowledge as examples of how Thai banks are sensing the opportunities and challenges of FinTech. In addition, setting up innovation labs, investment, partnership and platform design and development are identified as the response initiatives of Thai banks.

The study has several limitations. Firstly, the data source, which is popular media text, could be biased. Secondly, the use of the search terms may also have an impact on the research outcome. Further study for future research could include 1) field study which is important to verify the initiatives reported in this paper 2) carry out the iterations in identifying FinTech business models 3) explore how banks continue improvement in the sensing and responding process involved with the selection of FinTech business model.

## APPENDIX

Table 5: Banks' Sensing Initiatives and Business Models

Table 6.1-6.3: Banks' Sensing Initiatives and Business Models

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APPENDIX

Table 5. Banks' Sensing Initiatives and Business Models: A.Deep engagement with customers B. Crowdsourcing of FinTech idea C.Technology Scanning

<b>BANK</b>	<b>Sub-Category</b>	<b>Archetype label</b>	<b>Technology Component</b>	<b>Value proposition</b>	<b>Customers</b>	<b>Product/Service Offering</b>
<b>BANK1</b>	A.Interact with customers (facebook chatbox line)	1.Financial Market 2.Intermediary, Payment Service	Marketplace, Transaction Processing System	Convenience/Usability	B2C	1.Investment, Lending, Credit, Financing 2. Payment service, Brokerage device,
	A.Obtain customer insights	Information Extractor	NA	Insight	Bank	
	A.Monitor customer desires with mobile devices	Information Extractor	NA	Insight	Bank	
	C.Participate in novel technology events (mobile application)	1.Payment Service, Information Aggregator 2.Lending Community,	1. Payment Service, Transaction Processing System 2.Decision Support System	Convenience/Usability Automation	B2C	1.Payment Service, Information Aggregation 2.Lending
	B.Participate in Hackathons (AI, blockchain, data analytics)	Robo Advisor, Co-Creator of Financial Analysis	Blockchain, Decision support system	Monetary Convenience/Usability	B2C	Personal Assistant
<b>BANK2</b>	A.Interact with customers	NA	AI	Convenience/Usability	B2C	Chatbot
<b>BANK3</b>	A.Obtain customer insights (mobile application)	Data Analytics	Transaction Processing System	Insight	B2C	Payment service, Lending/Credit
	A.Monitor customer desires with mobile devices	Data Analytics	Transaction Processing System	Insight	B2C	Payment service, Lending/Credit

Table 6.1 Banks' Responding Initiatives and Business Models: Setting up Innovation Lab

<b>BANK</b>	<b>Sub-Category</b>	<b>Archetype label</b>	<b>Technology Component</b>	<b>Value proposition</b>	<b>Customers</b>	<b>Product/Service Offering</b>
<b>BANK1</b>	Innovation lab to develop and test, to foster investment, and to foster partnership	NA	Blockchain	NA	B2B B2C	NA
<b>BANK2</b>	Innovation lab to develop and test, to foster investment, and to foster partnership	1.NA 2.Cloud Security 3.Alternative Trading Venue 4.Social Commerce 5.Account Information System 6.Payment Service 7.Robo Advisor	1.AI, 2.Information Security 3.Marketplace 4.AI 5.Transaction Processing System 6.Transaction Processing System 7.AI	1.Automation, 2.Security service 3.Matching, Intermediation 4.Insight/Automation 5.Monetary 6.Automation 7.Convenience/Usability	1.NA 2.B2B 3.B2C 4.B2B, B2C 5.SME, Startup 6.B2C, B2B 7.B2E	1.NA 2.Cloud Security Service, 3.Brokerage Service, 4.Online store, 5.Accounting Information System 6.Payment Service 7.Personal Assistant
<b>BANK3</b>	Innovation lab to develop and test, to foster investment, and to foster partnership	NA	AI, Blockchain, Data analytics	NA	B2B B2C	NA
<b>BANK4</b>	Innovation lab to develop and test, to foster investment, and to foster partnership	1.Financial Service 2. NA	1.Blockchian 2. machine learning, IOT, mobile API	1.Monetary Convenience/Usability 2. NA	1.B2B 2. NA	1.Lending 2. NA

Table 6.2 Bank’s Responding Initiatives and Business Models: Partnership

BANK	Sub-Category	Archetype label	Technology Component	Value proposition	Customers	Product/Service Offering
<b>BANK1</b>	Partner with accelerators	Robo-Advisor	Decision Support System	Monetary Convenience/Usability	B2C	Personal Assistant
	Collaborate with start-up	1.Robo-Advisor 2.Payment Service 3.Lending Community 4.Lending Community 5.Lending Community 6.Information Aggregator, Information Extractor 7.Lending Community 8.Payment Service	1.Decision support system 2.Blockchain 3.Decision Support System 4.Decision Support System 5.Marketplace 6.Decision Support System 7.Decision Support System 8.Transaction Processing System	1.Monetary 2.Convenience/Usability 3.Convenience/Usability Automation 4.Insight 5.Matching/ Intermediation 6.Insight 7.Automation, 8.Convenience/Usability	1.B2C 2.B2C 3.B2C 4.B2B 5.B2C 6.B2B 7.B2B 8.B2C	1.Personal Assistant 2.Payment Service 3.Lending(information-based) 4.Information Aggregation 5.Brokerage Device 6.Information Aggregation 7.Lending(information-based) 8.Payment Service
	Partner with other banks	1.Accounting Information Systems 2.Security, Payment Service	1.Transaction processing systems(SME) 2.Authentication, Transaction Processing System	1.Convenience/Usability, Automation 2.Security, Convenience/Usability	1.B2B 2.B2B,B2C	1.Accounting Information Systems 2. Digital authentication, Payment Service
	Partner with other VC	Robo-Advisor	Decision Support System	Monetary Convenience/Usability	B2C	Personal Assistant
<b>BANK2</b>	Collaborate with start-up	Security	Authentication	security		Digital authentication
	Partner with promising FinTech	Security, Payment Service	Authentication, Transaction Processing System	Security, Convenience/Usability	B2B,B2C	Digital authentication, Payment Service
	Build feature on modern digital technology	Payment Service	Transaction Processing System	Convenience/Usability	B2C	Payment Service

<b>BANK</b>	<b>Sub-Category</b>	<b>Archetype label</b>	<b>Technology Component</b>	<b>Value proposition</b>	<b>Customers</b>	<b>Product/Service Offering</b>
<b>BANK3</b>	Collaborate with start-up	HRS	Transaction Processing System	Convenience/Usability, Automation	B2B	HRS
	Partner to improve in-house capabilities (with FinTech and analytic firms)	NA	Blockchain, Quantum Computing, AI, Data Analytics, AR/VR, Cyber/Cloud Security	NA	NA	NA
<b>BANK4</b>	Collaborate with start-up	1.Online Store management systems 2.Payment Service, Information Aggregator 3.Lending Community	1.TransactionProcessing System 2.Payment Service, Transaction Processing System 3. Decision Support System	1.Convenience/Usability, Automation 2.Convenience/Usability 3.Automation	1.B2B 2. B2C 3. B2C	1.Account & store management systems 2.Payment Service, Information Aggregation 3.Lending
	Partner with promising FinTech	1.Financial Market Intermediary 2.Security, Payment Service	1.TPS 2.Authentication, Transaction Processing System	1.Convenience/Usability 2.Security, Convenience/Usability	1.B2B, B2C 2.B2B,B2C	1.Payment services 2. Digital authentication, Payment Service
	Collaborate with tech firm	Payment Service	Transaction Processing System	Convenience/Usability	B2C	Payment service, Lending, Credit, Financing
	Partner with other banks	1.Accounting Information Systems 2.Security, Payment Service	1.Transaction processing systems (SME) 2.Authentication, Transaction Processing System	1.Convenience/Usability, Automation 2.Security, Convenience/Usability	1.B2B 2.B2B,B2C	1.Accounting Information Systems 2.Digital authentication, Payment Service

Table 6.3 Bank’s Responding Initiatives and Business Models: Platform Design and Development

<b>BANK</b>	<b>Sub-Category</b>	<b>Archetype label</b>	<b>Technology Component</b>	<b>Value proposition</b>	<b>Customers</b>	<b>Product/Service Offering</b>
<b>BANK1</b>	Build open API	Financial Market Intermediary	Marketplace; Transaction Processing System	Marketing/Intermediation; Security	B2B, B2C	Brokerage service
	Use modern digital technology to improve platform appearance/functionality	1.Information Aggregator/ Robo-Advisor 2.Lending Commu. 3.Payment Service, Information Aggregator 4.Lending Commu.	1.Decision support system  2.Payment Service, 3.Transaction Processing System 4.Decision Support System	1.Monetary Convenience/Usability 2.Automation 3.Convenience/Usability  4Automation	1.B2C 2.B2C 3.B2C  4.B2C	1.Personal assistant Information aggregation 2.Lending 3.Payment Service, Information Aggregation, 4.Lending
<b>BANK2</b>	Build blockchain	Financial markets Intermediary	Blockchain	Convenience, intermediation, security	B2B	Trade finance service
<b>BANK3</b>	Build open API	Financial Market Intermediary	Marketplace, Transaction Processing System	Marketing/Intermediation; Security	B2B, B2C	Brokerage service
	Use modern digital technology to improve platform appearance/functionality	Information Aggregator/ Robo Advisor	Decision support system	Monetary Convenience/Usability	B2C	Personal assistant Information aggregation
	Build feature on modern digital technology	1.Co-creator of Financial Analysis 2. Payment Service  3. Payment Service	1.Decision support system  2. Transaction Processing System 3. Authentication (palm vein/biometrics)	1.Convenience/Usability  2.Convenience/Usability 3.security	1.B2B  2. B2C 3. B2C	1.Information aggregation  2. Payment Service, Lending/Credit 3. Digital Authentication
	Develop new platform	Accounting Information Systems	Transaction Processing System	Convenience/Usability	B2B	Accounting Information Systems
<b>BANK4</b>	Launch new digital channel for service application	Payment Service, Information Aggregator Lending Community,	Transaction Processing System	Convenience/Usability, Automation	B2C	Lending. Credit
	Build feature on modern digital technology	Payment Service	Transaction Processing System	Convenience/Usability	B2C	Payment Service for visually impaired



# Re-Definition of the Concept of Power (A Case Study in Africa)

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**Abstract-** This paper is set out to make discourse of the concept of power, with a clear concentration of how the concept is seen and practised in Africa and further discussing how the concept of power has overtime changed in Africa, which is the re-definition of the concept of power as it relates to Africa. The application is based on the most comprehensive means to achieve the purposes set out in this study; thus, the study will applicably review existing works of literature in the areas where that cover the concepts contained in this study. This study found that power is a necessary evil which has come to become the norm in so far as politics, governance and socio-economic spheres of life are concerned. The study also found that the comprehension and practices relating to power have over the years changed. However, Africa is still lagging in reference to global idea of power, which gives room for constitutionality, democratic rules and dividends of governance. The unique contribution of this study is that the information which is contained in this paper is sieved from the findings of various scholars who have distinguished themselves in the study of politics, economy, sociology and concepts in Africa. Further, this study comes in time to cover the fields which are not covered by the previous studies.

**Index Terms-** Power, Africa, Re-definition, Constitutionality, Democratic,

## I. INTRODUCTION

The concept of power has over centuries become a significant concept in socio-political thought within the globe. Power is a political phenomenon that cuts across all the dimensions and facets of governance and the socio-political; human socio-economic endeavours (Bunier, 2010). Though the concept has a long history with the political structure of the human's society; it is imperative to state that there seems to be no uniform definition attributable to the conceptualization of power; thus, there variant analytical frameworks, methodologies, models, structures and context within which the concept of power is viewed. This is to say that the meaning of the concept of power is complex, just like many other concepts in social sciences and humanities (Posner, and Young, 2007).

The complexities associated with trying to get a definite meaning of the concept of power has to the suggestion that instead of making attempts to define the concept, the concept of power should be analyzed and explained. Even in cases where this suggestion of explaining and analyzing the concept of power in lieu of defining it is adopted, a reader or the audience would notice

the variations with the explanation being offered. However, one thing that is sacrosanct and common in any form of explanation, analysis or definition that may be offered in relation to the concept of power is that it always features the capacity of a person or group of persons, or capacity of an entity or state to attain the set-out objectives effectively and timeously with little or no hitches (Bratton, 2007).

In the bid of attaining these objectives by the person or entity that can do so, there may be a sort of resistance or hitches, this where the application of coercion which may embody application of physical force. It is the application of force to achieve a set objective by the person purportedly in possession of the capacity to get things done that brings the model of coercive and consensual powers into the lexicon of power as a concept. Given the above, power as a concept amongst humans and the society can be one which is coerced or one who is voluntarily consented to by the objects or subjects of the power (Posner, and Young, 2007).

Although power is mostly construed in the political sense and dimension, the concept of power flares across various sectors of human endeavours, aside from political powers, there are economic powers, academic powers, social powers, technological powers, religious powers, legal powers (Hassan, 2013). The agreed implication is that where any person or entity either individually or collectively possess the capacity to influence, control, direct or persuade another person or entity whether individually or collectively, to do or act in accordance to wish of the person or entity having the capacity for the objectives set out to be attained by the person or entity having the capacity, in respect to any given aspect of human endeavours, the person in possession of the capacity is said to have power over the person who is influenced, controlled, directed, or persuaded, in so far as that aspect of human endeavour is concerned (Bunier, 2010).

Notwithstanding the several facets of human endeavours in accordance with which the concept of power is distinctly conceptualized to; several studies have it that the ideal concept of power is political power (Amuwo, 2014, Hassan, 2013). The studies posit that political power is the supreme power as anyone who has political power is in a position to control the custodians of other forms of powers. Another argument in support is that the custodian of political power is also in a position to regulate the extent to which the custodians of other forms of power can exercise and exert their powers. Also, political power is all-encompassing, as it is the power at the root of human society and its structures. This study will concentrate on presenting a

concerted discourse on the concept of power with extreme interest in political power (Amuwo, 2014; Hassan, 2013).

The concept of power in Africa has been one which is inconsistent. This may be traced to the colonial history of most regions in Africa; however, it does not suggest that the concept of power was not in existence prior to the colonial era. Prior to the colonial era, traditional African societies have their political structures and communities. These political structures and communities did not thrive on their own, as there were different levels of capacities that instil discipline and common goals as a standard in the communities. Thus, there was in existence in the traditional Africa societies the concept of power (Goldsmith, 2004).

Depending on the practices, norms, customary and cultural heritage of a given community, the power can be residing in a given individual (monarch), or a family (royal family) or group of esteemed persons (cabinet members). It follows that prior to the obstruction of the relative peaceful political structures and communities in Africa by the storm and breeze of colonialism; Africa already had a form, model, frameworks or hierarchies of power which is used in stemming the affairs of the members of the community. Upon the advent of colonialism, the concept of power in Africa was given a different outlook which includes but not limited to violence, propaganda, conflict, and uncontrollable quest to hold on to power (Cilliers, & Hedden, 20 November 2014). This suggests why it was easier for the colonialists to penetrate into Africa, even to hinterland than it is for them to give in and surrender power back to the Africans when Africans started questing for what rightly belongs to them. In the streets of Rhodesia (Zimbabwe), Soweto (South-Western Town in South Africa) and Nairobi (Kenya), Africans were maltreated in the bid for the colonialists to restrain power for the indigenous Africans. The argument is that these series of events and coupled with other factors relative to the colonial regime did to a large extent influence the concept of power as seen and practised in Africa (Cilliers, & Hedden, 20 November 2014).

This study will discuss the concept of power in Africa from the period immediately after most African countries regained independence until the present disposition of power in the continent. This research is of the opinion that Africans did not gain independence; the independence of African states was stolen and was later re-gained by African states. The research study will progress in the next part by discussing the concept of power based on literature review and in the next part will analyze the concept of power, using Africa as a case study.

## II. CONCEPT OF POWER

The concept of power may be viewed as a process which is analogously related with concepts like commitments, and obligations, between two entities which may be likened to superior and subordinate, which may be coercive or voluntary in nature. Power may be seen as a capacity given to a person or entity as a result of a binding contract which has in it certain roles, rights and obligations of the parties, and parties thereto are bound by the terms of the contract. To this end when there is any form derail or

deviation from performing the obligations created in the contracted, the party vested with the capacity can in response to the non-compliance, apply coercion or force either by threat or actual infliction of sanctions so as to compel the performance of the obligation (Posner, and Young, 2007).

Power may be implied as to the capacity inherent in a given status or acquired by a person to secure the doing of the terms of a binding obligation existing in a collective organization in so far as the said obligations are consensual and legitimized in accordance with common goals and objective of the collective organization, and any form of recalcitrant attitudes towards the performance will be curtailed through sanctions or threat of such (Bunier, 2010).

Some political theorist did not subscribe to the idea that power is consensual; to them, the concept of power is more like being synonymous with coercion and force. To this set of theorist, power is the unalloyed capacity to impose one's ideal purposes, objectives and interest on others (Posner and Young, 2007). This definition seems like the concept of power is the ability to place others where they do not want to be and compel them to do what they do not want to do. It implies that the society is a contraption and that defeats the long-standing theory of state contract.

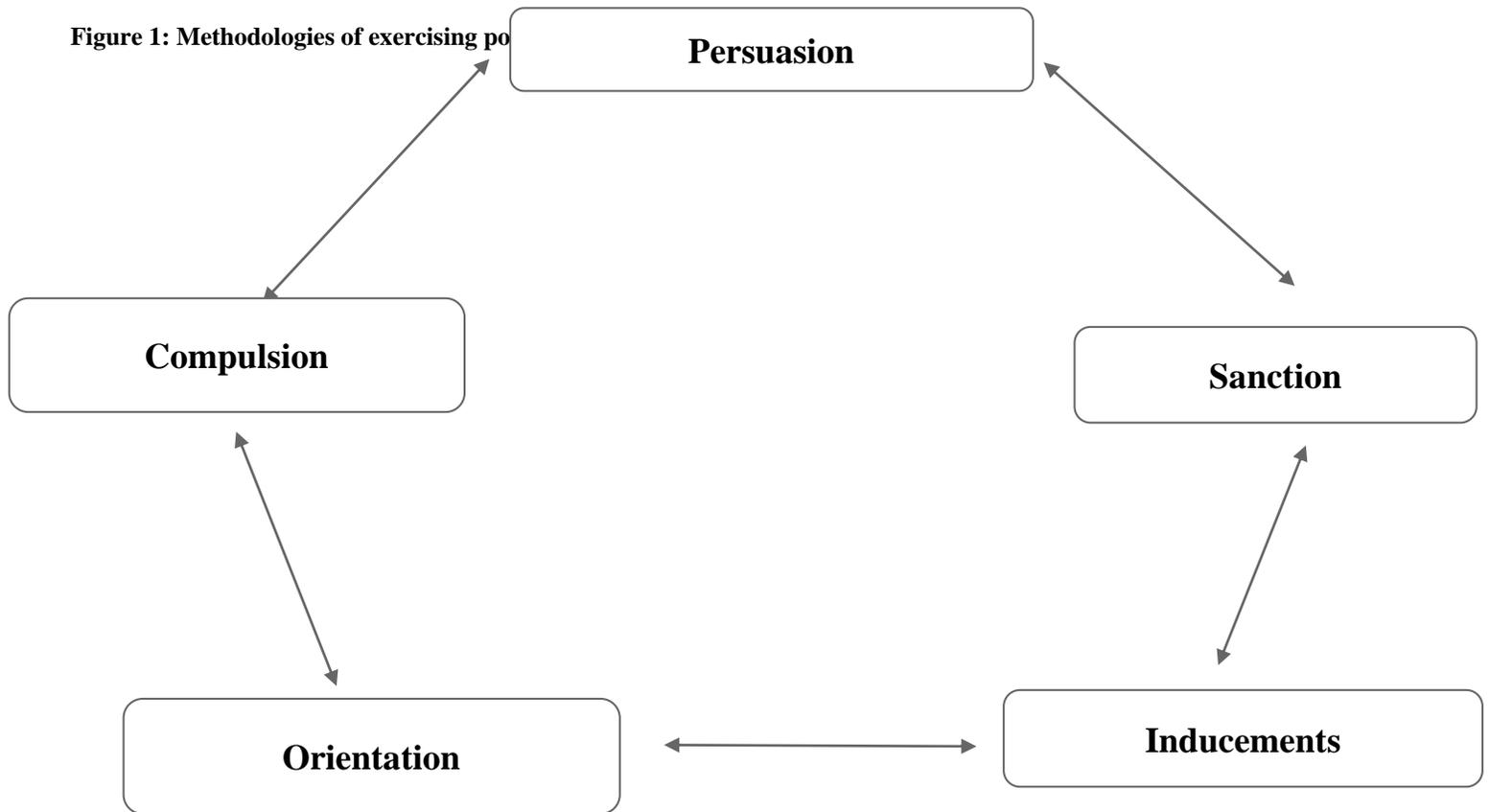
It has been argued that power involves legitimation. Therefore, power should not be conceived as one-sided thing where only a unit of the collective whole commands all units with no checks and balances. This idealization of power is the ideal form of power; in that, it does not leave the other units of the collective whole empty-handed with just the expectation that they are to follow the obligations spelt out in the contract. Contract as we all know is a bi-polar system, where there are obligations levied on each of the parties; and there are rights and liabilities for failure of any of the parties to abide and comply to the terms of the contract. In this sense, and dimension, the capacity to command, influence, control and persuade is not residing on one side of the collective whole only; it resides on both sides but the exercise of the capacity inherent in the contract is depending on the party who defaults (Brown, 2012).

The foregoing conceptualization of power is ideal in the spirit of the aphorism "Power corrupts, absolute power corrupts absolutely". Therefore, in order to avoid the circumstance where power is rested on one side of the collective whole in the contract, it implies that the unit may get livid and power-drunk, which would defeat the eternal purpose of state contract theory. Some political theorist and philosophers have termed this as a progressive concept of power (Bratton, 2007).

The implementation of the concept of power in a given society is determined by certain factors (Posner, & Young, 2007): Legal framework; Political arrangement; Existing precedents; Legitimacy; Bilateral and multilateral relationships; Population; and Sovereignty. The existence of the aforementioned factors will determine the level, form, model and extent of the power which may be exercisable in a given society (Posner, & Young, 2007).

In order to exercise power effectively and efficiently, there are applicable methodologies. These methodologies may work in a combination of one another or maybe applied solely. The applicable methodologies are depicted in the figure below.

Figure 1: Methodologies of exercising power



These methodologies identified above are not exhaustive. There are other methodologies which can be applied in the exercise of power. However, these ones contained in figure 1 above are the prominent methodologies which have proven effective in various settings (Bunier, 2010).

In the next part of this study, the study will progress to discuss the Re-definition of the concept of the power of Africa.

### III. RE-DEFINITION OF CONCEPT OF POWER IN AFRICA

The concept of power in Africa has, over the years, been depicted in high and low scales. Africa, as a region, has the highest concentration of the people of the black race. It comprises of people whose religious ideologies feign majorly between Christianity and Islam, and a handful of others who are rooted in the traditional African religion. Africa is located at the southern hemisphere, with most of her countries around the equator. Africa is amongst the six major continents of the world, and the people from Africa are referred to as Africans. Africa is a locality that is rich in agriculture, gold, oil, diamond, lead, and other natural resources. The argument is that Africa is the centre or cradle of modern civilization. In this light, Africa would have been in a better condition if not for the truncation and obstruction brought to the region by the European colonialists (Goldsmith, 2004).

Figure 2: Countries in Africa

East Africa	West Africa	South Africa	Central Africa	North Africa
Burundi, , ,	Benin, ,	Angola,	Cameroon ,	Algeria, and
Comoros,	Burkina Faso,	Botswana	, Central African Republic	Egypt,
Djibouti,	Cape Verde,	Lesotho,	Chad,	Tunisia,
Eritrea	Côte d'Ivoire,	Malawi,	Congo,	the Islamic Republic of Mauritania
Ethiopia,	The Gambia,	Mozambique,	Democratic Republic of Congo,	Libya,
Kenya	Ghana,	Namibia.	Equatorial Guinea,	Morocco.
Madagascar,	Guinea ,	South Africa,	Gabon,	

Mauritius,	Guinea Bissau,	Swaziland,	São Tomé and Príncipe	
Rwanda,	Liberia	Zambia		
Seychelles,	Mali,	Zimbabwe.		
Somalia,	Niger,			
Sudan,	Nigeria			
Tanzania	Senegal,			
Uganda.	Sierra Leone			
	Togo.			

Between 17<sup>th</sup> and 19<sup>th</sup> Century, Africa was raided by the colonialist who stole the political power in various indigenous African societies, and Africans were forced into accepting colonialist political structures, which form the basis for modern-day African societies. However, by the wake of the 21<sup>st</sup> century, Africans began to quest and fight in order to regain their stolen independence and political mandate. Following the events of Pan African movement, majority of the African countries regained independence from the colonial benefactors, and there were attempts heralded for the first time after long-forgotten time, where Africans are to be ruled or led by fellow Africans without any direct or indirect orders from the non-Africans (Hyden, 2006). It means that most African leaders fused both the learned system of governance/authority from the colonial benefactors and the inherent style of authority in Africa; coupled with the experiences under the colonial government. The outplay was a great turn out of tyranny, autocracy, and violence exhibitions of authority. Initially, it seems the exercise of power was legitimately obtained and exhibited; but with time, just as in line with the phrase, “power corrupts, absolute power corrupts absolutely”; the power which was once legitimate became a coercive or violent one (Hassan, 2013).

Whereas some African countries could be said to have enjoyed democratic victories over time, other countries are trapped in the form of power where they have no option or say. Some other parts of Africa have all been hit by series revolutions and violence; the exercise of powers in these countries often start off as legitimate but end up being a violent or coercive power, or in other cases, it can start as a violent or coercive power, and along the line, gain legitimacy and may further end up as coercive (Hassan, 2013).

Some other parts of the continents have been faced by counter government activities and pro-government movements. These countries such as Somalia, Sudan, etc. are embattled between two different governments in the same country all seeking for loyalty and authority via violent means. The case of Sudan caused the country to separate into South and North Sudan in 2005, but the case is still the same in the region (Okunu, 2016).

In some other parts of the continent, there have been cases of leaders who have been in rampant and abusive disregard of the laid down constitutions and laws governing the countries. In Congo, Joseph Kabila has been the president for over 18 years. Kabila had refused to leave the office. The case of Uganda is a more bitter one, the president, Yoweri Museveni has been on for more than 30 years counting; same is the case in other parts of the

continent where the heads of state have been injected with the sit-tight syndrome and have incessantly refused to step down even after the appointed time had elapsed (Okunu, 2016).

The quest to hold power or be in the custody of the capacity to exercise political powers have been a deadly virus that has affected the main fabrics of the political cotyledon of Africa. During the initial decade of independence amongst African countries, in the 1960s, there were issues on how to transmit powers and how to gain powers. Everyone wants to take over political power. In the small geographical territory of Benin republic, there were within a single decade more than ten (10) heads of state, who were all overthrown through violence or coup d'état, one after the other (Posner, and Young, 2007).

The case of Benin republic is a point of reference to other states which were devastated with the sharp violence that orchestrated the coups that ushers in every new power-seeking ruler. These series of events drastically affected the rate of development and growth in Africa. This is because, the leader who emerges from these unsacred means of gaining power only concentrated efforts on how to maintain power and forestall any form of deviance or further opposition (Posner, and Young, 2007).

In this regards, the emergent leaders in various African countries were more conscious of how to remain in power than how to make meaningful impacts in the lives of citizens. The African leaders who had the capacity to exercise power often employed it to combat any form of opposition or critics, whether in existence or ones suspected. This suggests why the first declaration usually made by the African leaders would be to suspend or abolish all existing laws prior to his emergence as the leader and also the bar against political activities and the freedom of the press was to a large extent curtailed or wholly terminated. The African leaders would employ all readily available means to destroy any form of opposition whether or not it would amount to bloodshed. Thus, there were great numbers of violent acts which were self-sponsored by the leaders (Cilliers, 22 October 2013).

There were no rooms for positive political participation, human rights activists etc. The regime of Abacha in Nigeria hampered the activities of human rights activist, to the extent of initiating the plans that led towards the execution of death sentence against the renowned Ken Saro-Wiwa and other members of the Ogoni extraction, in present-day, Rivers state. Across Africa, there were cases of leaders who clamped down media outlets and termed them as committing treason and disturbing the peace of the state (Amuwo, 2014).

In the time past, between 1960 and 1970, there were cases of African leaders whose thirst for power and quest to perpetuate their regime as leader purportedly declared themselves as “President for Life”. Good examples are (Goemans, Gleditsch, Chiozza, & Choung, 2004): President of Central African Republic (CAR) Jean-Bédél Bokassa (who later made and crowned himself to “emperor”), Francisco Macías Nguema of Equatorial Guinea, Kwame Nkrumah of Ghana, Hastings Kamuzu Banda of Malawi, Gnassingbé Eyadéma of Togo, Idi Amin of Uganda and Mobutu Sese Seko of Zaire.

These leaders did everything humanly possible to keep themselves in power. However, their plans were cut short by death or other relative factors. The case of Robert Mugabe, who instead of living office, made himself prime minister and the opposition was returned as president. These are examples of African leaders

who are prone to the sit-tight syndrome. Thus, elections were not reckoned in Africa between 1960-1970, and in countries where elections occurred, the systems were manipulated through every means available by drunken power leaders who did not want the power to shift from their custody. In this sense, the concept of power in Africa will be seen in violence and coercive form (Hughes, 2014).

From the foregoing, it depicts the concept of power in Africa in the negative light where only a unit in the whole collective benefits from the obligations created in the contract of state theory. However, the spheres of the concept of power in Africa in the present day are greatly distinct when compared to what it used to be in the past. Power in Africa can be said to have started towing the lane of progressive or positive conceptualization of power, where the power can be exercised by the unit of the collective whole against whom the obligations are breached.

In this light, it could be stated that power in Africa is no longer centred on the leaders, as the leaders are aware of the power of the people. This does not imply that the negative forms of power exhibition witnessed in the region in the immediate periods after independence have all been exterminated. This is because there are still areas in the continent where leaders are clogged unto powers. One thing noticed is that in the current dimensions of leaders who are clogged unto powers; the leaders utilized legal means to elongate themselves in office, by manipulating other arms of government to enact unlimited tenures of office which means that the president is at liberty to stand for elections (Posner,

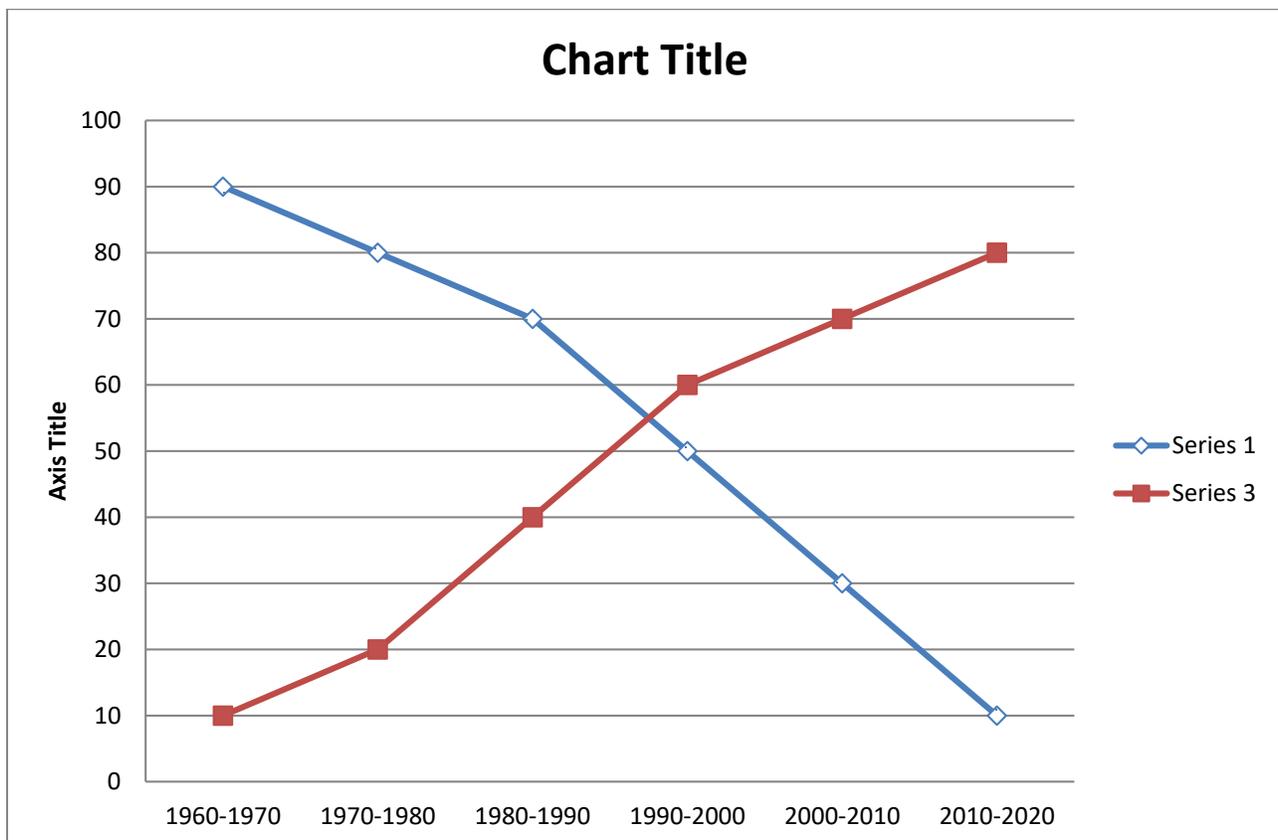
and Young, 2007). The biddings of Olusegun Obasanjo (the president of Nigeria, as he then was) in 2006 to influence the National assembly to enact the third term into the constitution of Nigeria failed woefully (Sklar, Onwudiwe, and Kew, 2006).

This sprints into one's mind that the concept of power in Africa has taken on new frontiers where the provisions of written laws are respected at least. Irrespective of the facts that there are allegations of election rigging by ruling parties, it is far better than a situation where elections are not held as at when due and the polity is always heated, thereby handicapping development and growth in the region.

While others have associated the re-definition of power in Africa to influences of bilateral and multilateral relationships, and to an extent the conditions for the award of grants and budget funding from international donors; counter-arguments are that Africans have become more politically conscious than they were and are not readily given to fears and threats. The later could be shown by the rates of political revolutions by the masses unsolicited by any selfish interests but for the common interest of the collective whole. Examples are the revolutions that ousted the Presidents of Egypt, Tunisia, Cote d'Ivoire and those helped to inform other leaders to accept the progressive conceptualization of power or exit from office (Hyden, 2006).

The graph below evidence the drastic change in the manner at which power is obtained or transmitted in Africa from 1960-2020.

**Figure 3: Graphical Representation of means of transmitting power and obtaining powers in Africa**



Source: Archivos, A database of political leaders, 2004 and <https://www.transparency.org/research>

The blue colour represents a change of power through violence, revolution, riot, coup-d'état, assassination, etc. and the other represents a change of power through a constitutional process, public opinions, democratic settings and voting, natural death, voluntary resignation, etc. A look at figure 3 above will show through the blue line that transmission and obtaining power through violence, assassination, coup-d'état, among others, fell from a high ranking of 90% between 1960 to just 10% in 2020, whereas the red verged line in the graph shows that transmission and obtaining of power through constitutional processes, which may be natural death, voluntary resignation, elections, doctrine of necessity has increased from as low as 10% in the 1960 to 80% in 2020. The presentation in the graph completes the entire discourse concerning the re-definition of power in Africa.

#### IV. CONCLUSION

The re-definition of power in Africa has brought Africa leaders and persons in capacities bequeathed with powers to be wary of the constitutionality or otherwise of their activities and also recognize formal institutions which are needful for to sustain the progressive conceptualization of powers. The media has a better forum and platform than they had in the past. Moreover, there are institutions which are in place to ensure transparency, and accountability amongst the leaders. The re-definition of power in Africa, is that leaders even with their exercise of powers are aware that they will be held accountable and responsible for any single actions or inactions by them.

The emphasis is that within the past decade or more, the concept of power in Africa has taken a new stride and there have been a high level of changes in the political structures in Africa in relation to the concept of power. It portrays that the era where Africa is depicted as an area where the people has no rights or opinions in regards to the politics and governance in the region has been gradually taken into extinction.

#### V. RECOMMENDATION

“Power corrupts, absolute power corrupts absolutely”. This should be a watch word for every well-meaning African. Africans should ensure that institutions are in place to ensure that leaders are made to account for their roles and responsibilities in governance. The functions of the media and press freedom should be upheld. The technological aid brought to existence vide social

media has been playing a great role in ensuring that leaders in Africa are not confused that power can be construed in the negative dimension where the people can be coerced unwarrantedly without any legitimacy. Social media can play a role like it has been playing by making constructive criticism of government policies through the avenues and channels therein.

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# Knowledge of Tuberculosis among Residents of Informal Settlements: A Case of Mukuru Kwa Njenga, Nairobi

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**Abstract:** A TB prevalence survey conducted by National Tuberculosis, Leprosy and Lung Disease-Program (NTLD-P) in 2016 revealed that the burden of TB in Kenya is higher than the previous assumptions. Additionally, it demonstrated that there was a higher burden of TB in urban compared to rural settings consistent with routine TB data collection which shows a higher notification in the big cities of Nairobi and Mombasa. There is need to find out factors contributing to the large TB burden in Kenya, especially in the escalating slums near cities such as Mukuru Kwa Njenga slum. The current study assessed existing knowledge regarding TB causes, symptoms, diagnosis and treatment. The study population consisted of residents of Mukuru kwa Njenga who had lived in the area for at least one month aged above 18 years, from both genders. Household survey was the major source of data for the demographics and socio-economic status of the participants who verbally consented to participating in the study. Focused group discussions were conducted with TB patients on intensive phase of treatment at the facility. Descriptive analysis with the help of SPSS was conducted. A majority of the respondents did not know additional symptom of TB other than cough (n=126, 51.2%) while (23% n=57) did not know how TB is transmitted. Additionally, (82 % n=203) of the respondents knew what causes TB. While adequate ventilation is key in TB prevention, majority of houses in this location had one room (94%, n=232) with a majority with only one window (89.4% n=220) and 41% n=102 with more than four occupants per house. The study concluded that the community suffers overcrowding, poor housing and lacks the ability to detect or diagnose TB occurrences earlier in order to acquire early treatment.

**Key Words:** Tuberculosis, Knowledge, Informal Settlements

## BACKGROUND

Tuberculosis (TB) is a highly contagious disease caused by Mycobacterium tuberculosis and remains a public health threat, with approximately 11 million people getting infected annually [1]. People with pulmonary TB (TB of the lungs) are mostly infectious and they can spread the disease by sneezing, coughing or talking among other actions. According to infection prevention factsheet [2] if untreated, a person with infectious pulmonary TB can infect 10 to 15 people annually on average [6]. Every individual is at risk of being infected but the susceptibility to TB is determined by different factors among them poverty. There is substantial evidence that poverty is a determinant of TB, as well as poor health habits such as spitting in the open and not covering their mouths when coughing that have been found mostly among people below poverty line level including those in slums. [3][4]. UN-HABITAT characterizes slums by groups of individuals who live under the same roofing in an urban set-up and they lack one or more of the following: access to safe water in sufficient amounts, adequate sanitation, security of tenure and durable permanent housing[7].

Approximately one out of eight people live in urban slums and a total one billion people live in urban slums globally. Urban slums are termed as high risk settings for TB because they are characterized with poverty, overcrowding, social, cultural and geographical barriers [8]. Knowledge of TB has been linked to complete or incomplete TB treatment in a study to find out patients' knowledge about tuberculosis treatment in Nepal [18]. An Ethiopian study that assessed knowledge of TB and HIV as well as perception about patient initiated testing and counselling (PITC) among TB patients attending health facilities in Harar town, Eastern Ethiopia indicated that most of the participants (70%) believed that there is no association between TB and HIV/AIDS [19]. On the other hand, two thirds (66.5%) of the participants thought that HIV testing has importance for TB patients, however, the majority (81.6%) of the study participants in the age category less than 21 years believed that fear of PITC could cause delay in treatment seeking. In Kenya, TB is a key priority communicable disease and a major public health problem. Kenya is currently ranked among 14 countries with triple burden of TB, TB/HIV and MDR-TB.

The cumulative negative consequences of TB such as human suffering and economic losses are immense. New numbers of TB cases are reported annually, but it is believed that the new cases represent a small fraction of the TB cases existing in Kenya. A TB Prevalence survey conducted by NTLDP, Kenya in 2016 revealed that the burden of TB in Kenya is higher than the previous assumptions at 426 people per every 100,000 people [13]. The reporting of the TB cases in Kenya is mainly limited to the cases that present themselves for check-ups in health centres and major hospitals[13]. In 2017, only 85,188 people were diagnosed with TB, meaning that the percentage of the undetected and untreated TB cases was at 40 percent. The prevalence survey also demonstrated that a higher burden of TB was in urban compared to rural setting and the prevalence rate among men was twice that of females higher in urban settings than in rural settings and highest in the 25 - 34 age group [13].

According to World bank report 2013, Kenya has close to 60% of the urban population living in these informal settlements [11]. People in urban areas, and particularly those living in informal settlements, bear the biggest burden of TB in Kenya. In 2015, three regions had the highest reported cases of TB, namely: Nairobi, Nyanza and Coast [12]. Ten out of 47 counties accounted for 76% of the notified cases with Nairobi county contributing 15% of all cases. A prevalence survey conducted in 2016 also demonstrated a higher burden of TB in urban (760 per 100,000 population) compared to rural settings (453 per 100,000 population) [13] consistent with routine TB data which shows higher notification in the big cities of Nairobi and Mombasa [12].

Overcrowding, poor housing and sanitation, conditions commonly found in the informal settlements, are known predisposing factors for TB disease. Additionally, the prevalence rate among men (809 per 100,000) was twice that of females (359 per 100,000), higher in urban settings (760 per 100,000 population) than in rural settings (453 per 100,000 population) and highest in the 25 - 34 age group (716 per 100,000). The survey also showed that among other TB symptoms, frequency of cough was higher among participants in urban settings compared to the rural setting. Despite the efforts and progress being made to control and eliminate tuberculosis, it still remains one of the fourth biggest diseases causing death after HIV/AIDS. This highlights likelihood of several deficiencies in the health systems that contribute to the lack of access to TB control interventions and the low effectiveness of the interventions than expected. There is therefore need to find out what factors are contributing to the large TB burden in Kenya, especially in the escalating slums near cities such as Mukuru Kwa Njenga slum. This assessment focuses on determining the existing knowledge gap regarding TB causes, symptoms, diagnosis, treatment among residents of Mukuru kwa Njenga

## METHODOLOGY

The study was conducted in Mukuru kwa Njenga which is among the largest slum in Nairobi and is located in Embakasi East Sub-county. The study population consisted of residents of Mukuru kwa Njenga who had lived in the area for at least one year aged above 18 years, from both genders. The participants had to be permanent residents in the area. Additionally, key informant interviews were conducted among facility health care workers and focused group discussions were conducted with TB patients on intensive phase of treatment as well as community gate keepers.

Community health volunteers interviewed the heads of the households using a paper-based questionnaire. Focused group discussions were conducted with TB patients on intensive phase of treatment at the facility. Key Informant interviews were also conducted. Qualitative data analysis was used in the research. Codes and themes were created from the data from the household survey, key informants' interviews and focus groups with TB patients through inductive content analysis. The data was broken down into different component parts which were later given labels. To establish the emerging essential themes, thematic analysis was conducted and the themes were classified according to the research objectives with which they were focused. Further analysis was conducted to search for any themes that occurred across the different sequences of coded labels and to establish if there were any links between the different codes.

## RESULTS

Out of the 308 participants selected, there were 246 respondents giving a response rate of 80%. The findings are also inclusive of two focused group discussions with TB patients, two focused group discussions with CHVs and five key informant interviews from health care workers.

### Socio-demographic Characteristics of Respondents

Majority of the respondents were aged between 18-34 years old (n=156, 63.4%). Most of the respondents were females (n=172, 69.9%), were married (n=182, 74.0%) with majority having primary education (50.8% and (49.2%) above level of education. Majority of the residents had an average income of more than US dollars (USD) 48.6 per month (n=168; 68.29%) and nearly all the houses are single rooms (n=232, 94.3%) with the same room being used for sleeping (n=236, 95.9%). Most houses had between 1 to 3 members (n=131, 53.2%) as described in table as shown in the Table 1.

### TB Prevention and Care

The respondents reported that they visit and discuss health issues by a healthcare worker once every 2-4 weeks (n=36, 14.6%) and nearly four-fifth of the respondents talked about TB by healthcare workers (n=205, 83.4%). However, only nearly a tenth of the respondents had been treated or were being treated for TB (n=21, 8.6%) and side effects of the treatment being the major concern (n=10, 52.6%) as revealed in Table 2.

On further exploration on patient related factors during the focused group discussion, one respondent indicated, *"I waited for two days to have my sputum results ready, I was told the test is not available here"* Additionally, on an interview with clinicians in the health center, two clinicians did not associate chest pains with TB as one of the clinicians said *"At times we delay to diagnose because we have to refer for further testing either chest X-ray or Gene Xpert and we may tire a patient. We also do not have new updates on TB which could guide us like guidelines"*

### **Knowledge Assessment among TB patients**

Majority of the residents knew what causes TB (n=203, 82.5%), nearly half (n=120, 48.78%) knew symptoms associated with TB while 23% did not know how TB is transmitted as showed in Table 3. A majority of the respondents knew at least one symptom of TB and how long the treatment took (n=18, 26%). Adequate ventilation was determined as being key in TB prevention (n=7, 33%) and most of the respondents first heard of TB from school (n=9, 43%) as seen in Table 4

Although 48% of the respondents knew more than one symptom of TB, one respondent said “I was just coughing, it was just a small cough and really I wasn’t coughing deeply like someone who has TB.” Another respondent indicated that “I had chest pains, I wasn’t coughing, I would never think it was TB.” Among the respondents who did not know how TB is spread indicated that “I have never smoked cigarettes in my life so I did not expect to have contracted TB.” Additionally, a young lady who had a child with TB said, “I know crowded places contribute to spread of diseases including TB but our houses are just built that way, spread is inevitable”

### **Knowledge of TB among residents**

The respondents knew at least one symptom of TB (n=9, 26%) and the duration of treatment (n=9, 26%). Adequate ventilation (n=4, 21%) was reported as being a key prevention of TB and they first heard of the disease from school (n=4, 33%). On a further interview with a CHV, she indicated that “*At times you identify these coughers within households but they say they cannot miss work to go and get screened and therefore they end up coming late to the health facility.*” A middle aged lady who had two of her children taking anti TB drugs said that “*I had previously attended ante-natal clinics in this facility and they spoke to us about many things but just asked me if I was coughing [...] I was with night sweats, weight loss and fever when I was diagnosed*”

## **DISCUSSION**

Findings of this study indicate that majority of the houses are a single room with only one window and more than three people living within it. This then indicates that poor housing and ventilation limits the effectiveness of TB eradication in slum dwellings. Effective healthcare delivery is reliant on efficient and properly trained healthcare workers to deal with the health concerns and this study found out that healthcare workers were limited in terms of knowledge and diagnostic equipment to help deal with the occurrence of TB. The healthcare workers in Mukuru kwa Njenga health centre have low index of suspicion for TB symptoms as found out during informants’ interviews. This could largely be due to faded memory to diagnose TB bearing in mind that none of them had attended any TB refresher training in the previous 2 years. Aloaibi describes early diagnosis combined with appropriate management by knowledgeable and skilled healthcare workers (HCWs) as key in addressing global health issues [13].

Although majority of the residents had knowledge on causes, symptoms and treatment of TB, aspects of stigma were noted. The population knew few symptoms of TB but most of them did not associate chest pains with TB and in return had sought treatment more than twice before they were finally diagnosed with TB. The community lacks the ability to detect or diagnose TB occurrences earlier in order to acquire early treatment. Early treatment reduces the chances of spread of the disease and the mortality rates. Additional studies conducted in revealed that misconceptions and limited knowledge about TB and its treatment have influence in its

occurrence and defaulting in treatment. [14] Stigma was also among concern that came up as a reason why the residents delayed seeking care largely due to the fact that people associate TB to HIV/AIDS especially due to body wasting.

Additionally, people at times restrict themselves from seeking treatment due to the perception that they would be linked as being affected with HIV/AIDS. Such occurrences are largely due to limited health education on TB. Stigma that is connected to TB is associated with limited effectiveness in the control approaches designed to deal with the disease as patients are isolated within their family or community in turn contributing to delayed healthcare seeking and poor treatment adherence mainly due to poor health education [15]. This study also found out that the majority of the houses in Mukuru kwa Njenga are a single room with only one window and with more than three people living within it. This then indicates that poor housing and ventilation which limits the effectiveness of TB eradication in slum dwellings.

## CONCLUSION

The healthcare workers in Mukuru kwa Njenga health centre have low index of suspicion for TB symptoms as found out during informants' interviews. On the other hand, the residents knew of the symptoms of TB but most of them did not associate chest pains with TB and in return had sought treatment more than twice before they were finally diagnosed with TB. The community lacks the ability to detect or diagnose TB occurrences earlier in order to acquire early treatment. Stigmatization is also a major concern which hinders the affected from seeking health at the government health facility due to attitude from health care workers. This community also is burdened with poor housing and ventilation which could limit the effectiveness of TB eradication in the area.

Although there is an existing plan within the NTLDP that is designed to help increase the knowledge of the health workers, community health volunteers also need to have this vital information and especially to effectively use this knowledge to keep the community adequately informed. In essence, the community requires health education in order to seek care and eliminate TB associated stigma still present in the area. Further, the health education activities should also include community mobilization to promote effective communication and participation among community members to generate demand for TB prevention, diagnosis, treatment and care services. The Mukuru kwa Njenga facility serves a huge proportion of patients diagnosed with TB and with so, rapid and accurate diagnosis is key. There is therefore need to expand diagnostic methods that are available to this community. Also, proper sample linkage to facilities offering specialised testing.

The larger Ministry of Health needs to put in place mechanisms to bring together key members of the public and private sector to combine efforts in finding and dealing with TB cases in the area and others such as this. A wider range of stakeholders already involved in community-based activities needs to be engaged so as to include TB in their priorities and activities. These include the nongovernmental organizations (NGOs) and other civil society organizations (CSOs) that are active in community-based development. CBO membership consists entirely of the community members themselves, so these organizations can be considered to represent the community most directly. This will help reach and spread and their ability to engage all persons. Operators of chemists and pharmacies also ought to be engaged in at least symptomatic screening of TB to all coughers and eventually link them to diagnosis. Ensuring TB is in control, engagement of the non-health sectors e.g. housing and education sector would be key. Mobilizing the efforts of both sectors would therefore be significant in dealing with health issues in the society and more importantly

construction of houses with adequate ventilation that would reduce the occurrence of TB disease. Further research is however needed to find out the prevalence of TB among dwellers of informal settlements so as to tailor specific interventions to them especially because of overcrowding.

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# Strategy Of Over Coming Hate Speech To President Jowo Widodo On Social Media At Presidential Election In 2019 The Perspective Of Cases Study

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**ABSTRACT** – The party of democracy in Indonesia has been identical with the competition among the candidates who has been struggling for power. The dynamics behind the 2019 Presidential Election demands the society to be literate toward the media information. With regards to the statement, the hate speech has been a global phenomenon that overwhelms Indonesia. In Indonesia, the hate speech has appeared altogether with the fake news during the 2014 Presidential Election, the Governatorial Election in the 2017 Province of Jakarta Special Capitol and the 2019 Presidential Election. Specific to the 2014 and 2019 the Presidential Election, two candidates have joined the competition consecutively namely Prabowo and Joko Widodo or popularly known as Jokowi.

In the case of the 2019 Presidential Election, the only difference is that Jokowi has been the incumbent while Prabowo has been the contender. In relation to the phenomenon, the Presidential Communication Team and the Office of Presidential Staff have a division that specifically deals with the hate speech in the social media. Departing from this fact, the study on the Role of the Presidential Communication Team that deals with the hate speech is important to conduct so that the hate speech might be minimized in the social media. The results of the study show that the strategies that President Jokowi has implemented in dealing with the hate speech are involving law enforcement officers, fostering the role of civil society, running campaign activities, displaying banners, establishing social network, delivering speech in front of public or demonstration, delivering speech in religious lectures, delivering speech in both the printed and the electronic mass media, delivering speech in the pamphlets and forming the Presidential Team and the Office of Presidential Staff in welcoming the 2019 Presidential Election.

**Keyword** : Hate Speech, Social Media, 2019 Presidential Election, Strategy

## INTRODUCTION

Nowadays, an overwhelming issue has been widely spread as the time gets closer to the 2019 Party of Democracy in Indonesia. The overwhelming issue has been widely spread the supporters between the two candidates of president and vice president for the general election in April 17<sup>th</sup>, 2019. Then, this overwhelming issue has been related to the allegation of competition for taking over the votes from the Indonesian population. The allegation of the competition itself has been more interesting this year because the incumbent has decided to go for the second candidacy. Certainly, there will be a strong struggle for power between the group of Joko Widodo as the incumbent and the group of Prabowo as the contender in manipulating the strategies of their victory. The competition is described vividly in the social media, such as Facebook, Twitter and Instagram, which has been part of the digital power recently.

Thus, it is clear that Internet has been the new media power nowadays since Internet has been able to make individuals communicate to one another without any limit on both of the time and the location. In the same time, gradually the number of Internet users in Indonesia has been increasing. The results of a study by a market research institution named e-Marketer show that the netter population in the Archipelago has been 83.70 million people by 2014 (e-Marketer, 2014, accessed from [https://kominfo.go.id/content/detail/4286/pengguna-internet-indonesia-nomor-enam-dunia/0/sorotan\\_media](https://kominfo.go.id/content/detail/4286/pengguna-internet-indonesia-nomor-enam-dunia/0/sorotan_media)). Indonesia has attained the sixth place out of 25 Internet-User Countries from 2013 until the 2018. The data might be consulted in Figure 1 below:

<b>Top 25 Countries, Ranked by Internet Users, 2013-2018</b>						
millions						
	2013	2014	2015	2016	2017	2018
1. China*	620.7	643.6	669.8	700.1	736.2	777.0
2. US**	246.0	252.9	259.3	264.9	269.7	274.1
3. India	167.2	215.6	252.3	283.8	313.8	346.3
4. Brazil	99.2	107.7	113.7	119.8	123.3	125.9
5. Japan	100.0	102.1	103.6	104.5	105.0	105.4
6. Indonesia	72.8	83.7	93.4	102.8	112.6	123.0
7. Russia	77.5	82.9	87.3	91.4	94.3	96.6
8. Germany	59.5	61.6	62.2	62.5	62.7	62.7
9. Mexico	53.1	59.4	65.1	70.7	75.7	80.4
10. Nigeria	51.8	57.7	63.2	69.1	76.2	84.3
11. UK**	48.8	50.1	51.3	52.4	53.4	54.3
12. France	48.8	49.7	50.5	51.2	51.9	52.5
13. Philippines	42.3	48.0	53.7	59.1	64.5	69.3
14. Turkey	36.6	41.0	44.7	47.7	50.7	53.5
15. Vietnam	36.6	40.5	44.4	48.2	52.1	55.8
16. South Korea	40.1	40.4	40.6	40.7	40.9	41.0
17. Egypt	34.1	36.0	38.3	40.9	43.9	47.4
18. Italy	34.5	35.8	36.2	37.2	37.5	37.7
19. Spain	30.5	31.6	32.3	33.0	33.5	33.9
20. Canada	27.7	28.3	28.8	29.4	29.9	30.4
21. Argentina	25.0	27.1	29.0	29.8	30.5	31.1
22. Colombia	24.2	26.5	28.6	29.4	30.5	31.3
23. Thailand	22.7	24.3	26.0	27.6	29.1	30.6
24. Poland	22.6	22.9	23.3	23.7	24.0	24.3
25. South Africa	20.1	22.7	25.0	27.2	29.2	30.9
<b>Worldwide***</b>	<b>2,692.9</b>	<b>2,892.7</b>	<b>3,072.6</b>	<b>3,246.3</b>	<b>3,419.9</b>	<b>3,600.2</b>

Note: individuals of any age who use the internet from any location via any device at least once per month; \*excludes Hong Kong; \*\*forecast from Aug 2014; \*\*\*includes countries not listed  
 Source: eMarketer, Nov 2014

**Figure 1.** 25 Top Countries of Internet Users from 2013 until 2018  
 Sumber : e-Marketer

Essentially, in overall the number of the Internet users throughout the globe has been projected to reach 3 million people by 2015. Thus, it is further predicted that three years after 2015, namely 2018, approximately 3.6 million people throughout the globe will access the Internet for at least three times in a month. Every developing country, including India and Indonesia, still has some space for the development on the number of the Internet users, which size might be two digits in each year. Compiled from the data provided by the Association of Internet Service Provider in Indonesia (APJII, *Asosiasi Jasa Penyedia Internet di Indonesia*), the penetration of the Internet users in Indonesia has experienced significant increase in each yer. The number of Internet users in Indonesia has been 143.26 million people by 2017, increasing from 132.7 million people by 2016 (Asosiasi Penyelenggara Jasa Internet Indonesia (APJII), 2019, p.2). Thus, it is apparent that the social media has facilitated individuals to access numerous information.

The use of social media has been distributed to numerous regions in Indonesia namely: (1) 21.60% in Sumatera; (2) 55.70% in Java; (3) 6.60% in Borneo; (4) 5.20% in Bali; (5) 10.90% in Celebes, Mollucas and Papua (Asosiasi Penyelenggara Jasa Internet Indonesia (APJII), 2019, p.4). In relation to the figure of the distribution, the increasing use of social media in the same time leads to the increasing number of virtual crime. As a result, there should be a special team for overcoming this situation. Then, from a number of virtual crimes, the most apparent case is found in the case of hate speech and hoax, which have been massively circulating in the social media nowadays. The reason is that the social media activities have always been started by sharing, collaborating and connecting (Sugiyanto, 2017:9-16).

As part of virtual crime in the digital context, actually the case of hate speech has been arranged in the Law of Republic of Indonesia Number 11 Year 2018 on Electronic Information and Transaction. On the other hand, in the context of criminal the arrangement for the case of hate speech refers to the Indonesian Criminal Code (*KUHP, Kitab Undang-Undang Hukum Pidana*) under the articles of Provocation and Incitement. A solid example of hate speech, which has been referred by the researchers as the example of the hate speech nowadays, in the real world is the statement by the Jero Wacik toward the reporters. The Alliance of Independent Journalists (*AJI, Aliansi Jurnalis Independen*) has accused that Jero Wacik has insulted the profession of reporters with his statement because through his statement Jero Wacik has taught his subordinates to bribe the reporters by using lunch and gift. Such case, thus, will be easier to identify in the digital world nowadays since the phenomenon of hate speech is not a taboo anymore.

The hate speech phenomenon becomes a matter that should be understood by all Indonesian people. The reason is that this issue has been so widely spread that it has the potentials to erode the diversity in Indonesia. If there is not any effort to eliminate the hate speech, then the elements of tribe, religion, race and class might be benefitted again as the propaganda media of certain parties in packing certain issues into the hate speech. The context of the hate speech refers to the statement or the writing of an individual that has been publicly delivered with the aim at inciting and disseminating the hatred of the people who hold different opinion, race, tribe, religion, gender and alike (Gun Gun Heryanto et al., 2017). Since the hate speech has been considered to have potential disintegration capacity, Indonesia has formulated the regulations for the hate speech in the Law Number 19 Year 2016 on Electronic Information and Transaction. This Law is popularly known as the UU ITE among the Indonesian people.

This condition has been given attention by Mr. President Joko Widodo, who asserts that Indonesian people should preserve the diversity and build the solidarity regardless the religious background, the tribe and the class. The statement by Mr. President Joko Widodo is a state of his attitude toward the dynamics that have been overwhelming the nation. Through the bold statement by Mr. President Joko Widodo, relevant information might be traced and accessed through a number of media such as book, encyclopaedia, abstract and recently-used Internet.

The presence of handling strategy serves as the efforts of building the society so that the society will be able to filter the access and the use of the social media. Therefore, the presence of social media within the society should be utilized as an accurate communication tool for sharing the expressions or the opinions, which might be immediately viewed by the public. Departing from the statement, the communication between the government officials and the public should be harmoniously established through the appearance of the new media nowadays instead of being a tool for denouncing the officials in the State, resulting

in the misunderstanding between the two parties. Based on the background that has been previously elaborated, the researchers would like to conduct a study under the following title: "STRATEGY OF OVER COMING HATE SPEECH TO PRESIDENT JOWO WIDODO ON SOCIAL MEDIA AT PRESIDENTIAL ELECTION IN 2019 THE PERSPECTIVE OF CASES STUDY".

The focus of the study is the strategy that has been implemented for dealing with the hate speech toward President Joko Widodo in social media during the 2019 Presidential Election from the perspective of case study. Then, the focus will be elaborated further into the following problem formulations: (1) What are the strategies that have been implemented for dealing with the hate speech toward President Joko Widodo in the social media during the 2019 Presidential Election?; and (2) What are the obstacles before the strategies that have been implemented for dealing with the hate speech toward President Joko Widodo in the social media during the 2019 Presidential Election?

## LITERATURE REVIEW

Several studies have been conducted with regards to the conflict management strategy. For example, the results of a study by Mohamad Muspawi have implied the strategy of handling the conflicts that have been caused by stress. Then, the conflict management strategy might be classified into five categories namely: (1) Avoidance; (2) Accommodation; (3) Competition; (4) Compromise or Negotiation; and (5) Problem-Solving or Collaboration. Furthermore, conflict might be understood as the contradiction between the expectation of an individual, other people and organization and the reality. Similarly, conflict might be classified into five categories namely: (1) Intrapersonal Conflict; (2) Interpersonal Conflict; (3) Inter-Individual and Inter-Group Conflict; (4) Intra-Group Conflict within the Same Organization; and (5) Inter-Organization Conflict. In order to overcome the conflict, there are five strategies that might be implemented namely: (1) Identification; (2) Diagnosis; (3) Solution Agreement; (4) Implementation; and (5) Evaluation.

Strategy might also be defined as an overall approach that has been related to the implementation of ideas, plans and executions for an activity within a certain period of time. According to Rangkuti, strategy is a tool for achieving the main objective, which might be viewing objectively the internal and the external conditions within an organization so that the organization might anticipate the environmental changes that take place on the external aspects (Rangkuti, 2009: 3). Similarly, Arifin defines communication strategy as a communication planning that includes strategy and, therefore, strategy planning management entails the actions that should be taken whereas planning itself includes how the actions might take place (Vania, 2019:36).

According to Mintzberg (2007), strategy consists of several concepts. The first concept is that strategy might be considered as a planning that will clarify the directions that an organization should undergo rationally in manifesting the long-term objectives. Then, the second concept is that strategy might be the reference that has been related to the assessment toward the consistent or inconsistent behaviour as well as actions taken by the organization. Next, the third concept is that strategy might be defined as the angle that an organization has positioned during the conduct of the organizational activities. Subsequently, the fourth concept is that strategy might be defined as the perspective that entails the integrated vision between an organization and its environment, which has been the limit for the organizational activities. Last but not the least, the fifth concept is that strategy might be the details on the tactical steps of an organization that contains information for deceiving the competitors.

Almost all of the societies throughout the globe establish communication through media. With all of the facilities that have been offered, media become a tool that has been highly favoured by the society for establishing communication. According to Kaplan & Haenlein (2010:59), social media is a group of Internet-based application that has been established on the Web 2.0 ideological and technological basis and enables the creation and the trade-off that has been resulted by the content users. The use of media as an individual communication tool has been increasing as having been apparent from the data issued by the APJI (*Asosiasi Pengguna Jasa Internet*, the Association of Internet Service Users): by 2017 the number of Internet users in Indonesia has been 143.26 million people. Based on the data, it might be stated that most of the Indonesian people have used the media as their aid in establishing communication both in the form of hate-speech issue handling and in the form of tribe, religion, race and class-based issue handling.

## METHOD

The method that had been adopted in the study was the qualitative method using the case study approach. Through this method, the researchers strived to describe all of the events that had taken place in the field and later analysed these events in order to meet the objective of the study. Then, the concept of the case study that had been utilized in the study was limited to the intrinsic case study. Through the use of the concept, the researchers would like to identify a specific case namely hate speech. The identification is conducted because the case of hate speech exposed specific peculiarity. Specific to the study, the researchers would uncover all of the variables that might lead to the hate speech toward the President Joko Widodo and eventually would identify the efforts of handling the hate speech by means of media literacy to the society.

The data had been gathered through by involving trustworthy source in an in-depth interview and using documentation study. The source in the conduct of the study was the Presidential Communication Team and the Office of Presidential Staff, which had been dealing with the case of the hate speech toward the President in the social media. The data that had been gathered later were analysed through descriptive stage, thematic analysis and assertion on several literature reviews based on the problem formulation. On the other hand, the paradigm that had been adopted into the study was the constructivism paradigm since the researchers would like to observe the logical foundation of an individual that might define the direction, the objective, the set of belief that might guide his or her actions.

Furthermore, the object of the study was the hate speech that had been directed to Mr. President Joko Widodo as the President of the Republic of Indonesia in the social media. After all of the data had been completely gathered, the data were analysed by using the symbolic convergence theory in order to answer the problems that had been formulated in the study.

**RESULTS AND DISCUSSIONS**

After the data have been gathered and analysed, the analysis results will be discussed further in the following sections. The discussion is divided into three sections namely Hate Speech Phenomenon, Strategy for Handling the Hate Speech in the 2019 Presidential Election and Obstacles in Implementing the Strategy for Handling the Hate Speech. Each section will be elaborated further in the following section.

**Hate Speech Phenomenon**

Hate speech has recently been mostly found phenomenon in the social media. Through the randomness, facilitation and freedom in accessing the Internet, many individuals have started to lose social control upon the social media management. The system behind the freedom of speech for all Indonesian people has indeed been formulated in the constitution. Not to mention, every part of the society holds the freedom to share their opinion in the already available public space. However, the freedom of speech seems to misused by some people and such situation has triggered the occurrence of many academic studies toward the hate speech.

The role and the function of the social media might be utilized as part of the campaign strategy during the 2012 Gubernatorial Election in the Province of Jakarta Special Capitol, which results have stipulated Joko Widodo and Basuki Tjahaja Purnama as the Governor and the Vice Governor of the Province of Jakarta Special Capitol. At the beginning, the Campaign Team of Jokowi utilized the social media as the campaign media or the campaign tool, which had been effective as the centre of attraction within the party of democracy in Indonesia. The use of social media became more interesting whenever Mr. Jokowi was portrayed while he was either doing activities or making decisions.

With regards to the above phenomenon, the hate speech has come to surface due to the activities or the decisions that Mr. Jokowi has performed or has taken. The wide and open information that has been the main characters of social media has made the users to be unable in understanding the limits that they should not break. Through the wide and open freedom in surfing the social media, society (both individuals and groups) might easily share their expressions and sometimes the activities of sharing these expressions lead to several negative impacts. One of the most apparent negative impacts is the clear and present increasing intensity of the hate speech around that period.

The case of hate speech has frequently taken place in Indonesia. With regards to the statement, the freedom of expression in social media does not solely become the reason behind breaking the limit on the use of social media. Actually, Indonesia has already had specific regulations about the hate speech in the social media. These regulations have been formulated in the Law Number 19 Year 2016 on Electronic Information and Transaction, which is popularly known as Law of Electronic Information and Transaction (*UU ITE: Undang-Undang Informasi dan Transaksi Elektronik*) among the Indonesian people. These regulations have been outlined because there have been numerous cases of hate speech that appear to the surface within the dynamics of the social media among the Indonesian people. The data form the Indonesian National Police Department (*POLRI, Kepolisian Nasional Republik Indonesia*) have shown the high rate of the hate speech-related cases. Up to December 2017, the Indonesian National Police Department has been dealing with 3,325 hate speech cases. This figure has increased approximately 44.99% from the previous year (2016), which has been 1,829 cases (detik.com, December 29<sup>th</sup>, 2017). In the same time, the Indonesian National Police Department has stated that since the middle of 2017 until the end of December 2018 the hate speech contents that have been widely spread in Indonesia already hit 3,884 items (news.okezone.com, January 15<sup>th</sup>, 2019).

In the era of information technology nowadays, the phenomenon of high number on the hate speech case is not totally surprising. Many experts have predicted the occurrence of such phenomenon. In fact, almost all of the countries throughout the globe have anticipated the occurrence of the hate speech by setting certain prohibitions. The legal standing for setting the prohibitions might be different from one country to another in terms of the scope, the perpetrator and the target of the hate speech. Despite the prohibitions, there are three countries in the world that do not design the criminalization policy for the hate speech or the hate incitation namely: (1) The United States of America; (2) San Marino; and (3) Holy See (Verkhosky, 2016:37).

The examples on the case of the hate speech that has taken place in Indonesia might be consulted in Table 1 below.

**Table 1.**  
 The Hate Speech Case in Indonesia

Year	Content of Hate Speech
2017	Ahok has been considered as a blasphemer of certain religion during the Gubernatorial Election in the Province of Yogyakarta Special Region.
2018	President Joko Widodo has been criticized due to the overwhelming number of foreign workers, especially the one from China, who has been in Indonesia.
2018	The resurgence of the Indonesian Communist Party during the reign of Jokowi
2018	President Joko Widodo has been nicknamed as the henchman of the Indonesian Communist Party. The Alliance of Independent Journalists has alleged that Jero Wacik has insulted the profession of journalists due to the statement that has suggested

	his subordinates to bribe the journalist by using lunch and gift.
August 7 <sup>th</sup> , 2008	Prita Mulyasari. Prita shared her opinion about the service delivery of Omni International Hospital through e-mails. Her dissatisfaction toward the Omni International Hospital has been delivered through the suggestion form available in the hospital.
December 15 <sup>th</sup> , 2009	Luna Maya's tweet in her Twitter account: "I am completely confused why people nowadays have been more of the devil than the devil itself ... Have all people been completely the devil? Infotainment has been more despicable than murderer! May your soul burn in hell!"

**Strategy for Handling the Hate Speech in the 2019 Presidential Election**

In order to explain the strategy for handling the hate speech toward Jokowi as the President of the Republic of Indonesia in the social media from the perspective of case study, several methods might be implemented namely: (1) interview; and (2) literature reviews that involve numerous sources serving as the main data on the validity of the study results. Referring to Porter (1996) in his article entitled "What is Strategy?", it is explained that strategy is a peculiar aspect with valuable position and strategy involves a number of different activities. When an individual has provided or performed several things through a different point of view, this situation might be considered as a strategy.

In the era of information technology nowadays, the phenomenon of high number on the high speech case has not been quite surprising. The reason is that the hate speech might be easily found by the society in the social media. Many experts have predicted that such phenomenon will be steadily increasing. In fact, almost all countries throughout the globe have anticipated the hate speech by setting the prohibition for such case. Despite the prohibition, these countries have differences in terms of scope, perpetrator and target. In overall, there are only three countries in the world that do not set any prohibition on the hate speech namely: (1) the United States of America; (2) San Marino; and (3) Holy See (Verkhovsky, 206: 37).

With regards to handling the hate speech, several strategies for handling the hate speech toward the President of the Republic of Indonesia in the political year have been implemented. First, the hate speech has been handled by involving the law enforcement apparatus since the law enforcement apparatus has been the neutral party within the context of the political competition. Second, the hate speech has also been handled by involving the society during the countdown to the 2019 Presidential Election (Rachman, 2018, *Dua Strategi dalam Memerangi Ujaran Kebencian dan Hoaks di Tahun Politik*, accessed from <https://nasional.kompas.com/read/2018/03/28/18202521/dua-strategi-dalam-memerangi-ujaran-kebencian-dan-hoaks-di-tahun-politik> on December 3<sup>rd</sup>, 2019).

The state apparatus, such as the Indonesian National Police Department, has issued certain policy which serve as the direction and the guideline for the police officers in the field with regards to the allegation of hate speech. The intended policy is the Official Circular of the Head of the Indonesian National Police Department Number: SE/6/X/2015 on the handling of Hate Speech (*Surat Edaran Penanganan Ujaran Kebencian (Hate Speech), Kepolisian Nasional Republik Indonesia*, accessed from <https://kontras.org/home/WPKONTRAS/wp-content/uploads/2018/09/SURAT-EDARAN-KAPOLRI-MENGENAI-PENANGANAN-UJARAN-KEBENCIAN.pdf>, on December 3<sup>rd</sup>, 2019).

The Circular is required to be distributed to the sectoral and the resort police department throughout Indonesia. The objective of the circular letter is to inform all of the Indonesian National Police Department members to understand the handling procedures for the hate speech case. In the Circular, it is explained that Hate Speech refers to an act of crime that has taken the form of humiliation, defamation, unpleasant acts, provocation, incitation, hoax, and all actions which objective or impact leads to the act of discrimination, the act of violence, the loss of life and/or the social conflict that might disintegrate the nation especially in Indonesia.

The case of hate speech might be experienced by anyone, especially the state officials like Mr. Joko Widodo as the President of the Republic of Indonesia who have been the President of the Republic for two periods consecutively. With regards to the context, the scope of the hate speech consists of tribe, religion, school of certain religion, faith and belief, race, inter-class, skin colour, ethnicity, gender, diffable community and sexual orientation.

The case of hate speech, on the other hand, might also be handled by using certain media such as: (1) campaign activities; (2) banner; (3) social media network; (4) public speech delivery or demonstration; (5) religious lecture; (6) printed media or electronic media; and (7) pamphlet. In dealign with the widely-spread hate speech that President Joko Widodo has experienced, Mr. President has established the Presidential Communication Team and the Office of Presidential Staff nearby the 2019 Presidential Election. The establishment of the Presidential Communication Team and the Office of Presidential Staff becomes important in balancing and neutralizing the information around the hate speech during the election.

In order to establish the synergy of information to the public, President Joko Widodo has issued the Presidential Intstruction Number 9 on the Management of Public Communication in June 25<sup>th</sup>, 2015. The content of the Instruction is related to the harmony among the numerous government policies and programs for the public. The government policies and programs should be under the single direction by the President (Humas Sekretariat Kabinet Republik Indonesia, accessed from <https://setkab.go.id/presiden-jokowi-tandatangan-inpres-no-92015-tentang-pengelolaan-komunikasi-publik/>, on December 3<sup>rd</sup>, 2019, 11:26 PM Western Indonesian Time).

The handling of hate speech toward President Joko Widodo during the 2019 Presidential Election through the establishment of Presidential Communication Team has been considered important for the governance. The reason is that the President might not be able to establish the direct communication with the people all the time. Not to mention, there is a need to establish a special team which main duty is to manage the flow of accurate and structured information in the government. The Presidential Communication Team itself has been established based on the Presidential Decree issued in May 2015.

The background behind the establishment of the Presidential Communication Team is that Mr. President would like to establish more effective communication. As a result, whenever there is news or information which content contradicts to, or which content might be a propaganda against, the facts behind the President of the Republic of Indonesia, the questions around the news or the information will be sent to the Presidential Communication Team. Then, the Presidential Communication Team will clarify the news or the information and discuss what kind of communication that will be delivered to the public with Mr. President (accessed from <http://www.cnnindonesia.com> on November 7<sup>th</sup>, 2019).

It is apparent that the content hate speech, which has been uploaded by IS for example, might lead to hatred, hostility and offense. Through a Facebook account named “Imran Kumis,” the perpetrator uploaded the content of hate speech on Friday, January 18<sup>th</sup>, 2019, one day after the first debate session of the president and vice president candidates. In the content, IS mentioned the presidential candidate Mr. Joko Widodo as the incumbent by relating the hate speech to the issue of religion (CNN Indonesia, accessed from <https://www.cnnindonesia.com/nasional/20190121131614-12-362461/polisi-tangkap-pengunggahan-ujaran-kebencian-terhadap-jokowi>, on December 3<sup>rd</sup>, 2019, 11:16 PM Western Indonesian Time).

The involvement of the team and the figures has been part of the strategy for dealing with the hate speech that the President of the Republic of Indonesia (Mr. Joko Widodo) has experienced as the presidential candidate in the 2019 Presidential Election. Such involvement becomes an important aspect in eliminating and neutralizing the hate speech by using the positive content. The establishment of the Presidential Communication Team thus has become one of the tools in combatting the information in the form of hate speech. This initiative has gained positive response from many parties within the society and is expected to shape a pattern of effective communication in the governance level. In the same time, the team is also expected to prevent any blunder that either Mr. Joko Widodo or his ministers might have committed.

Then, the persons who have become the part of the silencer team (the Presidential Communication Team) for the hate speech around Mr. Joko Widodo might be consulted in Table 2 below.

**Table 2.**  
 Members of Presidential Communication Team

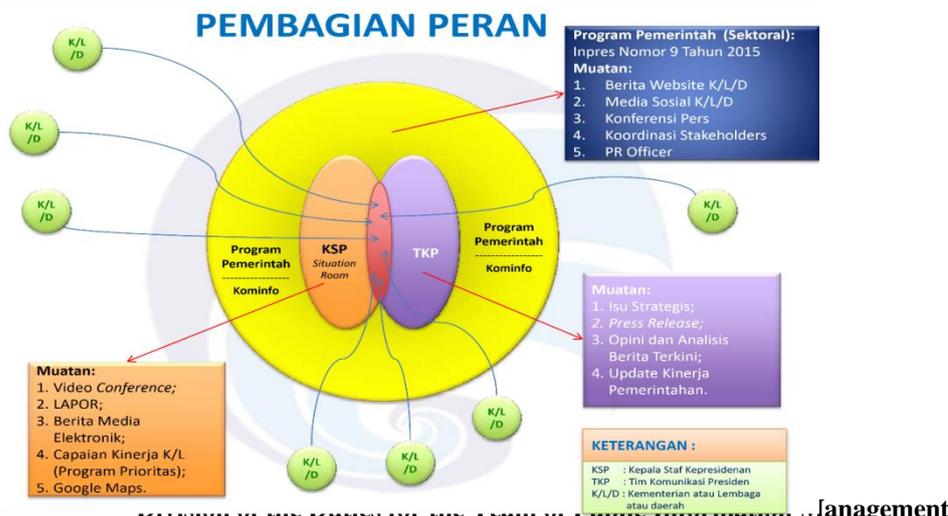
Name	Official	Experience	Education
Sukardi Rinakit or also known as Cak Kardi	Member of Presidential Communication Team. His duty is to accompany the President in the work visit or in the composition of speech script.	<ol style="list-style-type: none"> <li>1. Executive Director of Soegeng Sarjana Syndicate (SSS).</li> <li>2. Research Staff in the Center for Strategic and International Studies (CSIS),</li> <li>3. Ghost Writer for the Minister of Domestic Affairs</li> <li>4. Political Analyst for the Minister of Defense</li> </ol>	Master Degree in the Department of South East Asian Studies in Singapore
Johan Budi Supto Prabowo or also known as Johan Budi	Presidential Spokesperson. His duty is to clarify or deliver the statement of the President to the public. Consequently, whenever there is any information on the development of certain issue around Mr. Jokowi, he will be the one who delivers the statement of Mr. Jokowi as the President to the public.	<ol style="list-style-type: none"> <li>1. Reporter and editor in the <i>Forum Keadilan Magazine</i></li> <li>2. Reporter and Columnist Editor in the <i>Harian Indonesia Media</i></li> <li>3. Editor in the <i>Tempo Magazine</i></li> <li>4. Head of Jakarta and Foreign Affairs Bureaus in <i>Tempo Magazine</i></li> <li>5. Spokesperson of the Commission of Corruption Eradication (2006-2014)</li> </ol>	State 2 Junior High School Mojokerto (1981)  State 1 Sooko Senior High School Mojokerto (1984)  Undergraduate Degree from the Faculty of Engineering University of Indonesia (1992)
A.A.G.N. Ari Dwipayana	Presidential Communication Team	<ol style="list-style-type: none"> <li>1. Lecturer in the Faculty of Social and Politics Gajah Mada University Yogyakarta (1995)</li> <li>2. Political Observer</li> </ol>	Undergraduate Degree of Public Administration Gajah Mada University (1995) and Graduate Degree of Politics Gajah Mada

		3. Member of Expert Team in Committee 1 of the Regional Representative Council Republic of Indonesia 4. Member of Expert Team for the Bill of Village Community Development in the Ministry of Domestic Affairs (2008 – 2010) 5. Consultant for DRSP – RTI – USAID (2008 – 2009)	University (2015)
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**Data Processed by the Researchers**

The process of managing information into the domain of the government becomes another strategy that has been implemented in order to prevent the hate speech toward Mr. Jokowi. Certainly, the management of the information should be in line with the issues that have been developing within the public. Consequently, in order to maintain the balance on the information current within the government, there should be a special unit that deals with the information-management process.

The division of the duties within the team of public information management might be consulted in Figure 2 below.



Sumber : Gun Gun Heryanto, *Handbook Komunikasi Politik: Government Public Relations*

According to the Presidential Instruction Number 9 Year 2015 on the Mass Media Management (Instruksi Presiden Republik Indonesia Nomor 9 Tahun 2015 tentang Pengelolaan Komunikasi Publik, <https://eppid.kominfo.go.id/uploads/inpres-nomor-9-tahun-2015-tentang-pengelolaan-komunikasi-publik1.pdf>, accessed on December 6<sup>th</sup>, 2019, 03:03 PM Western Indonesian Time), it is mentioned that:

1. The Ministry of Communication and Information serves as the single-narrative composer.
2. The Ministry of Communication and Information prepares, plans and coordinates the agenda setting of the Government.
3. The Government delivers the information, the policy and the program through numerous communication channels immediately and accurately in order to balance the current of the news in the mass media.

On the other hand, the roles of the Ministry/Institution/Regional Government that has been outlined in the Presidential Instruction Number 9 above are as follows:

1. Preparing the substantive data of the priority program regularly to the Ministry of Communication and Information
2. Coordinating the planning, the preparation and the implementation of the public communication in relation to the programs and the policies of the Government
3. Disseminating the public information that has been compiled through the available communication channels

Despite the media management, there are other regulations that have been set for handling the hate speech-related act of crime in the Indonesian Legal Code namely: (1) Law Number 11 Year 2008 on Electronic Information and Transaction; (2) Law Number 9 Year 1998 on the Freedom of Speech before the Public; and (3) Law Number 40 Year 2008 on the Elimination of Racial and Ethnic Discrimination. Unfortunately, these regulations have still been dominated by the interest of the political elites. Usually, these regulations are utilized altogether with the issues of tribe, religion, race and inter-class as the instrument for meeting the political agenda of certain parties. Thus, the grassroot people are not provided with the legal standing by the state upon the hoax that has been circulating among them.

For handling the hate speech, the strategy that has been implemented for most of the time is monitoring the social media. The reason is that the attack of the hate speech has been highly massive, including the one that carries the name of certain

religion, tribe, race and class. Furthermore, the most fundamental attack of hate speech is the one that has been conducted on the behalf of certain religion within the content distribution. The government, therefore, should control the social media channel since social media might have enormous impact on the life of both the state and the nation. The control on the social media channel should be pursued specifically for the sake of the peace and security among the Indonesian people (Todung Mulya Lubis in the launch of *Buku Pedoman Penanganan Ujaran Kebencian di Indonesia* and in the Public Discussion entitled "Peneraban Kebencian, Problem Intoleransi, dan Peranan Penegak Hukum," February 27<sup>th</sup>, 2017, in Bidakara Hotel).

### **Obstacles in Implementing the Strategy for Handling the Hate Speech**

There will always obstacles in implementing the strategy for dealing with the hate speech since hate speech becomes the most selling phenomenon in Indonesia. Despite the strategy, the obstacles still appear to the surface because the handling of the hate speech in Indonesia has still been weak (Todung Mulya Lubis in the launch of *Buku Pedoman Penanganan Ujaran Kebencian di Indonesia* and in the Public Discussion entitled "Peneraban Kebencian, Problem Intoleransi, dan Peranan Penegak Hukum," February 27<sup>th</sup>, 2017, in Bidakara Hotel). The departure point of the hate speech attack is the factor or the leader, like President, Vice President, Minister and other state officials, who occupy the strategic position in Indonesia. For example, the President of the Republic of Indonesia (Mr. Joko Widodo) issued a policy (decision) after visiting certain area and the policy (decision) will be the object of the hate speech attack toward Mr. President (Thontowi, Expert Staff of Presidential Communication Republic of Indonesia, August 30<sup>th</sup>, 2019 01:45 PM in the State Secretary of the Republic of Indonesia).

The discussion over the hate speech might be various and might even turn out into a new dynamic known as digital harassment (aggressive attack in the digital world) since the cases of hate speech have not been well-handled. Not to mention, the steps taken by the Indonesian law enforcement apparatus have still been hesitant. The feat that the enforcement toward the hate speech will be considered violating the human rights is still apparent among the law enforcement apparatus. In the same time, it might even be possible that the Indonesian law enforcement apparatus has not been fully prepared to execute their enforcement function. The weak legal handling of the hate speech has resulted in pressure, discrimination and repression toward the minority groups. Such pressure, discrimination and repression has even been more massive due to an old adagio which states that the one who holds the highest vote is the one who holds the truth (Todung Mulya Lubis in the launch of *Buku Pedoman Penanganan Ujaran Kebencian di Indonesia* and in the Public Discussion entitled "Peneraban Kebencian, Problem Intoleransi, dan Peranan Penegak Hukum," February 27<sup>th</sup>, 2017, in Bidakara Hotel). However, the constellation in Indonesia supports the proper handling of the hate speech if all parties from the society, the academicians, the religious figures, the public figures and the mass media take participation in eliminating the pressure, the discrimination and the repression toward the minority group within the Indonesian democracy.

### **CONCLUSIONS**

Departing from the results of and the discussions within the strategy for handling the hate speech toward President Joko Widodo during the 2019 Presidential Election, several conclusions might be drawn. In the very first place, the phenomenon of hate speech has been commonly found in the social media especially nearby the party of democracy in Indonesia such as Presidential Election, Legislative Election, Gubernatorial Election and alike. Such phenomenon has been very common because of the variety, the facilitation and the freedom in accessing the Internet; as a result, individuals start to lose their social control in managing the social media. In the same time, the function and the role of the social media has been utilized as part of campaign strategy during the electoral period of Mr. Joko Widodo as the President of the Republic of Indonesia and Mr. Basuki Tjahaja Purnama as the Governor of the Province of Jakarta Special Capitol in 2012. It is apparent that social media has exposed certain impact. The impact has been so huge that every time Mr. Joko Widodo issues a policy or makes a decision hate speech will follow altogether with the hoax contents that enter and widely circulates within the society.

Looking at the phenomenon of hate speech toward the President of the Republic of Indonesia Mr. Joko Widodo during the political year, there are several strategies that have been implemented in order to overcome the hate speech. First, the handling of the hate speech involves law enforcement apparatus, namely the Indonesian National Police Department, because the law enforcement apparatus is the neutral party in the context of political contestation. In this regard, the Indonesian National Police Department should be fair and proportional in enforcing the law. Second, the handling of the hate speech involves the civil society participation in the upcoming 2019 Presidential Election. The involvement of the civil society in handling the hate speech is pursued by performing campaign activities, publishing banners, establishing social media network, delivering speech in front of the public or in the demonstration, delivering speech in the religious speech, delivering speech in the printed media, delivering speech in the electronic media and publishing pamphlet. Third, the handling of the hate speech toward Mr. Joko Widodo nearby the 2019 Presidential Election is conducted by establishing the Presidential Communication Team and the Office of Presidential Staff. The establishment of the Presidential Communication Team and the Office of Presidential Staff is compulsory and important in order to balance and neutralize any information in the form of hate speech. In the same time, in order to establish the information synergy before the public, President Joko Widodo has issued the Presidential Instruction Number 9 on the Mass Media Management in June 25<sup>th</sup>, 2015. The content of the Presidential Instruction is pursuing the harmony on a number of government policies and programs for the public information. In other words, the information of the government policies and programs that will be released to the public should be in accordance to the single instruction by the President of the Republic of Indonesia.

The establishment of the Presidential Communication Team has been considered important for the running of the governance since the President of the Republic of Indonesia has not always been able to establish direct communication with the public. Not to mention, there should be a special team that deals with the accurate and structured management information flow in the domain of the Government. The Presidential Communication Team has been established based on the Presidential Decree that

was issued in May 2015. The Presidential Communication Team has been expected to serve as the tool for countering the hate speech and, in the same time, has also been expected to create an effective pattern of communication in the governance level. Not to mention, the presence of the Presidential Communication Team has been expected to prevent the occurrence of any blunder that might have been committed by President Joko Widodo or his ministers. The presence of the Presidential Communication Team has attained positive response from the wide public. Last but not the least, the involvement of the figures like Sukardi Rinakit or Cak Kardi, Johan Budi Sapto Prabowo or Johan Budi and A.A.G.N. Ari Dwipayana, altogether with the other team members has become part of the ultimate strategy in dealing with the hate speech that has been targeted toward President Joko Widodo as the presidential candidate in 2019. In other words, the establishment of such team becomes highly important in eliminating and neutralizing the hate speech, especially by using the positive contents that take place recently.

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# Faunistic Survey of a Fresh Water Environment of Jammu Region J and K- India

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## ABSTRACT

*Faunistic survey of fresh water environment of jammu especially river tawi that is known as life line of jammu city winter capital of jk ut invites a research work at broader prospective due to its deteriorating condition.once there was a time when river tawi was graced with rich biodiversity but due to consistent and indefinite anthropogenic activities now the scenario have been changed.as it is evident from the fact that environmental changes caused by both human and natural or catastrophic activities worsen its condition.the man made changes includes denudation,soil erosion,alteration in vegetation pattern on stream banks,abstraction of stream water for agriculture ,domestic and industrial use collection of building material from the river bed and pollution caused by release of domestic and industrial effluents or water*

*The community of organisms in the water body form an important link in the food web apart from their biological role in the mud water exchang of nutrients.the never ending human quest to reap full advantage has always led to irrational utilisation of natural resources and thus to disastrous consequences.same is the truth of river tawi in jammu.the river tawi while running through the thickly populated area of jammu is increasingly being choked with population.*

*Available literature on the subject reveals that most of the studies are from fish ponds and lakes where as such studies for rivers specially on himalyan streams are very scanty , expecting a few important contribution made by pahwa 1979 dutta 1978 jhingran 1988 in different stretches of the rivers.in view of the scanty information over the subject in river tawi ,the present investigation were conducted.attempts were made to examine the comparative account of distribution and abundance of benthic and short line fauna of river tawi in 7.5km virgin stretch between nagrota to nikki tawi.main emphasis have been laid on the recovery of aquatic insects larvae[arthropoda] and molluscs which are not only important fish food organisms but are also indicators of pollution status of the water body.besides,amphibians which form an important link in the food chain have also been investigated.*

*The collection techniques were used as a hand net of a fine mosquito net tied around iron ring and fitted to wooden handle.the hand net or scoop net was dragged over the aquatic vegetation and when filled with elements then poured over the cloth piece.the other techniques like caste net , rod and line, bar baskets were also used for collection of invertebrate and vertebrate fauna from river tawi.the identification of collected specimen was done as per the recommended literature.*

**KEYWORDS:-**Arthropods,Biodiversity,Denudation,Fauna And River Tawi.

## 1. INTRODUCTION

The mighty Himalaya chain of mountains in J and K union territory has the vast repository natural resources,water ,forests ,plants,animals and aquatic life.It is because its complex geology and physiography,antecedent drainage of the major rivers and the relative instability and fragility of the environment complex ,never

ending changes are taking place.The Human interference on the natural environmental condition often give these dynamic process a catastrophic proportion leading to disasters and irreparable damage to the natural balance of the ecosystem and environment.

Same is the case of river tawi in jammu. The river Tawi is shrinking day today due to siltation and inhabitants of the river are also effected adversely due to man made pollution coming through drainage in the form of solid waste as well as sewage waste. River Tawi is also known as "Surya Putri, { daughter of sun} , considered as attraction of numerous religious and aesthetic values now facing the threat of losing its centuries old ecosystem. Available literature on the subject reveals that most of the studies are from fish ponds and lakes where as such studies for river especially on Himalayan streams are very rare and expecting a few important contribution in different stretches of the rivers particularly on river tawi. In view of the scanty information over the subject in river tawi , this investigation was conducted.

## 2. LITERATURE SURVEY

The aquatic organisms are considered as biological indicators which provide a direct clue and quick information of aquatic ecosystems. Some of the observers have been given the name as "biological litmus paper" to these aquatic organisms. Limnological studies of the rivers have been carried out extensively in USA and European Countries by various workers (Kofoid, 1903; Fritsch 1903; Allen 1920; Classen, 1927; Reinhard, 1931, Rice, 1938; Butchner, 1947; Fijer dingstad, 1950; Lacky and Hupp, 1956; Blum, 1956; Klein, 1957; Palmer, 1959; Waslik, 1965; weber and Moore , 1967; Lam 1971; Willem et al).

The high rate increase in human population and rapid pace of industrialisation have created an acute problem of disposal of waste products. Sewage and domestic wastes include all types of refuse, bathroom

washing, detergent, night soil etc. some of these are quite harmful and effects the quality of water and aquatic life of some respective water bodies. According to most recent investigations conducted on various lotic environment in India have been reviewed during present investigation on river Tawi.

The Chambal river and its tributaries were studied at Kota in Rajasthan (Olaniya et al, 1976) . Rama rao et al; (1978) observed the effects of pollution on river Khan (Indore) and made assessment of river water by biological community. Rishi and Kachroo (1981) studied the effect of sewage and fertilisers on phytoplankton of the Doodhganga river in Kashmir. Patra Nayak (1982) investigated limnobiological survey of Mahanadi during winter season only. Venkateswarlu and Kumar (1982) studied chemical and biological assessment of pollution in the river Moosi, Hyderabad (AP now Telangana) Lal et al. Raina et al; 1984 showed pollution studies on river Jhelum. Palharya and Malviya; 1988 studied pollution of Narmada river at Hoshangabad in M.P. Mittal and Sengar; 1990 studied on the assessment of water pollution and distribution of algal flora of Karwan river at Agra. Tamot and Khare (1991) observed limnological studies of upper lake of Bhopal during certain religious activities. Mishra (1993) studied phytoplanktonic composition of sewage polluted Kalpi river of Gwalior in M.P.

During the initial phase of investigation the physico-chemical characteristics of water and a thorough knowledge of the biotic constituents and their interrelationship were carried out. Keeping this in view Tawi was investigated as a representative of the lotic environment in Jammu. Attempts were made to examine the comparative account of distribution and abundance of benthic and shore line fauna of river Tawi in 7.5km virgin stretch between Nagrota to Nikki Tawi. Main emphasis has been laid on the recovery of insects, crustaceans, insect larvae, molluscs, amphibians and fishes.

The impact of sewage and industrial pollution on physico-chemical characteristics of water in river Betwa at Vidisha (MP) has been observed by Mishra (1996) Singh and Mahavir (1997) have studied the role of heavy metal in riverine pollution and found that the pollution load in river Ganga and river Gomti were maximum in respect of zinc, arsenic and chromium. Harjeet Kour, Prof. K.K Sharma and Arti Sharma of Jammu University in 2015 studied the fish diversity of some lotic bodies of R.S pura tehsil of Jammu District. In the most recent study that was carried out in 2019 by Maseera Shaikh, Roline Throrat and Sameer Padhye, it was carried out during the monsoon months of 2019 when invertebrate fauna such as branchiopods and rotifers were studied in a fresh water body Ahmednagar city.

On the basis of above survey it can be concluded that major Indian rivers are facing the danger of pollution. It is necessary to assess the effect of pollution on living organisms and water quality of fresh water bodies in India.

## 3. METHODOLOGY AND APPROACH

Tawi river has been investigated for the diversified macrofaunal invertebrate and vertebrate elements from their natural habitat by the methods adopted after Lefroy (1990), Kaburaki (1921), Parker and Haswell (1967), Tonapi (1980), Julka (1988), Verma et al, (1995) and Jayaram (2000) during the year 2007.

The aquatic insects were identified by using hand lens and with the help of field guide and literature (Lefroy, 1990 and Mani, 1982). The articles used in the collection are as follows:-

1. Hand net or a scoop net.
2. A small piece of cloth.
3. A few cloths or polythene bags.
4. Specimen bottles and plastic jars or buckets of different sizes.
5. A thermometer for the record of temperature.
6. A pair of blunt forceps.
7. Enamel trays and petri-dishes.
8. A hand lens.
9. Commercial formalin.
10. A good camera to click the photographs of sites and collected specimen.

Keeping in view the problems faced during this research process, there are some drawbacks that can be rectified in future. These are as already mentioned in the form of topography, location and pollution problems of river Tawi. It is very difficult for any scholar to investigate the river in each site. Therefore, it is necessary to select typical site suitable for data collection and water quality investigation.

Some of the approaches that can be introduced for future research work are as given below:-

1. Identification of polluted and non polluted areas.
2. Comparative study of data collected from both the areas.
3. Avoid the collection from channels of river Tawi that can delinked and changes into pools or ponds.
4. High level water quality monitoring system.
5. Repeated approaches of data collection.
6. Parameters are required to measure the impact of pollution on aquatic fauna and its growth.
7. Comprehensive measures to reduce the influx of pollutants in the river especially towards sensitive areas.
8. Awareness campaign about adverse effects of pollutants in the river.
9. Proper disposal of solid waste and other wastes exposing river to various harmful chemicals.
10. Sewage waste and solid waste treatment plants should be installed at prime locations as earlier as possible to preserve the water body and to conserve the aquatic fauna.

## 4. RESULTS AND DISCUSSION

The final outcome of research is very informative. During this research the efforts were made to find out maximum fauna present in present in river Tawi and to study their abundance and diversity. As far as result is concerned large no of invertebrate and vertebrate fauna have been observed and studied. The taxonomic and systematic position of fauna found in river Tawi during this investigation are as follow:-

### ARTHROPODA:-

Since this the largest group comprising nearly 70% of biotic world, it is more than obvious that they have reached the end of their sufferance in the impoverishment caused by mans wanton interference in diverting the natural water resource suddenly. The insects which are dominant terrestrial organisms have reinvaded in their ancestral aquatic habitats. The developmental stages required considerable modifications to with stand the stress and strains of such a dramatic changes in the Environment. The countless adaptations of insects to aquatic life illustrate the extraordinary varied structural organisation. The tracheal system has been regarded as one of the major keys to their unique success in the terrestrial insects. This structure is retained in the adult of the

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aquatic Hemiptera and Coleopteran. These forms come frequently to the surface of the water to take fresh air which is stored into the air bubble and physical gill in the larval forms. Most of the aquatic insects have piercing and sucking type of mouth parts.

Larvae of many insects move by vigorous muscular movements. Odonata nymphs are a menacing danger to crustaceans, fish fingerlings and Batrachian larvae. Aquatic bugs like notonectids, Belostomids are a threat to other economically useful animals. It is the only studies on similar checks and balances maintained by nature in an ecosystem that can unveil the intricate biological patterns. The Arthropods observed and studied during this research work in river Tawi are as follows:-

1. Cancer irroratus (Crab).
2. Palaemon malcolmsonii (Prawn).
3. Plecoptera (Stone flies).
4. Megaloptera (Alder flies).
5. Trichoptera (Caddis flies).
6. Ephemeroptera (May flies).

### MOLLUSCA:-

There are very limited molluscs present in river Tawi as it has down stream and spreaded flow. The specimen collected and investigated during the research are as follows:-

1. Physa species:- This is first record of the Genus from J AND K UT and to the best of the author, perhaps from rest of india as well. However, it still needs to be thoroughly searched and investigated.

### AMPHIBIANS:-

The specimen collected from river Tawi fall under the genus Rana. The specific investigation reveals characteristic features of a single species as given below:-

1. Rana cyanophlytics schniders (Skittering Frog):- The diagnosis features of this species are wider head with width 28.6 to 36.5 of snout vent length, snout is blunty pointed, nostril dorsal nearer to tip. The colour of frog is dorsum light ,olive green or brown; marbled or spotted with irregularly arranged scooty spots; a single white streak on the thighs, the dark pigment below this streak giving a mottled appearance rather than forming a distinct second dark streak.

### FISHES:-

Fishes belonging to different family (cyprinidae) and orders (cypriniforms and siluriforms) have been observed and studied during this investigation from river Tawi . The characteristic features with specific elaboration of these fishes are as follows :-

1. Tor tor (cyprinus tor):-

The body of fish is elongated ,moderately compressed, abdomen rounded.Head small broad pointed snout angularly rounded often with tubercles,lips fleshy, variable, pharyngeal teeth in 3 rows, five to six barbels with 12 to 13 rays and a strong stout and smooth spine.Lateral line completes with 22to37 scales.

### 2.Labeo rohita(Rahu):-

The body of fish is small or moderate sized , elongated with abdomen rounded.Head fairly large,snout more or less swollen rounded or truncated often projecting beyond mouth.Jaws with a sharp margin and with a soft movable horny covering which may be thick or thin. Barbels always present in one or two pairs.

### 3.Mystus seenghala (Cat fish):-

Body short or moderately elongated, abdomen rounded.Head of moderate size compressed, snout rounded or abtuse.Lips thin,jaws sub equal firmly villiform in bands on jaws and palate;that on later side always uninterrupted (hora). four pairs of barbells, one each of maxillary,nasal and two mandibulars generally longer.Pectoral fins with 6 to 10 rays, pelvic fins with 6 rays and caudal fins with 9 to16 rays.Caudal fins forked, bilobed with unequal lobes.

These species of fishes are also distributed in different countries of asian continent such as Nepal, Pakistan, Sri lanka,Bangladesh, Myanmar,Thailand,Indo-China and Malaysia etc.

### CONCLUSION:-

The Jammu and Kashmir UT, constituting ,the extreme western sector of the Himalayas lies between 32 17 and 36 50 north latitude and 73 26 and 80 30 east longitude.The UT looks like a crown on the head of the country.In Jammu ,the monthly temperature remain almost above 13C round the year,thus at enjoy a growing season of full year.The days are often sunny and warm as compare to nights,which are very cold.

The river Tawi which is flowing very close to Jammu city also known as Surya Putri.”This water body has its origin from Seoq near Bhaderwah (Distt Doda) a meadow of the Kailash mountain in the middle Himalayas.It flows through middle mountains along Doda, Chenani and Udampur where several tributaries join at different places on its way to Jammu.It is bounded by shivaliks range and covers a distance of 120 kms from its source to Jammu.

Available literature has revealed that scanty information on various subjects in river Tawi is available and in view of this , present investigations were conducted.Attempts have been made to examine the comparative account of distribution and abundance of faunal elements in river Tawi in 15 km stretch between Nagrota to Nikki Tawi area.The macrofaunal elements were collected from the main water body and its side pools for the years 2007and 2008 by

using different effective methods like hand net ,scoop net and hand picking etc. from the specific sites of habitats.

All the invertebrates specimen were classified upto species level by the methods adopted by Lefroy (1990), Mani (1982); parker and Haswell (1967); Tonapi (1980); Subba Rao (1989).All Vertebrate fauna were classified and identified by using key as provided by Jayaram (2000) and Verma etal; (2006-07) especially for Fishes and Amphibian fauna.

The entire collection of macrofaunal invertebrates and vertebrate fauna may be classified into three major phyla (2 invertebrate and 1 vertebrate) and 5 major classes as given below systematically:-

A) PHYLUM	:	Arthropoda
1) Class	:	Crustacea
2) Class	:	Insecta
B) PHYLUM	:	Mollusca
3) Class	:	Physidae
C) PHYLUM	:	Vertebrata
4) Class	:	Pisces(Fishes)
5) Class	:	Amphibia

Mollusca was the minimum group followed by Arthropoda and pisces.Amphibia was also represented by just one family with one Genus Rana and only one species.The identified species was physa which is a rare gastropod mollusc, and to the best of our knowledge, it has been reported from the region for the first time.

Occurance of Prawns and Crabs besides , molluscs and fishes suggest that prawn fishery and crab culture might be another alternative substitute of pisciculture besides shell fisheries, which could solve the problem of protein malnutrition in the fast developing region in the country like india.

Concomitant to above, in river Indus, Jhelum & Tawi, practically no efforts have been made to protect carps, Trouts &cat-fishes from extinction.Although the riverine habitat of river Tawi with the above mentioned characteristics, seems to be quite suitable for carps and cat-fishes.

### FUTURE SCOPE:

Transgenic fish technology has a great potential in revolutionizing the capture as well as aquaculture industry.Improved transgenic fish strains could be produced by introducing desirable genetic traits into fishes.The traits may include higher growth rate, improved food conversion efficiency, resistance to diseases,tolerance to low oxygen concentration etc.

However, the following aspects could be taken care, with regard to application of transgenic fish technology in fish culture:-

- 1) Proper identification of genes for desirable traits to develop aquaculture.
- 2) Development of targeted gene-transfer technologies.
- 3) Proper identification of suitable promoters to direct the expression of transgenes at optimal levels during the desired development stages.
- 4) Assessment of safety of the transgenic fish against environmental impacts.

Thus, it is suggested that since, India is a developing country and most of the population is suffering from protein malnutrition so to overcome this serious problem, "Prawn fisheries" and "Crab-fisheries" will be the alternative; which shall provide most palatable dishes to use.

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# The Assessment of Integrated Municipal Solid Waste Management in Case study Addis Ababa, Ethiopia

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**Abstract:** The purpose of this study is to assess the integrated municipal solid waste management case study Addis Ababa city. To conduct this study, the descriptive survey method was employed. The study was conducted in five sub-cities and thirty districts of Addis Ababa city. The subject of the study were micro enterprise workers of integrated municipal solid waste, communities, Administration and Agency workers of integrated municipal solid waste management and Addis Ababa city and Administration officer of Integrated municipal solid waste management. Thus, 500 micro enterprise workers of integrated municipal solid waste management and the communities and 65 Administration and Agency workers of integrated municipal solid waste management, 12 Addis Ababa city integrated municipal solid waste management Administration officers were taken as a sample. For micro enterprise workers of integrated municipal solid waste management and communities' sample were taken through random sampling techniques, Administration and agency workers of integrated municipal solid waste management and Addis Ababa city Administration of integrated municipal solid waste management officers were taken as a sample through purposive sampling techniques. Finally, to reduce the challenges of integrated municipal solid waste management it is recommended for integrated municipal solid waste management to give relevant training, seminar and workshop and implementing various options to strengthen the integrated municipal solid waste management to sustainable.

**Key words:** Assessment of municipal solid waste, municipal solid waste management, Urban environment.

## 1. Introduction

Solid waste management is becoming a big concern for cities administration task in developing countries. This is mainly due to the magnitude of rapid urbanization and increasing population growth; which in turn has greatly accelerated municipal solid waste generation rate in the urban environment (Hayal Desta, 2014). According to World Bank (2012), every year developing nations spend nearly \$46 billion on managing their municipal solid waste. These investments could exceed \$150 billion per year by 2025. Solid waste management (SWM) in Africa is often weak due to lack of appropriate planning, inadequate governance, poor technology, weak enforcement of existing legislation and lack of economic incentives (UNEP, 2005). Global researchers in the field are trying to work out for a common understanding, what waste is and show it is understood by defining and redefining as it is important for communication, designing strategies and collaboration; otherwise, any effort against the waste problem without common understanding is a futile attempt. How to deal with it in general and in a beneficiary way in particular depends on how we understand it. Perceptions of waste, as Dracker, M. (2005) argues, are important parts of local waste management systems, and the understanding of such perceptions might increase the effectiveness of waste management campaigns.

In Ethiopia, solid waste management was highly centralised until 2003. As part of a broader decentralisation effort in that year, the city administration of Addis Ababa was divided into ten sub-cities and 117 districts that comprise the local administration (FDRE 2003). The purpose of reorganising the city was to give more power to lower levels of the city administration, and to empower local

communities and their institutions (Taye and Tegegne 2007; Paulos 2007). As part of the reforms, the city government promoted integrated solid waste management by local administrations, and strengthened the role of both formal, informal, public and private sectors in solid waste collection, transportation, disposal and recycling activities (FDRE 2003). At the beginning of the reform, many informal private enterprises were involved in the collection and disposal of waste, and were allowed to operate without paying taxes. In a very short period, the number of actors involved in solid waste collection and disposal increased significantly. There was high competition among the informal operators and this reduced the price they charged for their services. The problems related to solid waste in the city were subsequently reduced; more waste was collected and the city became cleaner (Zelalem 2006; Bjerkli 2015).

## 2. METHODS

**Study area:** This study is conducted at Addis Ababa City which is the capital city of Ethiopia. It is also the largest city in the country by population, with a total population of 3,384,569 according to the 2007 census. However, it is believed that this number was inaccurate when recorded and underestimated the city's population. The city has through recent years seen a strong annual growth rate, and population counts as of 2017 are growing closer to 4 million. The next census is scheduled for the 2018 to 2019 fiscal year, as it was delayed by security concerns between 2017 and 2018. Addis Ababa is a chartered city and as such, is considered both a city and a state. It is the largest city in the world located in a landlocked country. (Addis Ababa population Agency 2007)

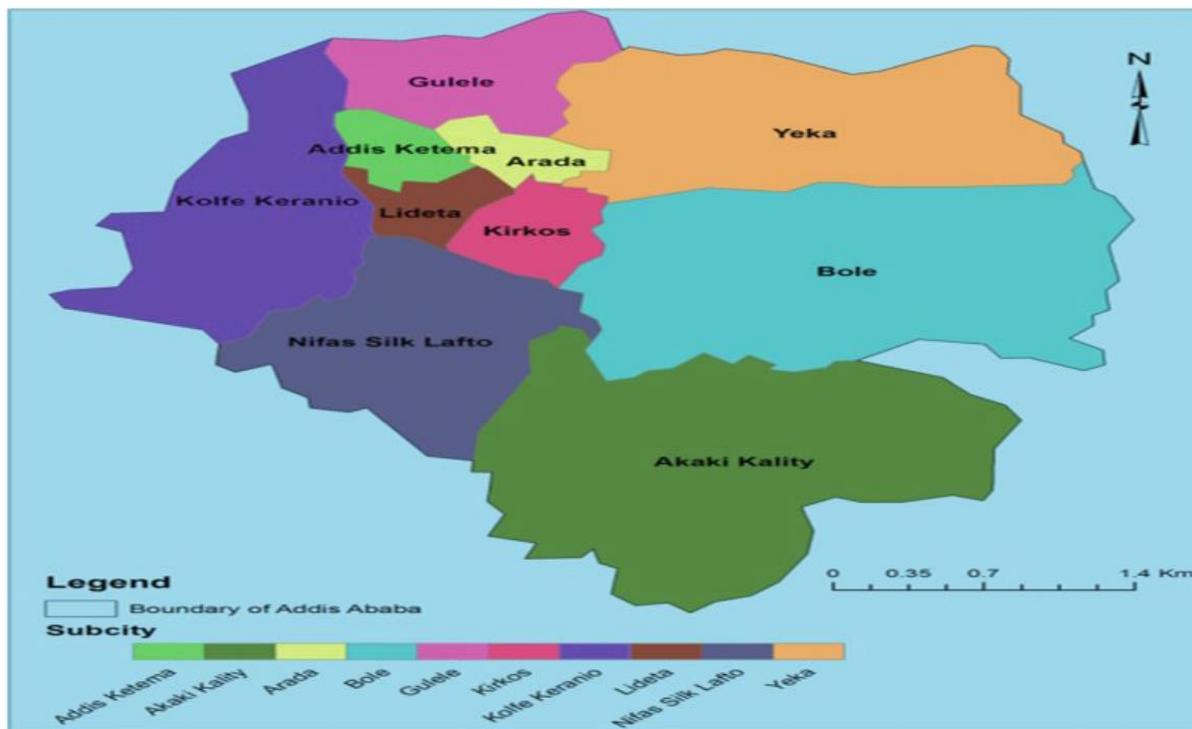


Fig 1. Daniel W. Ambaye (2015) Land rights and expropriation in Ethiopia

**Data collect and analysis methods :** In this study survey methods will be selected and the questionnaire used to collect quantitative data, while for the qualitative data interview is employed (Muijes,2004) cited Abebe(2014). A survey, according to Kathari (2004) ,is a method of securing information concerning an existing phenomenon from all or selected number of respondents of the concerned universe, while interview facilitate to have or to get in depth data on the Integrated Municipal Solid Waste Management System in

Addis Ababa city. To the line the qualitative approach is incorporated in the study to validate and triangulate the quantitative data. Physical survey were carried out by visiting the variance existing waste collection point and by examining the available equipment being used to manage the waste.

McLaughlin et al (2001:18) believe that for information that cannot be obtained through quantitative method (which relies mainly on close-ended questionnaire to collect data), the qualitative method and be effective in obtaining such information. In fact, open-ended questionnaires and some structured interview all the respondents to elaborate on their points with respect to the variable being studied.

### Primary Sources of Data

To collect firsthand information about the research, the study will be used questionnaires to micro enterprise workers of integrated municipal solid waste management and communities as well as for administration and agency workers of integrated municipal solid waste management and interview to Addis Ababa city and questionnaire to Addis Ababa city administration officers of the integrated municipal solid waste managements, and to Agencies who are involved in collecting ,transporting and disposing integrated municipal solid wastes.

### Secondary source of data

The secondary sources of data will be the Addis Ababa city administration published and unpublished data documents about solid waste management document- records. These files that observed to strengthen the data obtained through questionnaire and interviews.

## 3. RESULTS AND DISCUSSION

**3.1. The community awareness creation:** In the respect to the procedures of community awareness creation, respondents were asked whether or not the procedures have been implemented appropriately for awareness creation.

Table 1, the overall response were given by both respondent groups of the micro enterprise workers and the community as well as the administration and agency workers of integrated municipal solid waste management were lower performance. The weighted mean of both respondents framing to reinforce and there no difference between the groups of both respondents in rating the items that they perceives the task in a similar way.

The micro enterprise workers and the community were not visit on how to collected, store and separate the solid wastes, the integrated municipal solid waste management workers carried out their activity without plan and made no mutual agreement with the community taking in to account on the sustainable time at which they collected and store the solid wastes, and they did not arrange the peers (colleges) to create awareness among themselves and no awareness creation on how to use storage facilities, and also on how to separate the solid wastes in to the proper and respective item and properties. The t-test for significance were employed. It shows that there were no statically significance difference between the mean values of responses of the respondents groups.

No	Item description	Respondents
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		Micro enterprise worker and community		Administration and agency workers of IMSWM		w.m	t-value
		(n=500)		(n=65)			
		X	Std	x	std		
1	The Integrated Municipal Solid Waste Management workers make visit after informing the communities to collect the solid waste they generate properly.	2.23	0.81	2.34	0.76	2.24	-1.02
3	The Integrated Municipal Solid Waste Management workers arrange the peers /colleagues/ to create awareness among the communities themselves.	2.09	0.65	1.43	0.53	1.74	-1.1
4	The Integrated Municipal Solid Waste Management creates awareness on how to use the storage facilities, bins and material.	2.29	0.61	2.43	0.68	2.3	-1.75
5	The Integrated Municipal Solid Waste Management creates awareness to the communities on how to collect and store the solid wastes.	2.95	0.63	3.38	0.69	2.99	-1.68
6	The Integrated Municipal Solid Waste Management creates awareness to separate the solid wastes in to recycled, decompose and un decomposed, etc.	4.3	0.623	3.68	0.64	4.23	-7.6

**Table 1: Communities awareness creation**

The interview made for Addis Ababa city administration of integrated municipal solid waste management officer and agency workers were supported the opinion of majority of the group of respondents. They said, “There were no strong and effectively works were made on these areas. In the future we hope we will work a better performance. This can be made by with a bather community’s participation, by identifying and by solving our practical challenges and by proper implementation of integrated municipal solid waste management.”

In the future we hope we will work a better community participation by identify and by solving our practical challenges and by proper implantation of integrated municipal solid waste management. In this one can concluded that there were no this much workers were done. Thus it needs more attention and effective works in those areas.

**3.2. The Strength of IMSWM to be sustainable:**

As show item description 1, of table 2, respondent were asked to rate there agreement level private and small enterprise to practice self- directed of integrated municipal solid waste management. Accordingly, micro enterprise workers and the community (x=3.12, std =1.54) and the administration and agency workers of integrated municipal solid waste management (X=3.45, std= 0.75) were not sure about the issue. The weighted mean value 3.38 shows the uncertainty of the majority of the respondents with issue. Therefore, it can be concluded that the opportunities for private and small or micro enterprise to practice self-directed of integrated municipal solid waste management activities were unsatisfactory.

As response had given items 2, of table 2, the responses were given by both respondent group of micro enterprise workers and the community as well as the administration and agency workers of integrated municipal solid waste management were (x= 3.61, std = 0.95 ) and (x=3.94 std=0.83) respectively. The weighted mean (3.65) showed that it were high performance. The t-test for

significance were employed (-2.65), which implies. There were no significance difference between the opinion of two respondent groups. Hence peers or colleagues were created to organized for awareness creation among themselves.

The interview made for Addis Ababa city administration of IMSWM officers and agency workers were supported the opinion of majority of the respondent groups.

They said, “peers or colleagues were organized for awareness creation among themselves and helping the activity of integrated municipal solid waste management were about ten association organized per sub city level”.

As shown in item description 3, of table 2, respondents were asked to rate their agreement level on the implementation of face to face interaction (or door-to-door) with the community to improve awareness. The micro enterprise workers and the community ( $x=3.40$ ,  $std.=1.14$ ) were undecided. The administration and agency workers of integrated municipal solid waste management ( $x=3.22$   $std=1.28$ ) were uncertain. The weighted mean of both the respondent groups were (3.38) were moderate. One can observe the uncertainty of the respondent groups about the issue. The two respondent groups were not satisfied regarding the implementation of face-to-face (or door-door) interaction with the community for awareness creation.

As shown in item description 4, of table 2, respondents were asked whether or not micro enterprise workers and the community as well as, the administration and agency workers of integrated municipal solid waste management ( $x=1.47$ ,  $std=0.65$ ) and ( $x=1.54$ ,  $std=0.66$ ) respectively were strongly disagree. The weight mean (1.48) were showed very low performance. The t- test (-0.78) shows no significance difference between the opinion of the two respondents. Thus role models of active participants were not awarded or given incentives from the communities who timely, properly collect, store, separate it in to its item and property, hence, were not implemented effectively this way.

Interview made for the administrative groups of integrated municipal solid waste management officers said, “We are not actually awarded or were given incentives for role-model groups or individuals from the community. Because of failing to do this awarded some people mix solid wastes having difference properties together, even they add some gravel or stone to raise its weight. Because payment was made or calculated based on the mass of the solid wastes, 115 birr per m<sup>3</sup> (1m<sup>3</sup>=264kg) or 1kg solid wastes cost 0.66 birr.” Thus, there were no strong effective works were done on those area. So that this is another important option to strength the integrated municipal solid waste management to sustainable.”

	Respondents
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No	Items description	Microenterprise workers and the community		Administration and agency workers of IMSWM		m-w	t-value
		(n=500)		(n=65)			
		X	Std	X	std		
1	Opportunities given for private and small enterprises to practices self-direction of Integrated Municipal Solid Waste Management.	3.12	1.54	3.45	0.75	3.38	0.86
2	Organizing peers /colleagues/ and create awareness among themselves to work with Integrated Municipal Solid Waste Management	3.61	0.95	3.94	0.83	3.65	-2.65
3	The implementation of face to face interaction with the communities to improve awareness in Integrated Municipal Solid Waste Management	3.4	1.14	3.22	1.24	3.38	1.24
4	Awarding role model or actively participants from the communities who timely or properly collect, store, separate recycled solid wastes etc and cooperate the Integrated Municipal Solid Waste Management.	1.47	0.65	1.54	0.66	1.48	-0.78

**Table 2: Municipal solid waste management to be sustainable**

**3.3. Challenges Against Minimizing the problem of IMSWM.**

As it can be seen from item 1 and 2, of table 3, micro enterprise workers and to community, as well as, administration and agency workers of integrated municipal solid waste management were asked whether or not integrated municipal solid waste management workers incompetent to do there work properly and have not taken relevant training and have no skill, accordingly (x=2.28, std=1.02 ) and (x= 2.08, std =0.76), (x=1.66, std = 0.52) and (x=1.74, std =0.44) respectively were disagree that the respondents were not accept the opinion raised. The weight mean (2.26 and 1.67) respectively indicates the disagreement of the opinion.

Therefore, it can not possible to say that the integrated municipal solid waste management workers were incompetent enough to do there work and not taken relevant training and have no skill. Thus, one can concluded that the integrated municipal solid waste management workers were competent enough to do there work and have taken relevant training and have skill. As it can be seen from the item 3 and 6, of table 3 above, micro enterprise workers and the community as well as the administrative and agency workers of IMSWM rated there level of agreement regarding the IMSWM workers were over loaded with different work activity and lack of coordination of stoke holders. Accordingly {(x=1.88, std =0.60) and {(x=2.04, std=0.75) and (x=2.08), std= 0.65} respectively were disagreement on the opinion.

Therefore, it can not possible to say that the integrated municipal solid waste management workers were over loaded with different work activity and lack of coordination of stoke holders .Thus one can concluded that the integrated municipal solid waste management workers were not over loaded with different activities and also stoke holders work with coordination.

As it can be seen from item number 7 to 11, table 3 above, the respondents were asked there rate of agreement indicates they were undecided, which means they were not satisfied with the opinion. The weighted mean also showed moderate performance. Therefore, there were lack of storage facilities or transporting vehicles for the solid wastes, in some places solid wastes are dispersed, some how communities were not cooperative with integrated municipal solid waste management works and were resistant and also lack of follow up the activities of integrated municipal solid waste management workers.

The interview made for Addis Ababa administrative officers of integrated municipal solid waste management and agency workers of municipal solid waste management support the opinion of majority of the respondent groups. They said, that “Of course, we have not enough budget allocated to do and work all the activities of integrated municipal solid waste management. It is very vast; so we don’t have enough resources to cover all these things. Budget constraints are our main problem. As much as possible, even if the budget is not enough, we try our best to allocate the limiting budget fairly to carry out the activities of integrated municipal solid waste management.”

No	Item description	Respondents				
		Micro enterprise workers and community		Administration and agency workers of IMSWM		m.w
		N=500		N=65		
		X	std	X	Std	
1	The Integrated Municipal Solid Waste Management workers are incompetent enough to do their work properly.	2.28	1.02	2.08	0.76	2.26
2	The Integrated Municipal Solid Waste Management workers have not taken relevant training and they have no skill.	1.66	0.52	1.74	0.44	1.67
3	The Integrated Municipal Solid Waste Management workers are overloaded with different work activities in the city.	1.88	0.6	1.74	0.44	1.87
4	There is adequate number of enterprise workers to cover the jobs properly	3.64	0.5	3.51	0.62	3.62
5	There is insufficient allocated budget for Integrated Municipal Solid Waste Management program in the city.	3.9	0.73	3.89	0.68	3.9
6	Lack of coordination of stake holders in collecting, storing and transporting of the solid waste in the city.	2.04	0.75	2.08	0.65	2.04
7	Lack of storage facilities from waste you generate , or transporting trucks (vehicles)	3.13	0.74	4.14	0.7	3.24
8	Solid waste stored for very long and dispersal and communities do not respond or pay no attention.	3.21	0.69	3.09	0.72	3.2
9	Communities are not volunteer or not cooperative with the Integrated Municipal Solid Waste Management workers.	3.16	0.74	3.23	0.66	3.16
11	Lack of follow of the Integrated Municipal Solid Waste Management workers by the management bodies’.	3.16	0.81	1.98	0.88	3.09

**Table 3: Challenges Minimizing the problem of IMSWM.**

**4. Solid waste collection Policy:** The solid waste collection in Addis Ababas has been decided by the city administration. According to the existing policy, solid waste are collected by the government employees, private companies based on contractual agreements and micro and small enterprise.

The interview made for Addis Ababa city administration officers of integrated municipal solid waste management that whether any policy or/and legislative system support the integrated municipal solid waste management in the city or not.

They said “ There are policies to regulate the proper administration of integrated municipal solid waste management. But there were no policy or legislation that ban or protect not to use any plastic or polystyrene material which is related to solid wastes. The integrated municipal solid waste management policy of the city were not protect or ban before they produced plastic material, polystyrene or any others or even after conception (or after used up) and generated as in the form of solid wastes, from house hold, business areas or the factory itself”.



Fig.2. Storage on street sides



fig 3. Damping on the road side

## 5. FINDINGS OF THE RESEARCH

### 5.1. Summery of the major findings :

The major findings of the study were summarized in this parts of the study, general conclusion were drawn on the bases of their findings and recommendations forwarded for all concerned integrated municipal solid waste management in Addis Ababa city. Therefore, the central purpose of this study was to assess the integrated municipal solid waste management in Addis Ababa city.

Different kinds of analysis tools were employed for the analysis and interpretation of the collected data. The quantitative data gathered through questionnaires were analyzed in frequency count, percentage, and mean for the characteristic of the respondents and mean value, standard deviation weighted mean, t-value test was utilized to check the tactical significance where there is difference or not between the opinion of the respondents. Whereas, the qualitative data gathered through the open-ended questionnaire, interview and documents were analyzed by narration. Hence, the analyses made to substantiate the major findings of the study are summarized as follows:-

Among the different options used to strengthen the integrated municipal solid waste management to be sustainable that the majority of the respondents indicated were self-directed practices of private and micro enterprise face to face ( or door to door) interaction for awareness creation and awarding or giving incentives to encourage the role model (or active participants) among the community itself were possible options used to strengthen the integrated municipal solid waste management to be sustainable were not implemented effectively in the city. But among the different options peers( or colleagues) organized for awareness creation among themselves and helping the activities of integrated municipal solid waste management were about 10 associations organized per sub city level. Whereas, the rest of possible option were not implemented effectively in the city.

Based on the majority of the respondent groups that respond through questionnaire or interview, the findings of the study confirmed that during and after awareness creation the communities and the micro enterprise workers were not visited on how to collect separate and store the solid waste and also the respondents revealed that they were carried out the above activities without plan and taking in to account the suitable time by mutual agreement with the communities. They also gave no feed-back and they were not discussed with them about the problems and the appropriateness of the objectives. They did not collect and record data on the community participation. They were ineffective in this way.

The findings of the study revealed that administration and agency workers of integrated municipal solid waste management were not efficient and effective in conducting regular meeting and discussion for awareness creation with the communities and the micro enterprise workers and integrated municipal solid waste management and the micro enterprise workers of integrated municipal solid waste management and in organizing conference workshops and training ,to increasing there awareness and incentives for encouragement were not give. Of course, if thus was made effectively it has an adverse effect in helping the community to cooperate and actively participate in helping the activities of integrated municipal solid waste management workers.

The finding of the study also indicates that there were factors that hinder the implementation of integrated municipal solid waste management activities in the school were the budget constraints. The shortages of allocated budget to facilitate the integrated municipal solid waste management activities were factor that hinders its implementation effectively.

## **6. CONCLUSION**

Based on the findings of the study the following conclusions are drawn: Implementing effective awareness creation and orientation improves stake holders active participation in cooperation and working with integrated municipal solid waste management. This requires positive perception and commitments of all stake holders. This in turn increasing the improvements of the activities of integrated municipal solid waste management. This leads to the attainments of the desired objectives of the integrated municipal solid waste management. However, the research findings showed that the communities and the micro enterprise workers of integrated municipal solid waste management were not well oriented to the potential activities and benefits of integrated municipal solid waste management, could bring to the communities themselves or to the stake holders, where they lacked awareness of the activities of integrated municipal solid waste management. From this, it can be possible to conclude that community and micro enterprise workers of integrated municipal solid waste management in Addis Ababa city have limited understanding about the significance and the purpose of integrated municipal solid waste management activities.

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# Effects of Virtual Laboratory Instructional Strategy on Secondary School Students' Learning Outcomes in Physics Practical

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**Abstract-** The study investigated the effects of virtual laboratory instructional strategy on students' performance and attitude towards Physics practical in secondary schools. The study adopted the quasi-experimental design of pre-test, post-test and control group. The sample for the study comprised 50 Senior Secondary two (SS II) Physics students who were randomly selected from two co-educational Senior Secondary Schools in Osun state through multistage technique. The schools were randomly selected to experimental and control group. The experimental group was exposed to virtual laboratory instructional strategy while the control group was taught using conventional laboratory strategy. Physics Practical Test (PPT) and Physics Practical Attitude Scale (PPAS) were the two instruments used to collect relevant data for the study. The general questions raised for the study were answered using descriptive statistics of mean, standard deviation and bar chart. The hypotheses generated were analyzed using t-test. Decision was taken at 0.05 level of significance. The findings from the study showed that the treatment had positive effect on students' performance and attitude towards Physics practical. Based on the findings of this study, it was recommended that Physics teachers should make use of virtual laboratory instructional strategy to improve students' performance and cultivate students' positive attitude towards Physics practical in secondary schools.

**Keywords:** Virtual Laboratory, Instructional Strategy, Performance, Attitude, Physics Practical

## I. INTRODUCTION

Physics is a science subject taught in theory and practical. In internal and external examinations, Physics practical is assessed separately as an integral part of the subject. Practical works in teaching and learning of the subject are activities in which students, working individually or in small groups, manipulate and observe the apparatus in the laboratory. Physics practical activities can be regarded as an effective method of making the teaching and learning of the subject more real to students as opposed to abstract or theoretical presentation of facts, principles and concepts of subject matters. Effective teaching and learning of Physics is a measure of students' experience, understanding and skills acquired as a result of frequent engagement of the students in practical activities which enable them to think and act in a scientific manner.

Students learn better in activity based class where they manipulate equipment and apparatus to gain insight into the concepts, understand theories and principles. Adane and Adams, (2011) reported that students who are given opportunities to work with apparatus/equipment during laboratory work are able to investigate scientific problems which make them understand theories and principles of science concepts better. Also Nwagbo and Chukelu, (2012) reported that students achieve greatly when the teaching and learning of science occurs in an environment where students are allowed to carry out investigations, not only in the aspect of understanding scientific concepts but also in acquiring scientific skills

Physics practical activities create learning experiences in which students interact with apparatus to support theoretical explanations with actual practices in laboratory. It makes students become familiar with mental processes such as observing, inferring, classifying, measuring and data interpretation. Thus, learning becomes engaging as a result of using concrete materials. According to Uhumuavbi and Okodugha (2014), the use of laboratory as a method of teaching science helps the students to develop manipulative skills. It leads to better retention of information and also the development of favourable attitudes towards school subjects. The students during the use of laboratory are active participants who acquire more knowledge by performing experiments.

Despite the importance of practical activities in learning Physics, there are a number of observable problems plaguing the practical activities in teaching and learning of the subject, especially at the secondary school level. These problems contribute to the low performance of students in Physics in secondary schools. Over the years, the students' low performance in Physics has prompted

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educational researchers to continuously make relentless efforts at identifying mitigating factors that might account for the observed poor performance. One of these problems is poor method of instruction. Jegede and Adedayo (2013) attributed the deterioration in students' achievement in Physics to ineffective method of teaching Physics. This is supported by the assertion of Owolabi and Oginni (2013) that inappropriate teaching methods used by Physics teachers had resulted to the low performance of students.

The teaching of Physics practical in secondary schools is characterized with conventional laboratory instructional strategy. This is a teacher-centered teaching method in the laboratory where teacher dominates the activities turning the students to passive learners. It is hand-on experiment where students sit back on stools beside/behind the benches in the laboratory observe/watch their teacher at a distance in front of the laboratory demonstrating experiment for them; after which the students also repeat what the teacher demonstrated. This method of teaching Physics practical in secondary schools does not seem to be meeting the demands of the Physics curriculum in Nigeria. Physics curriculum contents emphasized understanding of concepts, experimentation and right attitude. For proper manipulation of the apparatus, acquisition of necessary skills and understanding of principles, theories and concepts, practical activities in the laboratory should be closed to the students not at a distance. The students should also be actively involved in the activities.

As emphasized in the National Policy on Education, the teaching and learning of science focus on preparing individual with appropriate skills, abilities and competencies both mental and physical to live and contribute to the development of the society (FRN, 2014). To achieve creativity and overall national development; acquainting students with basic knowledge, skills and attitude needed for future work in science and science related fields boil down to adequate teaching and learning of science. Akinbobola (2011) reported that a critical look at the contents of Physics curriculum in Nigeria indicates that the teacher-centered approaches are not relevant and appropriate to promote efficient learning of the content of the programme. Also Adegbola (2016) reported that effective teaching and learning largely depends on the varieties of methods adopted by a teacher.

The persistent decline in students' performance in Physics is not only frustrating to the students and their parents, its effects are equally grievous on the society. Therefore, the use of appropriate teaching method could help to curb the ugly trend of poor performance in Physics in secondary schools. To maximize the performance and achievement of students in Physics classes, there is need to adopt practical approaches to the teaching and learning of the subject. The allocation of marks to theoretical and practical aspects of Physics in WAEC and NECO examinations is a clear evidence that it will be very difficult for a student to make a credit pass in Physics if the student performs poorly in practical aspect of the examination. Therefore, proper exposure of students to practical works in Physics in secondary schools is inevitable.

Consequently, effort should be made by Physics teachers to facilitate teaching and learning of Physics with practical activities which will help the students to acquire series of process skills such as observing carefully, classifying, interpreting, predicting event, designing experiments, reporting completely and accurately. Lack of proper exposure to practical activities contribute to the poor trend of performance in Physics in secondary schools. Practical activities are very important to the teaching and learning of Physics to tackle the current mass failure in Physics examinations in secondary schools. Afemikhe and Imobekhai, (2014) opined that it is expected that emphasis should be on engaging students in experimentation, questioning, discussion and problem solving.

Physics instructions should actively involve the students to construct their own knowledge by gainfully engaging the students with practical activities in laboratory. Learning of Physics will not be completed if practical activities are not properly taken care of. If Physics is to be learned effectively, it must be experienced and close to the students through practical activities. Activity-based method of teaching which is student-centered would give room for students' active participation during the Physics practical lessons. According to Jegede (2016), students by nature are curious. They are seen active in the learning process in which they are continually enquiring, testing, speculating and building their own personal constructs of knowledge.

From personal experience of the researchers, it has been observed that in some secondary schools, the time allocated to Physics on the school timetable is not enough to accommodate laboratory activities. As a result of this, Physics teachers in such schools focus attention on completing the scheme of work without making provision for laboratory activities. According to Boyo (2011), some Physics teachers pay little or no attention to laboratory practical activities. In this situation, the ample opportunity needed by the students to develop new content, knowledge, techniques and approaches to scientific activities and exploration is not made possible.

These shortcomings in Physics practical activities are contributing to the poor performance of students in Physics. There is therefore need to critically look for more suitable and appropriate methods of exposing students to practical works in Physics regularly with the aim of discouraging the teacher centered teaching method that characterized the teaching of Physics practical in secondary schools and at the same time overcome the challenge of time constraint which makes Physics teachers to focus attention on completing the scheme of work without making provision for laboratory activities; hence the need for virtual laboratory instructional strategy.

One of the activity based and students-centered instructional strategies is Virtual Laboratory Instructional Strategy (VLIS) which is being investigated in this study. Activity based and students centered instructional strategies can attract and retain students in Physics classes by making lessons active, relevant, student oriented and participatory. Virtual Laboratory Instructional Strategy (VLIS) is a computer-based instructional strategy made up of three components: text, video and simulated experiment. The text section exposes the students to the title, aim, theory, apparatus and procedures of the experiments. The video section exposes the students to the steps in carrying out the experiments via video. The simulated experiment is a section where students carry out or perform experiments in virtual environment using computer program.

Virtual laboratory is a virtual studying and learning environment with the aim of developing laboratory skills of students by stimulating the real laboratory. It is a computer-based activity where students interact with experimental apparatus via a computer interface. It provides students with tools, materials and laboratory sets which are electronically programmed in computer to perform experiments anywhere and anytime (Babateen, 2011). Virtual laboratory makes students become active in their learning, provide opportunities for students to understand difficult concepts more easily. Virtual laboratory increases motivation and desire for lessons and laboratory activities in the process of learning (Pyatt and Sims, 2012). Gambari, Falode, Fagbemi, and Idris (2013) in their study on efficacy of virtual laboratory on the achievement and attitude of secondary school students in Physics practical reported that the application of the virtual laboratory had positive effects on students' achievements, retention and attitudes when compared to physical laboratory method.

Virtual Laboratory allows the learner to control and interact directly with the objects within the virtual environment as well as to experience total immersion in the case of immersive systems, allowing him or her to not just view but also experience the environment. This technology suggests the potential for an entirely new form of experiential learning. Such control and interaction, together with free exploration also provide a greater sense of empowerment, which makes a virtual environment very well suited for the learning problems that need to engage learners to learn through learner-centered activities. According to Burns (2012), an immersive environment allows learners to be totally immersed in a simulated environment while experiencing it as real. Immersive environments can offer learners rich and complex content-based learning while also helping learners hone their technical, creative, and problem-solving skills.

Virtual laboratory instructional strategy supports the philosophy of pragmatic learning theory. It provides exploratory learning environments in which students can learn through experimentation by manipulating the virtual objects. This virtual experience supports the pragmatist point of view which emphasizes that understanding is tracked by experience.

With virtual laboratory instructional strategy, the challenge of time constraint can be overcome by using devices such as iPad, iPhone, android phone and smart phone which are portable enough to be carried about. If virtual laboratory is installed on any of these devices, students can perform experiment anywhere any time. Installation of virtual laboratory on these devices would enhance laboratory skills and at the same time permit students to learn at their own pace.

Attitude affects academic performance. If it is positive, it enhances academic performance but if it is negative it brings about poor academic performance. Fakeye (2010) states that attitudes are positive or negative feelings that an individual holds about objects or ideas and the achievement of any learner will to a great extent depend on his/her attitude towards the learning materials. A positive attitude more often than not leads to a successful learning. Thus, students' attitude is one of the variables that affect the learning of Physics. This means that a favourable attitude could enhance performance in Physics while poor attitude of the students towards Physics may partly be responsible for their poor academic performance in the subject. The development of students' positive attitudes towards Physics as a school subject is one of the responsibilities of every Physics teacher. Without positive attitudes, students have little chance of learning proficiently, if at all learning will occur. Students' positive attitudes could be achieved through active involvement of the students in the learning process.

Physics practical is a sharpen tool for national technological advancement. It is therefore necessary for teachers to help the students to develop right attitude towards Physics practical. Relative to Physics, Godwin and Okoronka (2015) reported that a significant relationship exists between students' attitude and their corresponding academic performance in Physics. Right attitude is crucial to the understanding of concepts in Physics practical. With dynamism of science, an encouraging attitude is necessary in practical activities, attitude regulates the behaviour of the students in their availability, readiness for the subject and their interactive manner during the practical class. Attitude of the students towards Physics practical has a great consequence towards their performance. As a result of interactive and manipulative effects of apparatus by students in Physics practical activities using computer interface through virtual laboratory which is one of the modern teaching strategies of teaching science, the attitude of the students towards Physics as a science subject can be improved.

### **Purpose of the study**

The purpose of this study was to investigate the effects of virtual laboratory instructional strategy on students' performance and attitude towards Physics practical in secondary schools. Specifically, the study intends to find out students' performance and attitude towards Physics practical when exposed to virtual laboratory instructional strategy.

### Research Questions

The study answered the following questions:

1. what is the performance of the students in Physics practical in the two groups before and after treatment?
2. what is the attitude of the students towards Physics practical in the two groups before and after treatment?

### Research Hypotheses

The following null hypotheses were generated for the study:

**H<sub>01</sub>:** There is no significant difference in the students' attitude towards Physics practical using virtual laboratory instructional strategy before and after the treatment.

**H<sub>02</sub>:** There is no significant difference in the students' performance mean scores in Physics practical using virtual laboratory instructional strategy before and after the treatment.

## II. METHODOLOGY

### Research Design

This study adopted quasi-experimental design of the pre-test, post-test and control group. The design is represented schematically as follows:

G <sub>1</sub> :	O <sub>1</sub>	x <sub>1</sub>	O <sub>2</sub>
G <sub>2</sub> :	O <sub>3</sub>	x <sub>2</sub>	O <sub>4</sub>

Where

G<sub>1</sub> - Experimental group

G<sub>2</sub> - Control group

O<sub>1</sub>, and O<sub>3</sub> are the pre-test observations

O<sub>2</sub>, and O<sub>4</sub> are the post-test observations

x<sub>1</sub> - Treatment for experimental group (Virtual Laboratory Instructional Strategy)

x<sub>2</sub> - Treatment for control group (Conventional laboratory Strategy)

### Population, Sample and Sampling Technique

The population for this study consisted of all Senior Secondary two (SS II) Physics students in Osun State. The Senior Secondary two (SS II) students were considered appropriate for this study because they would have been exposed to a considerable knowledge of Physics in Senior Secondary one (SS I). The sample for the study consisted of 50 Physics students of Senior Secondary two (SS II) in two co-educational senior secondary schools in Osun State. The multistage sampling procedure was used to select the sample. Stage one involved the selection of two Local Government Areas from the three Senatorial Districts in Osun State using simple random sampling by balloting. The second stage involved the use of purposive sampling technique to select one secondary school with relatively-equipped Physics laboratory from each Local Government Area selected, and the third stage involved the use of students in an intact class of an arm randomly selected from each school considered.

### Research Instruments

Two instruments were used for the study. The two instruments were Physics Practical Test (PPT) and Physics Practical Attitude Scale (PPAS). PPT was a practical test consisting of two parallel tests (alternative A and alternative B) adapted from West African Examination Council past examination papers. There were two practical tests in each alternative. Each of the tests carries 25 marks, making the maximum score obtainable to be 50 marks for each alternative. Alternative A was used for pre-test and Alternative B was used for post-test. The Physics Practical Attitude Scale (PPAS) was developed to measure the attitude of students towards Physics practical. The PPAS had two sections A and B. Section A consisted of students' personal bio-data such as name of school, gender, age range and class while section B consisted of 40 items-questionnaire intended to measure students' attitude towards Physics practical. The PPAS was structured in 4-points Likert scale: Strongly Agree (SA) – 4 points, Agree (A) – 3 points, Disagree (D) – 2 points and Strongly Disagree (SD) – 1 point. Each respondents was made to tick appropriate options, the responses were collated and scored for data analysis.

### Validity of Instruments

The face and content validity of the instruments were carried out by experts in Physics education, Test, Measurement and Evaluation and Guidance and Counselling. The reliability of PPT was determined by test re-test method. The two sets of results were collated and analyzed using Pearson Product Moment Correlation Analysis. The reliability coefficient of 0.82 and 0.80 were obtained for

alternative A and alternative B of PPT respectively, while 0.73 was obtained for PPAS using Cronbach’s Alpha. These values were regarded as high enough to be used for the study.

**Data Analysis**

The data collected were collated and analyzed. The general questions were answered using descriptive statistics of mean, standard deviation and bar chart. The hypotheses generated were analyzed using t-test. The hypotheses were tested at 0.05 level of significance.

**III. RESULTS**

**Question 1**

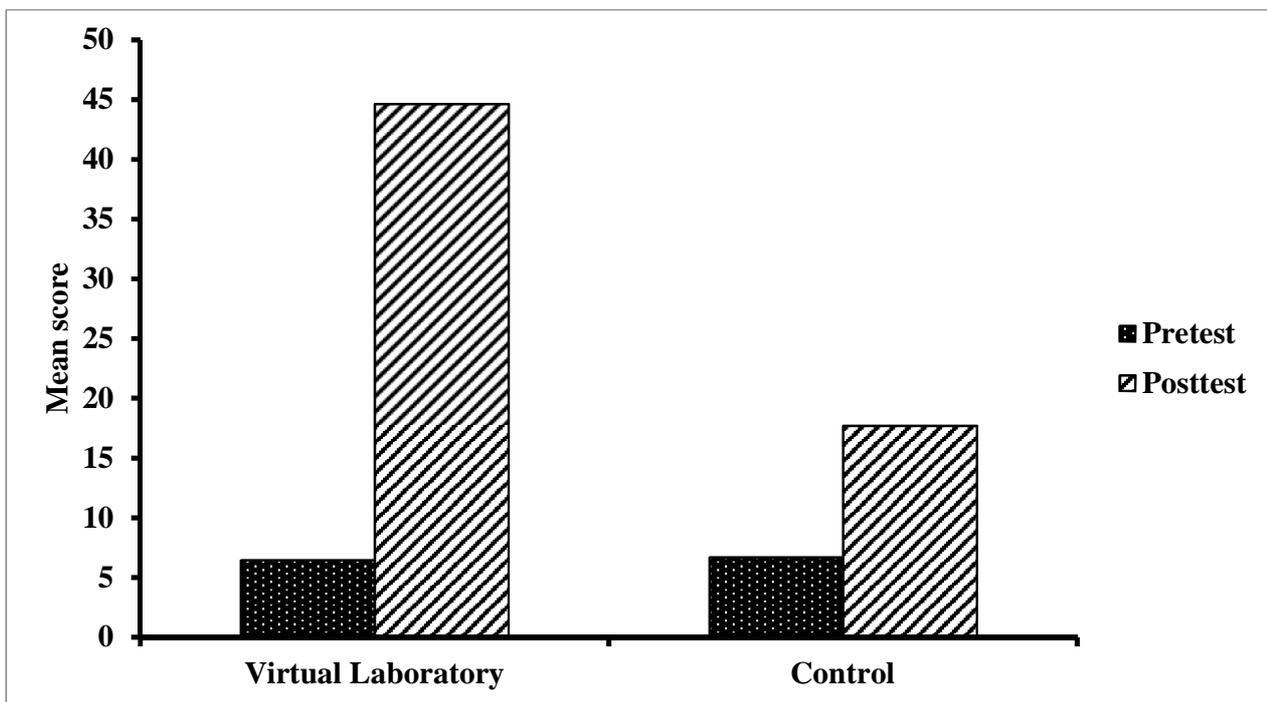
What is the performance of the students in Physics practical in the two groups before and after treatment?

In order to answer the question, mean scores of performance of the students in Physics practical in the two groups before and after treatment were computed and compared. The result is presented in Table 1.

**Table 1: Performance of the students in Physics practical in the two groups before and after treatment**

<i>Group</i>	<i>N</i>	<i>Pre-test</i>		<i>Post-test</i>		<i>Mean Difference</i>	
		<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>		
Virtual Laboratory	20	6.45	1.76	44.65	5.12	38.20	
Control	30	6.70	2.25	17.70	3.53	11.00	
Total	50						

The performance of the students in Physics practical in the two groups before and after treatment are further depicted in Figure 1.



**Figure 1: Bar chart showing performance of the students in Physics practical in the two groups before and after treatment**

**Question 2**

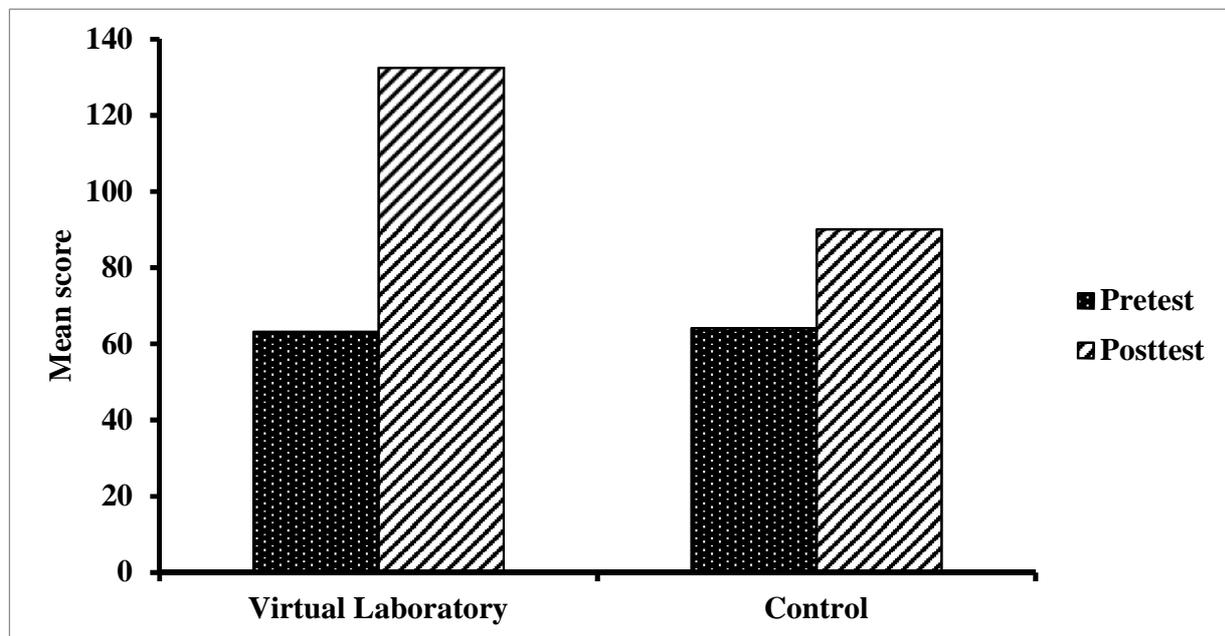
What is the attitude of the students towards Physics practical in the two groups before and after treatment?

In order to answer the question, mean scores of attitude of the students towards Physics practical in the two groups before and after treatment were computed and compared. The result is presented in Table 2.

**Table 2: Students’ attitude towards Physics practical in the two groups before and after treatment**

Group	N	Pre-test		Post-test		Mean Difference
		Mean	SD	Mean	SD	
Virtual Laboratory	20	63.20	4.77	132.56	9.04	69.36
Control	30	64.21	6.08	90.10	8.77	25.89
Total	50					

The attitude of students towards Physics practical in the two groups before and after the treatment are further depicted in Figure 2.



**Figure 2:** Bar chart showing attitude of the students towards Physics practical in the two groups before and after treatment

**Testing of Hypotheses**

**H<sub>01</sub>:** There is no significant difference in the students’ attitude towards Physics practical using virtual laboratory instructional strategy before and after the treatment.

In testing the hypothesis, scores of students’ attitude towards Physics practical using virtual laboratory instructional strategy before and after the treatment were computed and compared for statistical significance using t-test statistics at 0.05 level of significance. The result is presented in Table 3.

**Table 3: t-test of students’ attitude towards Physics practical in virtual laboratory group before and after treatment**

Variable	N	Mean	SD	df	t <sub>cal</sub>	P <sub>value</sub>	Decision
Pretest-Attitude	20	63.20	4.765	19	56.330*	0.000	Significant
Posttest-Attitude	20	132.56	9.040				

\* p<0.05

Table 3 showed that the effect of the treatment on students' attitude towards Physics practical was statistically significant at 0.05 level ( $t=56.330, p<0.05$ ). The null hypothesis is rejected. It implies that there was significant difference in the students' attitude towards Physics practical using virtual laboratory instructional strategy before and after the treatment.

**H<sub>02</sub>:** There is no significant difference in the students' performance mean scores in Physics practical using virtual laboratory instructional strategy before and after the treatment.

In testing the hypothesis, scores of students before and after being exposed to virtual laboratory instructional strategy were computed and compared for statistical significance using t-test statistics at 0.05 level of significance. The result is presented in Table 4.

**Table 4: t-test showing students' performance before and after being exposed to virtual laboratory instructional strategy**

Variable	N	Mean	SD	Df	t <sub>cal</sub>	P	Decision
Pretest	20	6.45	1.76	19	35.292*	0.00	Significant
Posttest	20	44.65	5.12				

\*p<0.05

Table 4 showed that the effect of the treatment on students' performance in Physics practical was statistically significant at 0.05 level ( $t=35.292, p<0.05$ ). The hypothesis is hereby rejected. This implies that there was significant difference in the students' performance mean scores in Physics practical using virtual laboratory instructional strategy before and after the treatment.

**Discussion**

Table 1 revealed that Physics students in the virtual laboratory instructional strategy group had mean score of 6.45 while those in conventional laboratory strategy group had mean score of 6.70 prior to treatment. This implies that the performance of the students in Physics practical in the two groups before treatment were generally low. On exposure to treatment, students taught using virtual laboratory instructional strategy had the higher mean score of 44.65, while the students in the conventional laboratory strategy group had the mean score of 17.70. This implies that the performances of the students in Physics practical in the two groups after treatment were high.

Figure 1 showed the students' performance mean scores in Physics practical in the two groups before and after treatment. The Bar Chart showed that students taught using virtual laboratory instructional strategy performed better than the students exposed to conventional laboratory strategy. The comparison between the pre-test and post-test mean scores in the two groups showed that the post-test mean scores are higher than the pre-test mean scores. This implies that the treatment had positive effect on students' performance in Physics practical. The Bar Chart further showed that virtual laboratory instructional strategy is more effective for enhancing students' performance in Physics practical.

Table 2 revealed that Physics students in the virtual laboratory instructional strategy group had mean scores of 63.20 while those in the conventional laboratory strategy group had mean scores of 64.21 prior to treatment. This implies that the attitude of the students towards Physics practical in the two groups before treatment was unsatisfactory. On exposure to treatment, students taught using virtual laboratory instructional strategy had the mean score of 132.56 while the students in the conventional laboratory strategy group had the mean score of 90.10. This implies that the attitude mean scores of the students towards Physics practical in the two groups after treatment were high.

Figure 2 showed the students' attitude mean scores towards Physics practical in the two groups before and after treatment. The Bar Chart showed that the post-test attitude mean score of students taught using virtual laboratory instructional strategy is higher than that of the students exposed to conventional laboratory strategy. The comparison between the pre-test and post-test attitude mean scores in the two groups showed that the post-test attitude mean scores were higher than the pre-test attitude mean scores. This implies that the treatment had positive effect on students' attitude towards Physics practical. The Bar Chart further showed that virtual laboratory instructional strategy is more effective for enhancing students' attitude towards Physics practical.

Table 3 showed that there was significant difference in the students' attitude towards Physics practical using virtual laboratory instructional strategy before and after the treatment.

Table 4 showed that there was significant difference in the students' performance mean scores in Physics practical using virtual laboratory instructional strategy before and after the treatment.

Results indicated significant effects of treatment on students' performance and attitude in Physics practical. The results showed that virtual laboratory instructional strategy has potential of improving students' learning outcomes in Physics practical. This finding provides empirical support to earlier finding of Gambari *et al* (2013) which established that virtual laboratory improves students' achievement and attitude in Physics practical.

#### IV. Conclusion

This study shows that virtual laboratory instructional strategy is an effective instructional strategy for teaching Physics practical in secondary schools. It had positive effect on students' performance and attitude towards Physics practical.

#### V. Recommendation

Based on the findings of this study, it was recommended that Physics teachers should make use of virtual laboratory instructional strategy to improve students' performance and cultivate students' positive attitude towards Physics practical in secondary schools.

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# Performance Of Micro And Small Enterprises In The Supply Of Goods And Services To Public Institutions In Kenya

(A Survey of Baringo County)

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## *Abstract*

The Government of Kenya (GoK) has made effort to strengthen the small business sector yet micro and small enterprises (MSEs) are perceived to have registered weak links with all potential customers. The purpose of this study was to establish whether MSEs could satisfactorily supply requirements to public institutions. It specifically sought to establish whether MSEs could assist public institutions achieve procurement objectives; identify attributes that could make MSEs' good suppliers and determine the nature of relationship between Suppliers' attributes and their satisfactory performance. The study was conducted in sample public institutions in Baringo County in Kenya. Descriptive survey research design was adopted on a target public institutional population of 1,600 in the county. Data was collected by use of a questionnaire on study sample of 300 respondents and analyzed by use of descriptive and inferential statistics and subjected to Chi-Square test. The study rejecting the null hypothesis that 'There is no relationship between supplier attributes and satisfactory performance by suppliers' concluded that Micro and Small Enterprises were potential sources of supply that may compete favorably with other sources of items needed in the public institutions; may make satisfactory supply of goods and/or provision of services to all clients depending on the prevailing situations of resources, skills and locations; were capable of assisting public institutions to achieve the procurement objectives of acquiring right quality items in right quantities at right prices delivered at the right time and with the desired levels of service; may be made the preferred suppliers of public institutions. The study recommended that the procurement procedures used should encourage reaching out to all interested potential sources of supply irrespective of size of enterprise and scales of business operations. In order to obtain requirements from the right sources, the institutions should consider competences of the suppliers Enterprises that are to be engaged in the supply of requirements to public institutions should demonstrate flexibility and high speed of response In order to obtain requirements more competitively, public institutions should employ procurement procedures that enable reaching out to all interested potential suppliers in every procurement for which their businesses were suited. It is also recommended that resources, skills and location should be taken into consideration when developing criteria for evaluating potential sources of supply in the procurement process.

**Index terms-** Micro and Small Enterprises, Public Institutions, Procurement

## I. INTRODUCTION

World over, public procurement is central to the growth of all businesses but more so to Micro and Small Enterprises (MSEs) of an average of approximately 70% and 30% developing and developed countries respectively. About 35% of developed and 70% of developing countries' annual budgets are used in public procurement spending (World Bank, 2016; Saxena, 2012). MSEs are among the major players in social and economic development through creation of new jobs and subsequent growth in GDP. (Ngugi, 2012; Kazungu and Panga, 2015; Kazungu, Ngugi, Rotich and Odhiambo, 2018).

The rapid growth of Chinese economy is 98% owed to MSEs creating 80% jobs. MSEs account for 95% of firms, 65% of job creation and approximately 55% of government GDP in Nigeria (Chen, 2013; EC, 2015; WB, 2016; Peprah, Mensah, and Akosah, 2016). In Kenya MSEs account for 98% of all businesses creating 30% of jobs annually and accounting for 3% to Kenya's GDP. (Hansen, Kimeria, Ndirangu, Oshry, and Wendle, 2012; Chen, 2013; World Bank, 2016). The Government of Kenya (GoK) has been spending substantial amounts of money on programmes aimed at promoting micro and small enterprises (MSEs). The anticipated benefits included; creation of demand as well as supply for the domestic commodities; increased participation by indigenous people in commercial activities; increased savings and investments; and better utilization of local resources (GoK, 1992). The Government has mainly concentrated in improving infrastructural facilities in order to create enabling environment for business startup and growth (GoK, 2004). On their part, MSEs were expected to exploit the existing opportunities to promote their performance in the supply of goods and or provision of services.

Some countries have made efforts to reform and restructure their procurement policies that create preferential treatment so as to strengthen the involvement and contribution MSEs in public procurement (Obanda, 2011; Sanchez, 2011). For example, China, Ghana and Tanzania enacted enabling legislations that require public institutions procurement to help, develop and promote MSEs through according first and preferential considerations in procurement of goods and services (Kazungu and Panga, 2015; Peprah, et al., 2016). The systems of Public Procurement in Kenya has progressively improved from a rudimentary system with no regulations in the 1960s, through regulations by Treasury Circulars in 1970s, 80s and 90s to the current public procurement legislations and regulations (Public Procurement Oversight Authority (PPOA), 2009).

The importance of the informal and later the small business sector dominated the debates on employment creation in Kenya and other developing countries. This was because MSEs have been considered potential sources of new jobs and good avenues for technological innovation and rapid acquisition of business management skills. However, industrial development policies, historically favored large businesses in Kenya, providing them with more conducive business environment than the MSEs. Consequently, Kenya's output continued to be dominated by large enterprises with the highest recorded contribution to the gross domestic products. Besides, Kenya's weak indigenous technological base forced the country to rely heavily on technologically superior items from foreign countries.

The Government recognized development of MSEs as the means of strengthening the country's weak economy. In this regard, partnership between indigenous and foreign entrepreneurs was encouraged for the purpose of transferring both management and technological skills. This strategy also helped in restructuring business ownership in favor of indigenous entrepreneurs who were to graduate into competitive business system. In this regard, indigenous entrepreneurs would participate in commercial activities on equal footings with foreign entrepreneurs. Inter-firm linkages was also encouraged as the means of expanding market for the MSE products, hence public institutions were urged to develop partnership with MSEs (GoK, 1992, 2005, 2008, 2009).

It was envisaged that such partnerships will enable public institutions increase their access to quality supplies which is critical to social – economic growth and productivity. This would translate into increased savings and expedited procurement process. Since the inception of these partnerships, public institutions in Kenya have developed governance and accountability mechanisms that facilitate greater participation of micro and small enterprises in ensuring transparency and accountability in public resource procurement (GoK, 2008). This is imperative considering the fact that the bulk of government funding translates into the procurement of supplies used in public institutions. The ultimate objective is to ensure that these funds are properly utilized and enrich the internal economy by strengthening the micro and small enterprises which provide these supplies.

The establishment of the Public Procurement Oversight Authority (PPOA) was pegged on this objective of accountability, transparency, avoidance of conflict interest, corporate social responsibility and recognition that a public office is a public trust (PPOA, 2009).

In most countries, governments subsidize utilities, and thus the price and quality of these utilities is paramount. In both industrial and developing countries, the procurement function is effectively the major conduit for the distribution of public utilities. These utilities affect people's life chances as adults in terms of their earning ability as well as mobility. Performance of micro and small enterprises in the supply and provision of services to public institutions, therefore, influences the future distribution of income, wealth and status in society.

### **Statement of the problem**

There has been growing interests in developing micro and small enterprises (MSEs) owned by Kenyans in order to reduce large volumes of purchases made by consumers from enterprises whose capital structures tended to be foreign dominated. In the recent past, the Government of Kenya (GoK) with the help of some development partners designed and implemented a number of promotional programmes aimed at increasing the participation of indigenous people in commercial activities. Specifically, inter-firm linkages in terms of sub-contracting had been encouraged to stimulate supply and demand of the locally produced commodities.

It has been widely expected that the indigenous entrepreneurs would take up the opportunities to graduate into competitive suppliers of commodities to all potential customers. However, the perceived weak links between MSE and all potential customers except individual consumers indicated a continued marginalization of indigenous entrepreneurs in the rapidly expanding domestic market (Barclay, 2012). The inherent weaknesses of the small business sector in terms of inadequate finance, outdated business management skills and inappropriate technologies also contributed to the marginalization of MSEs. It remains unknown why despite the Government of Kenya's policy interventions to help MSEs; large enterprises with high levels of foreign capital investments have continued to dominate the expanded domestic market as suppliers of commodities to large scale consumers including public institutions (Peprah et al., 2016; Hamisi, 2011; Ng'ang'a, 2011 ). To this extent, MSE suppliers remain unlikely to gain long term advantages over competition through better terms that could attract large consumers of commodities. Besides, many potential customers continue doubting whether MSEs had the required capacity and appropriate technology to make them compete favorably with large scale suppliers. This implies that the country's economy continues to be drained by foreign investor through capital flight resulting from such activities as repatriation of profits and transfer pricing.

The purpose of the study was therefore to investigate the performance of micro and small enterprises in the supply of goods and or the provision of services to public institutions in Kenya. The study sought to find out whether procurement agents have the capability of selecting the right suppliers of requirements. Furthermore, it endeavored to find out the attributes required by micro and small enterprise to make them preferred suppliers of requirements for large customers.

The study was guided by the following specific objectives: To establish whether micro and small enterprises were capable of making satisfactory supply of commodities to public institutions; identify the supplier attributes that could make micro and small enterprises preferred suppliers of requirements to public institutions; and determine the nature of relationship between supplier attributes and satisfactory performance by suppliers. The study also sought to test the null hypothesis that "There is no relationship between supplier attributes and satisfactory performance by suppliers"

Business dealings with unacceptable suppliers always result in extra costs due to unsatisfactory performance in terms of poor customer care service. In this regard, purchasing and supply executives in the institutions generally avoid dealings with unacceptable suppliers who should be substituted by the preferred suppliers. Acceptable suppliers who are capable of meeting operational and strategic needs as specified in supply contracts may be identified through competitive bidding techniques.

The exceptionally good suppliers anticipate the operational and strategic needs of customers since they react to the unforeseen needs such as sudden accelerated or decelerated volumes of business or changes in specifications and any other legitimate requests made by customers. They provide technical assistance and other expertise when requested or when they believe it would assist the customer better. They also warn ahead of time, of any material shortages, industrial strikes or anything else that may affect the operations of customers (Lenders et al, 2002).

The buyers "Perception of suppliers" ability to meet satisfactory quality, quantity, price, delivery time and customer care service objectives generally governs the choice of the preferred suppliers. The supplier attributes that relate to these purchasing and supply management objectives include financial strength, technical strength, business management skills, physical facilities and location of the supplier. Changing a supplier from "acceptable" to "good" requires both buyer's and supplier's effort to obtain rewards of mutual break through. In this context, most MSE suppliers are viewed as mere acceptable suppliers who provide levels of performance that can be matched easily and have no strong basis for competitive edge. MSE suppliers may be moved from mere acceptable to good suppliers through a public-private partnership move.

## II. REVIEW OF LITERATURE

Performance of MSEs is of paramount importance since it constitutes a large portion of domestic service and goods market in majority of developing countries (Mchopa, Njau, Ruoja, Huka and Panga, 2014). Purchasing and supply functions in governments and public service are normally carried out through the institutions established to provide essential services to members of the public. Such services include education, healthcare services, security, and other services aimed at enhancing quality life of citizens. Public institutions in this context include Central Government and its Departments, Local Authorities, State Corporations, the Central Bank of Kenya, Cooperative Societies, Colleges, Schools, Public Universities, and all institutions established under voluntary contributions for the general welfare of public community (GoK, 2008)

Purchase *et al.*, 2009 asserts the urgent need to involve MSEs in public procurement so as to harness the massive benefits that would accrue as a result of such partnerships. The authority to use public funds in public institutions is established by law, regulations or statutes. The personnel who undertake purchasing and supply activities in public institutions are expected to observe the appropriate legal structure under which such functions are performed (Leenders, et, al 2002). Purchasing and supply in public institutions is a stewardship function that involves hired administrators who spend money derived mostly from tax in support of activities which the employers undertake on behalf of the clients.

The Public Procurement Directorate (PDD) has already formulated and implemented various strategies in order to create greater public procurement awareness throughout the Central Government and other organizations. It has organized Seminars and Workshops for Training Officers and operatives through the technical and financial assistance received from the World Bank. The need for transparency and proper accountability was emphasized in the trainings and workshops and it is hoped this will go a long way in eradicating corrupt practices as well as developing capacity and sustainable human resource.

The Public Procurement Reforms brought about by the new Regulations need political endorsement and commitment through legislation, organization and support. Pursuant to the Regulations established under Legal Notice No. 51 of 2001, resulting to the current public procurement and assets disposal legislation. Puddephatt & Kaspar (2012), asserts that a frail national regulatory framework accounts for most challenges facing MSMs in public procurement. There is need for a strong legal, legislative and regulatory framework institute the foundation for transparent and competitive public procurement process. It is however important to ensure that such frameworks do not inadvertently impact negatively on MSEs as opposed to the envisaged benefits such as reduction in red tape and value of money among others (Perry, 2011).

The World Bank is funding the Public Procurement Reforms, through the Public Sector Reforms Co-coordinating Unit (PSRCU). The objective of the public procurement component is to improve transparency, fairness, and probity and enhance capacity and thus curb corruption in public procurement a pandemic that Mwemezi (2013) and Badenhorst-Weiss (2012), posits that it totals 200 billion USD per year or constitute about 3.5% of the world procurement spending.

Systematic identification of both potential and actual suppliers with a view to selecting the one with the most appropriate terms forms the basis of creating sound suppliers base in the organizations. The units which make supplier selection decision in Public Institutions comprise the buyers, users, influencers, gatekeepers, and chief decision makers whose decisions should fit the risks profile of the organization concerned. Risk in purchasing and supply is higher with unknown materials, parts, equipment, and increased value of transaction, hence the perceived high risk of placing business orders with unknown suppliers (Leenders et al, 2002). In Kenya the Ministry of Trade whose MSEs operate has the mandate of advocating and ensuring through other institutions that MSEs are supported. Government set affirmatively at least one in every 10 State tenders for MSEs and the youth who control a huge chunk of Kenya's MSEs. Despite such interventions, MSEs face challenges in accessing public procurement opportunities (Ng'ang'a, 2011).

Involving MSEs in procurement process leads to increased competitiveness of the procurement process which is likely to results to better value for procurement funds to public institutions and resultant benefits to the economy (Memba, Gakure & Karanja, 2012). Selection of the right supplier is a crucial component of purchasing and supply function since it ensures the right quality on time at the right price with the desired levels of service. In this regard, a search for the new sources of supply requires adequate market research which may be conducted informally as part of routine

purchasing and supply activities involving discussions with sales representatives; visiting exhibitions; reading trade journals; or investigating a market before placing orders. Supply market research may as well be conducted formally as a support function to purchasing and supply management by full time research staff. However, the decision to place a certain volume of business with particular suppliers would depend upon reasonable criteria that reflect buyers' perception of suppliers' ability to meet satisfactory quality, quantity, delivery price and service objectives of purchasing and supply management in the public institutions. (Leenders et al, 2002).

Most formal supplier rating schemes track supplier performance on quality, price, delivery time and customer care services. In many organizations, only certified suppliers are considered for future businesses and extensive evaluation on quality and other dimensions of performance attributes are carried out accordingly. However, a critical factor that all buyers would examine thoroughly is quality capability of a potential supplier MSEs included. Buyers believe that no action other than quality management may be taken so as to improve performance; increase profits; and reduce costs with minimum efforts. A good quality management approach is where the organization focuses on quality based on the participation of all its members and carried out as a long term success through customers' satisfaction. Depending on the nature and volume of transactions, offers received from suppliers should be evaluated for both technical and commercial qualifications (GoK, 2002). Technical evaluation may be carried out by a technical evaluation committee appointed for that purpose whereas commercial evaluation may be carried out by a committee composed of buyers (Leenders et al, 2002).

Uncertainty makes MSEs to have small customer base and low levels of capital investments leading to high levels of flexibility. Innovation of new products is key to the success of new enterprise whereas evolution makes MSEs to be unique suppliers with shorter response time to needs of customers. MSEs also have faster and efficient internal communication systems required for emergency purchasing and supply needs in public institutions. Obanda (2011) posits the need for MSEs to be techno-savvy by utilizing ICT to harness quick access to information on public procurement. Enterprises in this category have shown loyalty and service demand deemed impossible by large enterprises, making them more ideal for emergency procurement that tend to dominate buying in public institutions (Leenders et al, 2002). MSEs tend to be more local and handy for the items in which flexibility, speed of response and availability are more important especially where additional cost that a customer has to bear while waiting for delivery or looking for alternatives is significant. Because of their sizes and geographical locations, MSEs have greater flexibility in meeting 'buyers' needs and they tend to fill market niches that large enterprises have chosen not to cover (Fearon et al, 2000).

Majority of MSEs operate in the service sector where they have competitive edge due to personalized tailor made activities suited to their flexibility and responsiveness. Since most services involve consumption at the point of purchase, MSEs as local suppliers may respond more positively to the unique demand of public institutions. They are considered more dependable for customer made requirements given that public institutions generally purchase considerable amounts of construction materials. Peprah *et al.*, (2016) in their study on MSEs accessibility to public procurement established that MSEs contribute enormously to economic development when procurement operating environment for MSEs favourable. He however found out that MSEs are yet to fully benefit from public procurement albeit frameworks established by procurement legislations. It is essential that MSEs possess majority of public procurement requirements alongside requisite resources, skills and competencies including modern production equipment's, machinery, experience in a various and specific fields and financial capability. This will ensure MSEs effectively participates in public procurement (Nicholas and Fruhmann 2014)

However, the performance of micro and small enterprises in the provision of requirements to public institutions has been hampered by economic recessions. Economic recessions have the potential impact on micro and small enterprises' efforts to keep afloat and be consistent in their pricing policies (I.M.F, 2009). The report suggested that micro and small enterprises design strategies to exit from financial, monetary and fiscal uncertainties. These strategies should be consistent across the board to avoid opportunities for financial and regulatory arbitrage. Medium term strategies should help establish a lasting framework of sound financial regulation, sustainable fiscal balance and price stability. To enhance performance of MSEs, there would also be a general need to upgrade developing countries Infrastructure also viewed as a challenge for MSEs since it can affect prospects of MSEs cost competitiveness (Olawale and Garwe, 2010).

Sandman (2009) established that MSEs face some important truths during economic recessions thereby hindering their performance are; many micro and small enterprises fear for the loss of their contracts; many of them loose new businesses due to increased costs of doing business and many of the micro and small enterprises face exceptional challenges (Kazungu, Ndiege, Mchopa, and Moshi, 2014). Though many of the micro and small enterprises involved in the supply of goods and or the provision of services to public institutions cut their budgets by about 10% during such times, it does not mean that the working environment is 10% more dangerous, but it does mean that the work environment is at least a little more dangerous. When they seek for a bigger budget, their goal is to improve performance. International Finance Corporation (2011), asserts the need to ensure access to funds for MSEs so as to expedite their contributions of MSEs in economic development and resultant contributions to employment and GDP. Indeed Wanjohi (2012) considers lack of access to credit as almost universal problem faced by MSEs, a problem that further affects the choice of technology which limits number of alternatives that can be considered by MSEs this makes such enterprises rely on cheap and inappropriate technology albeit their serious disadvantages. Going forward MSEs will need to ensure they growth and access to better public procurement through collaborations with larger and even foreign enterprises, this collaborations will also strengthen the entrepreneurial, financial and technical capability of MSEs (Abor and Quartey, 2010; Barclay, 2012).

### **III. RESEARCH DESIGN AND METHODOLOGY**

The study based on survey research design involved making testable proposition about the relationship between supplier's attributes and satisfactory performance, hence necessitating a hypothesis testing research that required careful approach not only to reduce biasness and increase reliability but also to allow drawing conclusion about causes (Kothari 2003). The target population was all the public institutions in Baringo County in Kenya. These institutions procure requirements using public funds. From the county records office, there are 1,600 public institutions in Baringo County of different categories. The respondents for this study were the procurement agents representing public institution in the procurement process.

Baringo county was selected the sampling unit and a complete list of all cases in the population was prepared in order to develop correct, reliable and appropriate sampling frame which had one thousand six hundred (1600) public institutions. Proportional Allocation Method was used in selecting number of public institutions in Baringo County to constitute a sample. This was found to be a suitable method since there was no serious difference in within stratum variance and sampling was simply to estimate number of public institutions which benefited from the services of MSEs (Kothari, 2003).

A sample was drawn from the sampling frame, taking into account the need for efficiency, reliability, representativeness and flexibility (Kothari, 2003). While determining the sample size, the proportion of public institutions which benefited from the services of micro and small enterprises was estimated. The level of confidence in the estimate was 95% while the margin of error that was tolerated stood at 5%. Providing an adjusted minimum sample size sample size of 300. Data was collected through self-administered questionnaires were delivered to the widely spread respondents whose responses were collected immediately in order to avoid contamination of answers through group discussion. Data was then analyzed using both descriptive and inferential statistics and subjected to the Chi-Square test. The research findings were presented using statistical tables, graphs, charts and statistical indices.

### **IV. DATA ANALYSIS, PRESENTATION AND INTERPRETATION**

#### **4.1. Respondents demographic characteristics**

The people in-charge of purchasing and supply management in public institutions participated in this study. Demographic characteristics relating to their age, sex experience and qualifications formed the basis for the descriptions about the workforce in public institutions.

One hundred and twenty respondents' volunteered information about their ages, majority of who were in the age bracket of between forty and fifty years. Majority of the public procurement officers were aged between 40 and 50 years old.

The information gathered on gender of workers revealed that there were more male than female procurement officers' employees in the workforce. Ninety six out of one hundred and twenty respondents (80% male, 17% women and 3% others) performing purchasing and supply functions in public institutions surveyed were male Employees.

Regarding work experience, responses on how long the workers had been engaged in the institutions to perform purchasing and supply functions was established majority of the officers had worked between 30-39 years.

Responses on qualifications of employees performing purchasing and supply functions in public institutions were 81% secondary education, out of which 26% were supply chain professionals.

## 4.2. Sources of Supply

One of the main tasks of this study was to establish the sources of requirement for public institutions. To accomplish this task, people in-charge of purchasing and supply units in public institutions were probed by means of questions which sought to establish types, sizes and competences of supply sources;

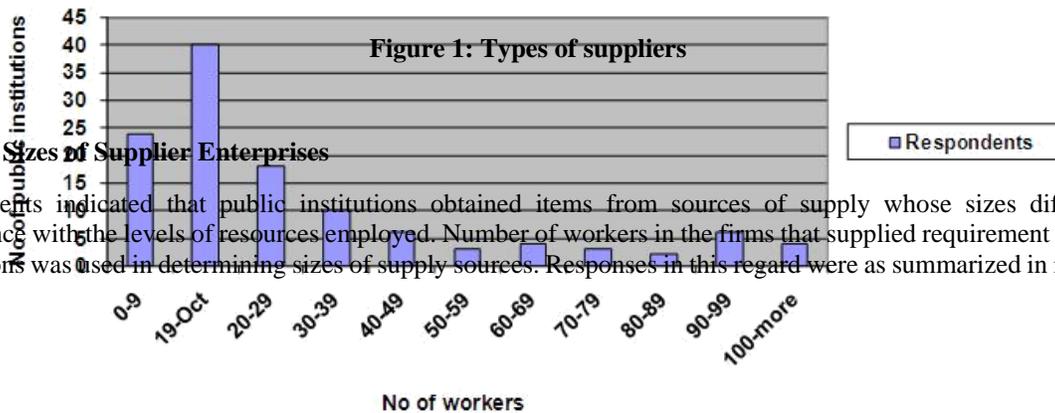
### 4.2.1. Types of Suppliers

Regarding types, respondents pointed out that public institution obtained requirement from two main types of suppliers, namely internal and external suppliers i.e. some institutions made what they required internally while others conveniently obtained their requirement from external sources of supply. Responses on the types of suppliers were as summarized in Figure 1.



### 4.2.2. Sizes of Supplier Enterprises

Respondents indicated that public institutions obtained items from sources of supply whose sizes differed in accordance with the levels of resources employed. Number of workers in the firms that supplied requirement to public institutions was used in determining sizes of supply sources. Responses in this regard were as summarized in in Figure 2.



**Figure 2: Number of workers in suppliers' businesses**

**4.2.3. Competences of Suppliers**

Sources of supply demonstrated different abilities in meeting procurement needs of public institutions. Responses on quality, quantity, delivery, price, and service competences of the suppliers were as shown in Figure 3.



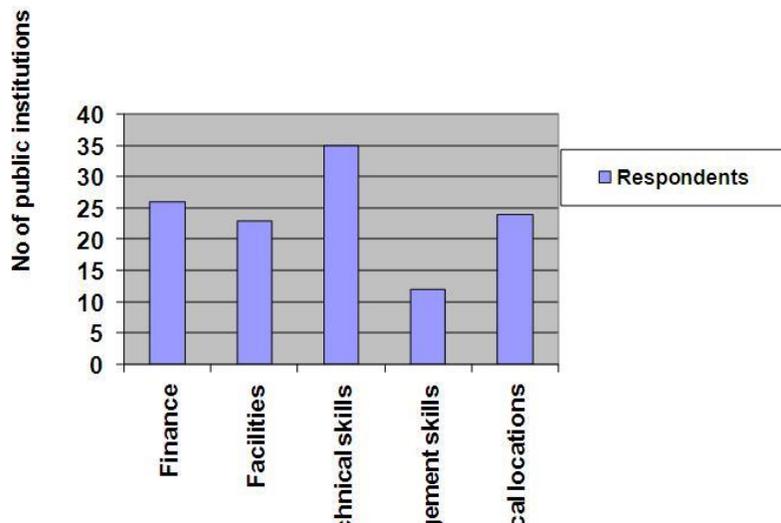
**Figure 3: Competences demonstrated by the supplier**

**4.3. Suppliers' Attributes**

This study also sought to establish the existence of attributes that made particular suppliers to perform more satisfactorily. In this regard, respondents were asked to identify the kind of attributes, the dominating attributes in particular business sector and the impact of attributes on competences of suppliers.

**4.3.1. The Kind of Attributes**

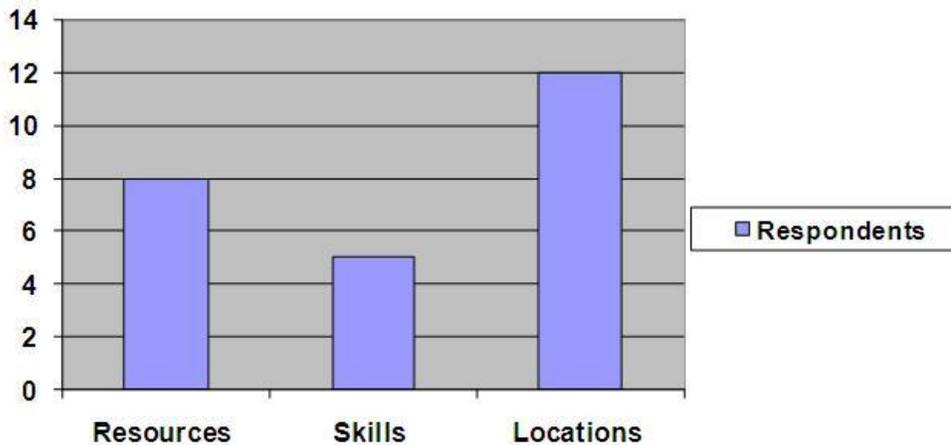
All incidences of satisfactory supply of goods and/or provision of services to public institutions were associated with the presence of particular attributes in the suppliers. Respondents identified the attributes that were associated with satisfactory performance as finance, technical skills, physical facilities, business management skills and geographical location of the suppliers as shown in in Figure 4.



**Figure 4: Kinds of attributes present in the suppliers**

**4.3.2. The Dominant Attributes**

Respondents showed that some attributes were more dominant in particular suppliers than in others. The highly dominant attribute in the suppliers from the small business sector was found to be 'location' while that dominating in suppliers from large business sector were 'resources' and 'skills' as shown in Figure 5.

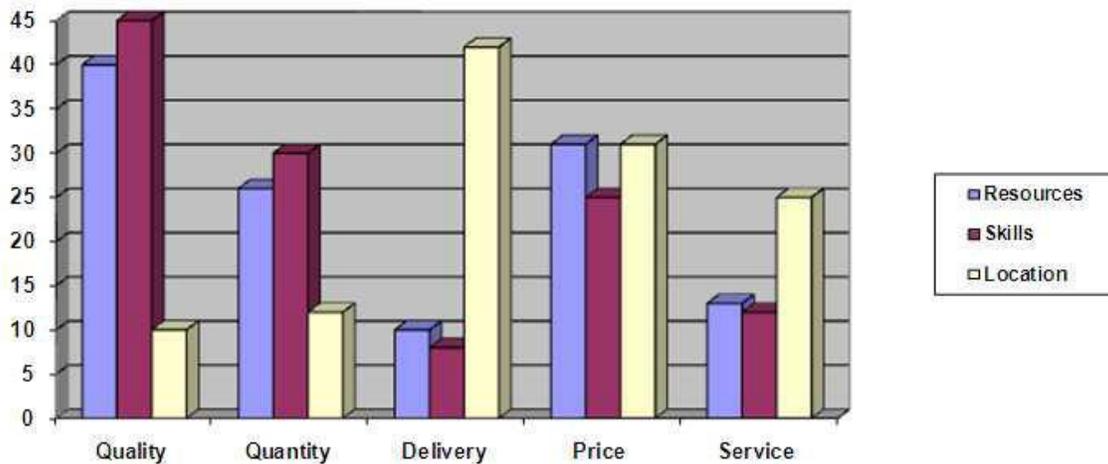


**Figure 5: Dominant attributes in small business suppliers**

**4.3.3. The Impact of Attributes on Areas of Competences**

Impacts of attributes were on quality, quantity, delivery, price and service competences of the suppliers. Responses on how different attributes created impact on quality, quantity, delivery, price and service competences of the suppliers were as shown in the composite bar graph below;

Responses showed that resources, skills and location created different levels of effect on competencies of suppliers in different public institutions. Resources and skills created more effect on quality, quantity and price performance in institutions while location (distance) created more impact on delivery, service and price performance of suppliers as shown in Figure 6.



**Figure 6: Effect of Attributes on Suppliers' Competences**

**4.4. Nature of Relationship between Satisfactory Performance and Attributes**

This study established the nature of relationship between satisfactory performance by suppliers and the attributes present in the suppliers. Information gathered on incidences of satisfactory supply of goods and/or provision of services to public institutions was analyzed to ascertain the association between the attributes and satisfactory performance by the suppliers.

Responses on the observed frequencies when satisfactory performance was associated with resources, skills and location of suppliers from both small and large business sectors were as shown in table 1.

**Table 1: Incidences When Satisfactory Performance was Associated with Attributes**

Attributes /Frequency	Resources	Skills	Locations	Total
Suppliers from small business sector	8	5	12	25
Suppliers from large business sector	41	42	12	95
Total	49	47	24	120

The expected frequencies when satisfactory performance was NOT associated with resources, skills, and location of suppliers from both small and large business sectors are shown table 2.

**Table 2: Incidences When Satisfactory Performance was Not Associated with Attributes**

Attributes /Frequency	Resources	Skills	Locations	Total
Suppliers from small business sector	10.2	9.8	5.0	25
Suppliers from large business sector	38.8	37.2	19.0	95
Total	49.0	47.0	21.0	120

**4.5. Testing the Hypothesis**

The significance of the association between satisfactory supply of goods and/or provision of services to public institutions with resources, skills, and locations of suppliers from both small and large business sectors was established through Chi-Square ( $X^2$ ) test. The value of Chi-Square( $X^2$ ) was computed using the observed and expected frequencies of incidences of satisfactory performance by the suppliers as shown in table 3.

**Table 3: Significance of the Association between Attributes and Satisfactory Performance by Suppliers**

Sources of Supply	Attributes	Frequencies		O-E	[O-E] <sup>2</sup> /E
		Observed [ O ]	Expected [ E ]		

Small Business Sector	Resources	5	10	-5	2.5
	Skills	8	10	-2	0.4
	Location	12	5	7	9.8
Large Business Sector	Resources	41	39	2	0.1
	Skills	42	37	5	0.7
	Location	12	19	-7	2.6

Value of Chi-Square[X<sup>2</sup>] was computed by summing up [O-E]<sup>2</sup>/E as shown below:

$$\sum [O- E]^2 / E = 16.1$$

The computed value of Chi-Square[X<sup>2</sup>] was found to be 16.1 for two degrees of freedom at five percent levels of significance. The table value of Ch-Square at 2 degrees of freedom at five percent levels of significant was found to be 5.991 for two degrees of freedom at five percent levels of significance. The calculated value was greater than the table value, indicating that the association between satisfactory supply of goods and provision of services to public institutions with supplier attributes was significant and not by chance.

## V. SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

### 5.1 Summary of Findings

The information gathered for the purpose of this study was carefully analyzed in order to establish the following; Nature of the workforce responsible for purchasing and supply functions in public institutions; Sources of the items used in public institutions; Attributes that enhanced competences of suppliers; and nature of relationship between attributes and satisfactory performance by suppliers.

Generally, the research established that, the mature nature of the workforce coupled with several years of hand-on experience gave an assurance that purchasing and supply personnel in public institutions were capable of selecting the right suppliers. They were capable of using skills and experience acquired through on-the job training to enhance competitive edge of public institutions and facilitate the development of appropriate business relationship with a wide range of suppliers from both small and large business sectors. The research also established that public institutions obtained requirements more often from micro and small enterprises. Finance, physical facilities, technical skills, business management skills and geographical location were found to be key attributes that enhanced performance of micro and small enterprises in the supply of requirements.

#### 5.1.1 Nature of the Workforce

The workforce responsible for purchasing and supply functions in public institutions was described as aging, inadequately trained, comprised workers with several years of hands-on-experience in purchasing and supply management, and was a demonstration of gender imbalance in the public sector. These descriptions were based on the research findings that: Many workers were aged forty five (45) years and above; A relatively low number of workers involved in purchasing and supply function of public institutions had relevant professional qualifications; Majority of workers performing purchasing and supply function in public institutions acquired skills and experience through on-the job training; and More male than female workers were undertaking purchasing and supply activities in the institutions.

Despite the above descriptions, the mature nature of the workforce coupled with several years of hand-on experience gave an assurance that purchasing and supply personnel in public institutions were capable of selecting the right suppliers. They were capable of using skills and experience acquired through on-the job training to enhance competitive edge of public institutions and facilitate the development of appropriate business relationship with a wide range of suppliers from both small and large business sectors. In this context, micro and small enterprises (MSEs) which formed part of suppliers' base for public institutions were competitively selected.

#### 5.1.2 Sources of Supply

This study also intended to establish the sources of items used in public institutions, the outcome indicated that institutions either made internally or conveniently obtained the requirements from external sources. The levels of resources employed demonstrated different sizes of enterprises which supplied goods and/or provided services to public institutions. The sources of supply demonstrated different competences in meeting quality, quantity, price, delivery, and service needs of public institutions.

### **5.1.3 Types of suppliers**

In the context of the above findings, it was clear that public institutions obtained requirements from two main types of suppliers namely: Internal sources of supply which comprised institutions with capabilities to make internally what they required; and external sources of supply which comprised micro, small, medium and large enterprises that had the ability to supply goods and/or provide services to the institutions.

However, to choose the right suppliers, the institutions should undertake a well searched '*make or buy*' decisions, whereby: A decision to make has to explore the competences of the institutions with a view to 'making' the items that require capabilities linked to the core competences; and A decision to obtain items from external suppliers has to be based on a well-developed and maintained viable 'source base' that must include suppliers with particular strengths which give them competitive edge over the others. A practical consideration for effective 'make or buy decision' was found to be a comparison of situations in public institutions and that of the suppliers in terms of cost, quality capability and volumes of requirements.

### **5.1.4 Sizes of Enterprises:**

Additionally research findings also indicated that levels of resources employed by the enterprises provided a measure of business sizes and scale of operations. Enterprises with high levels of resources were larger in sizes and were operating in large scales while those with low levels of resources were smaller in sizes and were operating in small scales. For the purpose of this study, the number of workers engaged in the suppliers' enterprises demonstrated their respective sizes, hence: Micro enterprises included those which employed between zero and nine workers; Small enterprises included those which employed between ten and nineteen workers; Medium enterprises those which employed between twenty and ninety nine workers; and Large enterprises those which employed one hundred and more workers.

Although public institutions obtained requirements from enterprises of different sizes it was noted that: Requirements were obtained more frequently from Micro and Small Enterprises; and requirements were obtained less frequently from Medium and Large Enterprises.

### **5.1.5 Competences of Suppliers**

The research findings also indicated that suppliers demonstrated different abilities to meet quality, quantity, delivery, and price and service needs of public institutions as follows: Micro and Small Enterprises (MSEs) demonstrated price, delivery and service competences; and medium and Large Enterprises demonstrated quality, quantity and price competences.

### **5.1.6 Supplier Attributes**

This study also established the presence of certain attributes in the sources of supply which made satisfactory supply of goods and/or provision of services to public institutions and it were established that: Performance of the enterprises improved with the presence of particular attributes; the presence of particular attributes enhanced competences of suppliers in specific areas; and some attributes were more dominating in particular suppliers than in others.

### **5.1.7 Supplier Attributes**

The research findings showed that satisfactory supply of goods and/or provisions of services to public institutions were attributed to the presence of one or more of the following attributes in the sources of supply: Finance; Physical facilities; Technical skills; Business management skills; and Geographical locations.

These may be conveniently categorized as resources, skills and locations of the supply sources. To this extent, satisfactory performance by the suppliers was considered to be dependent on the resources, skills, and locations of the suppliers. However, to obtain requirement from the right sources, purchasing and supply management of public

institutions should develop and use appropriate evaluation criteria, capable of establishing adequate resources, appropriate skills and favourable locations of the supply sources.

### **5.1.8 Dominating Attributes**

Findings of this study showed that certain attributes were more dominant in particular suppliers than in others. It was established that: Micro and small enterprises were in most cases, the suppliers with favourable physical locations; and Medium and large enterprises were in most cases, the suppliers with plenty of resources and skillful workers.

On the basis of the dominating attributes, enterprises were categorized as those with adequate resources, appropriate skills and favourable locations.

## **5.2 Effect of Attributes on Suppliers' Competences**

Through the study, it was established that satisfactory performance by suppliers was realized in public institutions when right quality items were obtained in right quantities delivered at the right time and at the right price with the desired levels of service. In this regard, the following were established as the effect of attributes on competences of suppliers: Resources created significant impact on quality, quantity and price competences of the suppliers; Skills created significant impact on quality, quantity and price competences of the suppliers; and Location [distance] created significant impact on delivery, service and price competences of the suppliers.

Thus, suppliers that had relevant attributes demonstrated enhanced competences in the areas of quality, quantity, delivery, and price and service performance in public institutions.

## **5.3 Nature of Relationship between Suppliers' Attributes and Performance:**

The association of attributes with satisfactory performances by suppliers revealed that: The observed high frequency of satisfactory performance by suppliers from large business sector was due to high levels of resources and appropriate skills; The observed low frequency of satisfactory performance by suppliers from large business sector was due to unfavourable locations; The observed high frequency of satisfactory performance by suppliers from small business sector was due to favourable locations; and the observed low frequency of satisfactory performance by suppliers from the small business sector was due to low levels of resources and inappropriate skills. Thus, observed incidences of satisfactory supply of goods and/or provision of services to public institutions were associated with presence of particular high levels of resources, appropriate skills and favourable locations of the suppliers.

However, in the context of the predictive statement of this study, satisfactory supply of goods and/or provision of services to public institutions should not necessarily be associated with resources, skills and locations of the suppliers, hence: The expected high frequency of satisfactory performance by suppliers from small business sector was not due to favourable locations of the suppliers; The expected low frequency of satisfactory performance by suppliers from small; The expected high frequency of satisfactory performance by suppliers from the large business sector was not due to high levels of resources and appropriate skills; and the expected low frequency of satisfactory performance by suppliers from the large business sector was not due to unfavourable locations.

Thus, the expected frequencies of satisfactory supply of goods and/or provision of services to public institutions were not associated with the presence of high levels of resources, appropriate skills and favourable locations of the suppliers. This conforms to the null hypothesis that, 'Satisfactory performance by suppliers was independent of the supplier attributes'.

## **5.4 Hypotheses Testing**

Chi-Square( $\chi^2$ ) test was applied to establish the nature of the relationship between satisfactory performance by the suppliers and the attributes in the enterprises which supplied goods and/or provided services to the institutions. This proved that the association between the variables was significant and not by chance since the difference between the table value (i.e.5.991) and the calculated value (i.e. 16.1) was significant. Hence, alternative hypothesis that, 'Satisfactory performance by suppliers was dependent of the supplier attributes' was considered more appropriate.

It was observed that suppliers of requirements who were selected from among the potential sources of supply with the most appropriate attributes, from either small or large business sector demonstrated satisfactory performance as

follows: Micro and Small Enterprise (MSE) suppliers with appropriate attributes demonstrated high level of competences in areas of quality, quantity, price, delivery and service; Micro and Small Enterprise (MSE ) suppliers without appropriate attributes demonstrated low level of competences in the areas of quality, quantity, price, delivery and service; Medium and Large Enterprises with appropriate attributes demonstrated high level of competences in the areas of quality, quantity, price, delivery and service; and Medium and Large Enterprises without the appropriate attributes demonstrated low level of competences in the areas of quality, quantity, price, delivery, and service

### 5.5 Conclusions

In view of the above findings, it was concluded that Micro and Small Enterprises: were potential sources of supply that may compete favorably with other sources of items needed in the public institutions; may make satisfactory supply of goods and/or provision of services to all clients depending on the prevailing situations of resources, skills and locations; were capable of assisting public institutions to achieve the procurement objectives of acquiring right quality items in right quantities at right prices delivered at the right time and with the desired levels of service; may be made the preferred suppliers of public institutions by making available to them adequate resources, appropriate skills and favorable geographical locations; May only make satisfactory supply of requirement to public institutions if the requisite supplier attributes that enhance their respective competences were made available to them.

### 5.6 Recommendations

Based on the findings, it is recommended that,

The procurement procedures used should encourage reaching out to all interested potential sources of supply irrespective of size of enterprise and scales of business operations. This should be encouraged in order to bring about the desired competition, including technological competition.

In order to obtain requirements from the right sources, the institutions should consider competences of the suppliers along with the following: The likely costs to be incurred while awaiting delivery of items; Additional costs to be incurred while looking for alternative sources; The need for flexibility by the sources; Speed of response to urgent or emergency needs of customers; and the need to respond positively to unique demand of customers.

Enterprises that are to be engaged in the supply of requirements to public institutions should demonstrate flexibility and high speed of response especially since these were rated more important than any other factors.

In order to obtain requirements more competitively, it is recommended that public institutions should employ procurement procedures that enable reaching out to all interested potential suppliers in every procurement for which their businesses were suited. This implies reaching out to suppliers in both small and large business sectors that have adequate resources, appropriate skills and favourable locations.

Since suppliers that had relevant attributes demonstrated enhanced competences in the areas of quality, quantity, delivery, and price and service performance in public institutions, it is recommended that, resources, skills and location should be taken into consideration when developing criteria for evaluating potential sources of supply in the procurement process.

It is necessary that employee resourcing process in public institutions take into account both external and internal factors like age trend of the general population and ages of current staff respectively. The process should as well disaggregated the use of gender as a genuine occupational qualification and should lay emphasis on formal training and perpetual refresher courses to enhance purchasing and supply skills in public institutions. This will ensure selection of enterprises that can assist the institutions to achieve the desired procurement goals.

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# The Recent Development of Tax Accounting in Indonesia

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**Abstract-** This study has two objectives. The first aim is to reveal the development of tax accounting thoughts in Indonesia before and after the 2012 convergence of International Financial Reporting Standards (IFRS). The other objective is to provide options to tax policymakers to solve the book-tax difference because of IFRS convergence. This study is qualitative research adopting Foucauldian archaeology of knowledge, using documentary materials and collections of statements, and using in-depth interviews. This research concludes that the development of tax accounting thoughts is not separable from and depends on the development of accounting thoughts before the 2012 IFRS convergence. Before and after the IFRS convergence, the tax accounting thought keeps unchanged and under the industrial accounting paradigm with the following characteristics: rules-based, transaction-focused, historical cost accounting, matching cost against revenue, reliability-based. The shift of financial accounting paradigm from the industrial era to the information one does not bring about the change in the tax accounting thought since the relevant tax laws have not changed yet. Finally, the book-tax difference gets increased. The other conclusion is to decrease the book-tax gap requires two methods. First, conceptually tax policymakers and their stakeholders should perform joint discussions so that tax reconciliation will be insignificant automatically. Besides, the tax imposition must consider legal certainty and ability-to-pay tenet so that taxpayers' compliance can increase and compliance costs can decrease.

**Index Terms-** Financial accounting, tax accounting, book-tax gap, ability-to-pay principle, legal certainty.

## I. INTRODUCTION

There have been many studies on the development of accounting in Indonesia. However, there is still little research on the development of tax accounting in Indonesia, although tax accounting constitutes one of the accounting sub-disciplines (Baker & Barbu, 2007, p. 273). Some researchers have published their articles on the development of accounting in Indonesia from various perspectives, as summarized below.

Sukoharsono & Gaffikin (1993a) examined the development of accounting and accounting professions in Indonesia during the 1800s to 1950s. Besides, Sukoharsono & Gaffikin (1993b) also studied the origin of accounting in Indonesia during the Dutch Colonialism in the early 17th century. Abdoelkadir & Yunus (1994) investigated the development of accounting since 1642 when the Governor-General of the Dutch East Indies ruled Batavia and Surabaya until 1994, including the development of accounting education. Sukoharsono (1995a) explored the historical genealogy of accounting in Indonesia in the economic, political, and social contexts. Sukoharsono (1995b) examined the history of accounting developments during the Dutch colonialism period during the mid to late 19th century.

Sukoharsono (1998) examined the history of accounting during the transition of the Hindu kingdom to the Islamic empire. Sukoharsono (2000) explored the development of accounting from the bookkeeping model to the accounting model whose transformation took place in universities. Yaya (2005) examined the influence of religious culture (Hinduism, Islam, and Christianity) on the development of accounting during the Hindu, Islamic, and Dutch colonialism empires. Sukoharsono & Qudsi (2008) examined the development of accounting during the Ancient Mataram period (7th to the 11th century AD).

Murwanto et al. (2011) studied the development of accounting before the 14th century up to the IFRS convergence in 2011. The development of the accounting role in building civilizations (Mesopotamia, Ancient Egypt, Ancient Greece & Rome, Arabic Islam, Renaissance in Italy, and Indonesia) becomes the focus of Kurohman & Maradonna (2012)'s research. Sukoharsono & Lutfillah (2013) researched the development of accounting during the heyday of Singosari (1222-1292). Rosyiniadia et al. (2014) revealed the development of accounting during the reign of Gajah Mada in Majapahit. Similar to Rosyiniadia et al. (2014), Lutfillah et al. (2015) examined the existence of accounting during the Majapahit kingdom (1293-1478). Budiasih et al. (2018) reviewed the development of accounting in Batavia during the Dutch colonialism.

According to Samuel et al. (2013, p. 173), tax accounting in many countries has developed dependently on financial accounting. Tax accounting generally starts from the notion of using financial accounting, and this matter refers to both theoretical and practical motives (p. 173). To understand the evolution of tax accounting and its recent development, a statement of Aristotle (a Greek philosopher) can

be the reference. As quoted by Higson (2003), Aristotle said, "if you wish to understand something, observe its beginnings and development" (p. 40).

Hendriksen (1965, p. 15) stipulated that the study of the history of accounting and accounting theory is a necessity because both have a relationship in the past. In all scientific disciplines, theories and concepts develop through continuous history (p. 15). One thought influences other thoughts, and what happened today depends on what happened yesterday (p. 15). His statement is also applicable to tax accounting as the sub-discipline of accounting. Current thoughts of accounting provide more than just a collection of ideas and ideas that have accumulated from the experiences of many people in the past (Littleton & Zimmerman, 1962, p. 271).

Based on the statement of Samuel et al. (2013, p. 173) above, studying the development of tax accounting in Indonesia can refer to the development of accounting. It is because Lamb (2009, p. 579) stipulates that the relationship between accounting and tax is intertwined. Therefore, this study has two objectives. The first is to reveal the development of tax accounting thoughts in Indonesia before and after the convergence of International Financial Reporting Standards (IFRS) in 2012. The second is to provide tax policymakers with options to solve the book-tax gap due to IFRS convergence. Because IFRS standards are mandatory for only publicly listed companies, financial institutions, and state-owned companies, we only analyze the development of tax accounting implemented by these companies.

## II. CONCEPTUAL FRAMEWORK

### A. The Development of School of Accounting Thought

Accounting is "a process of becoming" (Littleton & Zimmerman, 1962, p. 271) because accounting is adaptive and persistent. Adaptive nature occurs because accounting can change, and tenacious kind happens because accounting does not change without cause (Edwards, 1989, p. 14). Therefore, the term "continuity & change" appeared to describe accounting developments that occur (Edwards, 1989, p. 14), such as the title of the book "*Accounting Theory: Continuity and Change*" by Littleton & Zimmerman (1962).

None of the literature is the same when exploring the development of accounting theory. Each author used a varied approach to explore how accounting developed with the development of the environment. However, Shortridge & Smith (2009, p. 15) stipulate that "*because accounting is a social science, the driver of change is the environment in which it operates...*". Hendriksen (1965) categorized the development of accounting thought into two major groups, namely: (a) before 1930 and (b) since 1930. Hendriksen (1965) used the 1930 boundary split based on the 1929 NYSE stock market crash. The development of accounting theory, according to Riahi-Belkaoui (2000, pp. 6-11) focused on the role of pressure groups so that the information from financial statements meet their information needs. Porwal (2001, p. 56) made the periodization of accounting developments based on his predictions.

The development of accounting theory, according to Godfrey et al. (2010, p. 5), referred to the efforts of accounting standard drafting to solve the problem of inconsistency in financial reporting. Wolk et al. (2013, p. 64) made a periodization of the development of particular accounting theory in the US-based on the fundamental question of whether accounting practices and financial reporting were sufficient to assess an investment. Meanwhile, Shortridge & Smith (2009, p. 15) developed an accounting paradigm based on an approach to economic development and its related information professionals, explored by Elliott & Jacobson (2002).

According to Coetsee (2010, p. 2), there are two schools of thought that can represent accounting theory. The first tradition deals with the development of accounting principles. The authors for this tradition, for example, are Hendriksen (1965) and Wolk et al. (2013). Hendriksen (1965, p. 1) defines accounting theory "...as logical reasoning in the form of a set of broad principles that (1) provide a general frame of reference that can evaluate the accounting practice, and (2) guide the development of new methods and procedures. Meanwhile, Wolk et al. (Wolk, Dodd, & Rozycki, 2013, p. 3) define accounting theory "...as the basic assumptions, definitions, principles and concepts —and how we derive them— that underlie accounting rulemaking by a legislative body".

Another school of thought explains accounting theory as an activity to explain and predict. For this second tradition, Coetsee (2010, p. 2) refers to definitions of accounting theory by Riahi- Belkaoui (1981), Watts & Zimmerman (1986), dan Wolk et al. (2013). Riahi-Belkaoui (1981, p. 8) states that "the primary objective of accounting theory is to provide a basis for the prediction and explanation of accounting behavior and events." Watts & Zimmerman (1986, p. 2) mentioned that "the objective of accounting theory is to explain and predict accounting practice." Wolk et al. (2013, p. 32) state that "theories attempt to explain relationships or predict phenomena."

Thus, the first school of thought above focuses on accounting principles, while the second one has a focus on evaluating accounting practices (Coetsee, 2010, p. 3). Both traditions started from two methodologies for the formulation of accounting theory, namely: the normative approach and the descriptive approach. Based on the process followed to develop a theory, the normative method constitutes a deductive process in formulating the accounting objectives. In contrast, the descriptive approach is an inductive process concentrating on the observations of the factual world (p. 3).

Through the normative approach, a significant debate occurred because various views emerged related to the ideal method to measuring and reporting accounting information (Godfrey, Hodgson, Tarca, Hamilton, & Holmes, 2010, p. 7). This normative theory adopts an ideal goal condition and specializes in how to achieve that perfect condition (p. 7). Therefore, in the Normative Period, accounting theory focused on "true income" (profit) for an accounting period and focused on a discussion of what types of accounting information were useful for decision making or decision usefulness (Godfrey, Hodgson, Tarca, Hamilton, & Holmes, 2010, p. 24).

With descriptive methods, several accounting practices are justified so that they are useful. An example of accounting theory research with a descriptive approach, according to Riahi-Belkaoui (2000, p. 67), is "Inventory of Generally Accepted Accounting Principles for Business Enterprises" (Grady, 1965), adopted into Indonesian Accounting Principles 1973 (IAI, 1973). Generally Accepted Accounting

Principles or GAAP are also examples of the application of inductive theory in financial accounting (Roslender, 1992, p. 118).

The latest developments in accounting theory exist in a mixed development period. Godfrey et al. (2010, p. 14) stipulate that in this period, there is a mixture of normative accounting theory and positive accounting theory. Godfrey et al. (2010, p. 13) state explicitly that "... these positive and normative theories are not incompatible ...". The development of accounting theory in this period leads back in line with developments in the previous period that were inductive and descriptive, but the approach varies. The accounting theory has shown the direction back to empirical methodology, often referred to as a positive methodology (p. 28). Positive accounting studies focus on "explaining" the reasons for current accounting practices and "predicting" the role of accounting information and other related information in the economic decisions of individuals, companies, or parties who have contributed to market and economic development (p. 28).

The main difference between normative accounting theory and positive accounting theory is that normative accounting theory is prescriptive, while positive accounting theory is descriptive, explanatory, or predictive (p. 28). Another feature of positive accounting theory is that it explains (1) how people behave; (2) how people behave, for example, to achieve the goal of maximizing company value or individual wealth; or (3) how predictions about what people have or will do. The explanation or prediction, according to positive methodologies, does not see whether the person's actions are correct or not (p. 28). When the research emphasis remains on the area of capital markets, agency theory, and behavioral impact, researchers were more inclined to use a normative approach, explicitly looking for normative theories to unify and uniform accounting practices (p. 13).

The mixed development of these accounting theories has results in a decision-usefulness theory initiated by Staubus (1954) through his doctoral dissertation (Previts & Flesher, 2015, p. 52). Furthermore, Staubus (1961) published his thesis under the title "*A Theory of Accounting to Investors*." The decision-usefulness theory is normative and deductive, and it focuses on the objectives of financial reporting because basically, the financial statement information prepared by management is to provide useful information in the decision making process.

The Mixed Development Era increased in May 2000. At that time, IOSCO (International Organization of Securities Commissions) recommended its members to allow multinational companies that trade their shares in various countries' capital markets to implement International Accounting Standards (IAS) (Zeff, 2012, p. 823). In June 2000, the European Commission issued a notice stating that publicly traded companies in the European Union needed to adopt IAS/IFRS for its consolidated financial statements starting from 2005 (Alexander & Nobes, 2010, p. 85; Zeff, 2012, p. 823). The European Commission announcement constitutes a strategy to gain confidence that shares were tradable on the European Union and international financial markets based on "a single set of financial reporting standards" (Zeff, 2012, p. 823).

Finally, based on the IFRS Foundation (2020), 166 jurisdictions have applied IFRS standards. The fair value paradigm now adopted by IFRS standards stems from the decision usefulness paradigm formulated in the conceptual framework (CF) project of the US Financial Accounting Standard Board (FASB). (Hitz, 2007, p. 328). Then, the International Accounting Standard Board or IASB, as the IFRS standard-setting body, also adopts the decision usefulness theory in its conceptual framework (CF 1989, CF 2010, and CF 2018). Those CFs become the primary reference, which the Indonesian Institute of Chartered Accountants or IAI use to publish a local conceptual framework and develop accounting standards applicable in Indonesia. The CF 2018 is still in the process of IAI's adoption in the form of an Exposure Draft.

### *B. The Development of School of Tax Accounting Thought*

The development of tax accounting began when accounting theory and entity theory emerged, and the government imposed a tax on corporate income. From a historical perspective, the calculation of taxable income in the US came into force when Congress passed the first Income Tax Act in 1913. Starting that year and until the early 1940s, the companies used universal accounting practices (except for utilities) as a basis for determining tax liability. During that period, the income tax was relatively small and the distortion of the difference between accounting earnings and tax profits, if any, was not significant (Crawford, 1946, p. 756; Rayburn, 1986, p. 89; Schroeder, Clark, & Cathey, 2020, p. 415). Therefore, until the 1940s, the allocation of income tax at that time was not a big issue.

Accounting for income tax became a significant issue for the first time when the Internal Revenue Code (IRC) was under amendment during World War II (WW II). The IRC amendment allowed companies to make accelerated depreciation of emergency facility costs for tax purposes (Rayburn, 1986, p. 91; Schroeder, Clark, & Cathey, 2020, p. 415). Meanwhile, the accounting depreciation proceeded normally (Rayburn, 1986, p. 91). At that time, the tax policy was essential for companies in the US because there was still a war (Rayburn, 1986, p. 91; Schroeder, Clark, & Cathey, 2020, p. 415). During WW II (1939-1945), corporate income tax rates increased from 19% to 38% (Schultz & Johnson, 1998, p. 82). Such conditions caused taxable profits to fall and were lower than accounting profits, and the difference between accounting and tax increased.

The debate arising from the above conditions was whether the income tax payable and paid to the country was (1) an expense accrued in the income statement or (2) distribution of profits to the government (Carey, 1944a, p. 425; 1944b, p. 267; Rayburn, 1986, p. 91). The accountants' attention at that time was when crediting income tax, what account they had to debit (Schultz & Johnson, 1998, p. 83). If taxes are considered a burden, this opinion is consistent with the theory of ownership (proprietorship theory) because the tax treatment can be like interest payments, which are a burden on the company's operations (p. 83). If taxes are like a profit distribution, this opinion is in line with the theory of entities that position creditors and investors as providers of funds, and the taxes paid are treated as interest payments to creditors (p. 83).

In brief, based on the two options of income tax treatment above, there are some consequences. First, treating income tax as a company expense results in an accrual accounting concept to be applied, and the financial statements should present and disclose the impact of the temporary difference. Second, treating income tax as a distribution of profits to the government brings about the amount of income tax paid in each book year to be a portion of the profit not intended for business owners, and the determination of tax liability refers to the applicable law. In this context, there is no consequence of temporary differences between accounting and tax.

Finally, the Committee on Accounting Procedure (CAP) issued ARB No. 23: Accounting for Income Taxes (American Institute of Accountants, 1944). The CAP was the forerunner of the Accounting Principles Board (APB) and the Financial Accounting Standards Board (FASB) (Schultz & Johnson, 1998). ARB (Accounting Research Bulletin) No. 23 concludes that PPh is an expense presented in the income statement (American Institute of Accountants, 1944, p. 183). In the next stage of development, the principle of income tax as a burden was widely accepted (Shield, 1957, p. 53; Schultz & Johnson, 1998, p. 83). Based on ARB No. 23, accounting for income tax started to develop, and the accounting treated the impact of income tax due to temporary differences arising from differences in accounting and tax treatment or Book-Tax Difference (BTD).

Based on the accounting treatment for income tax, as described above, "...tax accounting refers to the recognition and measurement rules that a company applies in preparing its tax returns, i.e., in determining the taxable profit (tax loss) for the period" (Gielen & Hegarty, 2007, pp. 1-2). Under the 2018 Conceptual Framework (IASB, 2018, p. 5.1), recognition constitutes the process of capturing to include an item in the statement of financial position, or the statement(s) of financial performance provided that the item meets the definition of an asset, a liability, equity, income, or expenses as the elements of financial statements. In other words, the recognition process relates to the journal entry process using debit and credit account(s). Meanwhile, measurement refers to the monetary terms used to quantify element(s) recognized in financial statements (IASB, 2018, p. 6.1).

For tax purposes, the recognition and measurement process refers to the prevailing tax rules that regulate specific treatment. Otherwise, the process to recognize and measure adopts usual accounting rules. For accounting purposes, IFRS standards apply some measurement basis. The basis includes historical cost and current value (fair value, a value in use, and current cost) (IASB, 2018, pp. 6.4, 6.11), depending on which measurement basis provides the most useful information to the users of financial statements for decision making.

### *C. Qualitative Characteristics under Decision-Usefulness Theory*

To meet the needs of financial statement users, information on financial statements must satisfy particular characteristics (Riahi-Belkhoui, 1981, p. 74). Trueblood Committee report under AICPA (1973, p. 13), which formulated the first CF in the world, included the concept of decision usefulness into its CF by explicitly mentioning that "the basic objective of financial statements is to provide useful information for making economic decisions" (p. 13). Trueblood Committee report calls particular characteristics as qualitative characteristics that should base mainly on the needs of users of the statements (AICPA, 1973, p. 60). Meanwhile, the Accounting Standards Board of Japan (2006) stipulates that "the most significant characteristic required in accounting information is the usefulness in achieving the objectives of providing accounting information." The CF calls this characteristic 'decision usefulness'" (Accounting Standards Board of Japan, 2006).

Along with economic development and economic globalization, the qualitative characteristics of financial statements has also transformed. Shortridge & Smith (2009) researched the shift of the qualitative characteristics of financial statements. Shortridge & Smith (2009), in their study, mentioned the change in the qualitative characteristics as part of the shift in the accounting paradigm. According to Shortridge & Smith (2009, p. 12), the implementation of IFRS around the world has moved the accounting paradigm from an industrial model to an information paradigm. Figure 1 depicts the accounting thoughts in an industrial era and an information era, respectively.

According to Shortridge & Smith (2009, pp. 12-15), referring to the economic development and its information specialists (Elliott & Jacobson, 2002), an industrial era existed during 1760-2002. In this period, corporations getting funds from the capital market dominated the form of business, and accountants became the primary information providers (Elliott & Jacobson, 2002, p. 73). Besides, the growth of machines created a surplus of production, the size of enterprises grew, a corporate organization developed and led to a separation between capital owners and the managers (Shortridge & Smith, 2009, p. 15), so that entity theory emerged and impacted on the information needs. The qualitative characteristics of accounting in the industrial era were relevant and reliable information used to allocate resources efficiently (p. 15). Reliability had a similar meaning to verifiability (p. 12).

The reliable information referred to historical cost enabling reliable measurement of industrial/manufacturing assets (i.e., machines, factories, and equipment) (p. 15). The rules-based approach in formulating accounting standards during the industrial economy resulted from evolutionary accounting changes as responses to new transactions in incremental steps and adopting piecemeal progression (p. 13). To measure a corporate performance depended on the delivery of goods instead of services and focused on transactions. Therefore, the enterprises required accounting based on matching costs against revenues. Such a condition reflected the orientation of financial reporting to the income statement approach.

Under the industrial era, there were no specific users of financial statements. According to the 1989 Conceptual Framework (IASB, 1989, p. 14) issued by International Accounting Standard Committee (IASB), the users of the financial statements included investors (present and potential), employees, suppliers, and other trade creditors, lenders, customers, governments and their agencies, and the public. In terms of governments and their agencies as the user, the information they require, among others, was to determine tax policies (p. 15). In other words, the interest of tax authority in financial statements was still part of the various users of financial statements during the industrial period.

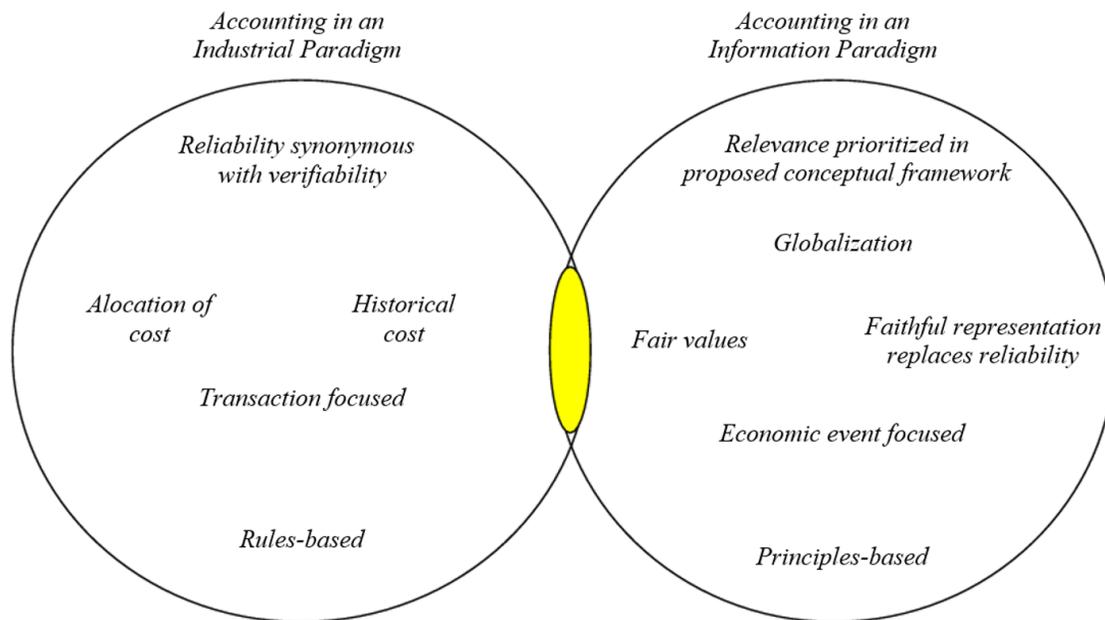


Figure 1: Accounting paradigm between industrial and information era

Notes: adapted from Shortridge & Smith (2009, p. 12). Based on the figure above, the main fundamentals of accounting thought has been undergoing a revolutionary change. However, an overlap still takes place, as seen from the slice between the two circles. This overlap means that the shift from the industrial era to the information era is incomplete so that during this transition period, some characteristics for the two paradigms are the same.

When economies develop, the need for information those economic development changes (Shortridge & Smith, 2009, p. 15). The increased use of technology and globalization make it easier to obtain more magnificent information. Therefore, Elliott & Jacobson (2002, p. 70) mention that recently, the era of the information economy has emerged. In most developed countries, knowledge work is the primary source of growth. Services play a significant role in this information era (p. 70). For instance, advertising is a form of knowledge work. In manufacturing companies, design, quality control, marketing, strategy, planning, and customer need identification are examples of knowledge work in the information economy (pp. 70-71). The center of this information paradigm is computers and telecommunication (p. 71).

In financial reporting, financial statements represent economic phenomena in numbers and words (IASB, 2018, p. 2.12). To obtain decision usefulness under the information era, the reporting entity must not only present relevant phenomena in the reports, but the information of financial statements must also represent the substance of the events faithfully. To get perfectly faithful representation must satisfy the following characteristics: (a) complete, (b) neutral, and (c) free from error (p. 2.13). Based on this characteristic under the information economy, there is a radical change from reliability to faithful representation. At the same time, the aspect of relevance remains unchanged in the industrial and information era.

International Accounting Standard Board or IASB (as the successor of the IASC) replaced the term reliability of 1989 CF (IASB, 1989, p. 14) by faithful representation in the 2010 CF (IASB, 2010) and the 2018 CF (2018) because of a lack of a common understanding of the term reliability. The attempts to explain what reliability means were not successful (IASB, 2010, p. BC3.24). Before finalizing 2010 CF, IASB (together with FASB) received many respondents' comments on the meaning of reliability. Anyhow, the respondents described the sense of reliability more closely resembling IASB's idea of verifiability than its concept of reliability (p. BC3.25). Finally, IASB decided to replace the term reliability with faithful representation.

Based on the decision-usefulness theory, IASB (2010, p. BC1.16) concluded that the most critical and immediate need for the information in financial statements belongs to the following users: (1) existing and potential investors, (2) lenders, and (3) other creditors. They cannot require the reporting entity to provide the information directly to them. Therefore, IASB (2010, p. BC1.16) call them as the primary users of financial statements. However, regulators and members of the public other than the three primary users do not become part of the primary users. They are not the parties to whom the reporting entity primarily provides general purpose financial reports under IFRS standards (pp. OB10, BC1.10).

Based on the primary users of financial reports above, to improve the quality of useful information can no longer use historical cost accounting (HCA) applied in the industrial paradigm. It is because HCA is unable to satisfy the needs of the primary users under the information era. Chambers (2006, pp. 101-102) stipulates that all past prices are a matter of history at any present time. Investors' concern is with value instead of costs so that fair value is preferable and justified to have a superior economic measure to historical price (Penman, 2007, p. 33). Historical cost is not relevant in assessing the current financial position of a reporting entity (p. 33). Fair value is a market-based measure and assumed to be "more relevant" (p. 33).

Finally, many IFRS standards adopt fair value accounting (FVA), which provides information about managements' stewardship and equity value by presenting assets and liabilities on a statement of financial position as their value to shareholders (p. 36). Besides, there is a shift from income statement orientation to balance sheet orientation so that a statement of financial position becomes the primary means for providing information to shareholders (p. 36).

Since IFRS is a single set of financial reporting standards with CF as a fundamental concept, the IFRS standards must adopt a principles-based approach, not a rules-based approach (Bullen & Crook, 2005, p. 1). The standards focus on economic events, not transactions, and can guide the reporting entity to represent economic phenomena faithfully in financial reports.

### III. METHODOLOGY

This study is qualitative research, concerned with a particular method to look at the recent development of tax accounting in Indonesia. This research made an intelligent inquiry into some specific phenomena using Foucauldian archaeology of knowledge (Foucault, 1972), as adopted by Sukoharsono & Gaffikin (1993a; 1993b), Sukoharsono (1995a; 1995b; 1998). The Foucauldian method is a means to articulate a more comprehensive and coherent account of the transformation in the field of historical knowledge (Sukoharsono & Gaffikin, 1993b, p. 6). The inquiry started with documentary materials and collections of statements. To enrich this inquiry, we also applied an in-depth interview with five key resource persons who hold a Chartered Accountant (CA). Our interviewees are (1) Yon Arsal, S.E., Ak., CA, M.Ec., Ph.D. as a member of the Financial Accounting Standard Board of IAI and Expert Staff of the Minister of Finance in Tax Compliance; (2) Dr. Samingun, SE. Ak., CA, M.Ak as a lecturer of Faculty of Economics and Business at Universitas Indonesia; (3) Wahyu Santosa, SE., Ak., CA, M.Si as Head of Sub-directorate of Income Tax Regulations at Directorate General of Taxes (the Ministry of Finance); (4) Dr. Taufik Hendra Kusuma, SST, SH, MBA, Ak., CA, CPA, CPMA, AFP, BKP as a tax consultant; and (5) Kemal Iwan Dharmawan, SE, Ak., CA, CPA, MM, SH as a tax practitioner at PT Indosat Tbk (a public company). Our interview aims to understand the development of tax accounting after the convergence of IFRS based on the perspectives of policymaker, academic, tax consultant, and corporate practitioner.

### IV. RESULT & DISCUSSION

#### *A. The Development of Accounting before IFRS Convergence*

Based on Foo (1988), before 1973, there were no accounting theories, including tax accounting. However, bookkeeping methods developed by referring to the Dutch colonial legacy as stipulated under the Code of Commercial Law (1848) or "KUHD." Bookkeeping, according to KUHD, had the following characteristics: (1) not mandatory; (2) not specifying the form and content of the financial statements; and (3) not requiring an audit of financial statements (Foo, 1988, p. 134).

KUHD, ratified in 1848, is still valid now, although several laws have replaced some of the contents of KUHD. For example, KUHD became the legal basis for most company transactions in Indonesia until March 1996 before the Limited Liability Company Law (Law No. 1 of 1995) came into effect (Perera & Baydoun, 2007, p. 215).

In 1974 the inductive accounting theory began to develop along with the enactment of the 1973 Indonesian Accounting Principles or "PAI 1973" (IAI, 1973). Putri (2010, p. 41) stated that PAI 1973 became the first milestone in the development of accounting in Indonesia. This PAI 1973 referred to US GAAP (Grady, 1965), while US GAAP itself was an example of the application of inductive accounting theory (Roslender, 1992, p. 118). The codification of PAI 1973 became part of the government's efforts to prepare the capital market (Irmawan, 2010, p. 202). The codification did not arise from needs due to the complexity of business in Indonesia (p. 202). PAI 1973 also constituted a consequence of investment openness for foreign investors (Perera & Baydoun, 2007, p. 209). These foreign investors brought their accounting standards, along with their practices, according to their values, such as transparency (p. 209).

Two factors were underlying the US GAAP-based 1973 PAI codification (The Asian Development Bank, 2003, p. 97). First, the effect of US accounting on academics' thoughts in Indonesia was increasing at that time. Secondly, as a result of the cessation of trading in the shares of Dutch companies, the existing capital market was closed, even though the Government of Indonesia ("GoI") considered that the capital market was needed to invite foreign investment. To overcome this, GoI created a team to reactivate the capital market, including working with IAI to prepare Indonesian accounting standards (p. 97).

According to Foo (1988, p. 126), PAI 1973 adopted the US GAAP, of which most of the contents were outdated or irrelevant, and there was little effort to revise it. Besides, PAI 1973 could not be used for special accounting treatment because it was only a compilation of basic accounting principles, practices, and methods. PAI 1973 allowed companies or accountants to refer to other GAAP from other countries if PAI 1973 did not explicitly regulate the specific accounting treatment (Murwanto, Khanna, & Zijl, 2011, p. 155).

Finally, IAI (1984) then replaced PAI 1973 with the 1984 Indonesian Accounting Principles or "PAI 1984" by carrying out a significant revision of the old standards. According to Putri (2010, p. 41), PAI 1984 constituted the second milestone in the development of accounting in Indonesia. The issuance of PAI 1984 resulted from the Indonesian government's pressure to IAI because GoI just enacted new tax laws applying the self-assessment system (Murwanto, Khanna, & Zijl, 2011, p. 158). This event became a starting point for the development of tax accounting in Indonesia and will be on our more detailed discussion of tax accounting in Subsection B.

Some paragraphs below explain in more detail about PAI 1984 as its accounting concepts have formed the basis of tax accounting thoughts since the first enactment of the Income Tax Act or "UU PPh" (Law No. 7 of 1983) up to its fourth amendment in 2008. It is because of for tax purposes the definition of income that remains unchanged, including the concept of matching cost against revenue.

In the Introduction to PAI 1984 (IAI, 1984, p. xi), PAI 1984 is a set of principles, procedures, methods, and accounting techniques that govern the preparation of financial statements, especially those addressed to external users, such as shareholders, creditors, and tax authority. In other words, explicitly, the tax authority became part of financial statement users. Besides, PAI 1984 is general and discloses in broad outline only and does not cover accounting practices for specific industries, such as banking and insurance. For accounting principles that require further elaboration, IAI issued a particular statement of accounting principle (p. xi). PAI 1984 was still the U.S.-based accounting principles (Murwanto, Khanna, & Zijl, 2011, p. 158). In brief, PAI 1984 yet adopted inductive accounting theories and rules-based approach.

However, PAI 1984 (IAI, 1984, p. 1) also adopted deductive accounting theories by applying decision usefulness theory. Chapter 1 PAI 1984 concerning the basic concepts and limitations of financial statements explicitly states that financial accounting and financial statements aim to provide financial information about a business entity used by stakeholders as a material for consideration in economic decision making. According to PAI 1984 (pp. 2-3), to be useful, financial statements should meet the following qualitative characteristics. They are (1) relevance, (2) understandability, (3) verifiability, (4) neutral, (5) timeliness, (6) comparability, and (7) completeness.

Basic concepts of accounting under PAI 1984 includes (1) accounting entity, (2) going concern, (3) periodicity, (4) monetary unit measurement, (5) exchange price requiring to record financial transactions based on the exchange price (historical cost), (6) determination of expenses and revenues based on the accrual method (pp. 4-6). The nature and limitations of the financial statements, among others, include the following matters (p. 7). First, financial statements are historical. Second, financial statements are general and have no intention to meet the needs of particular parties. Third, financial statements are conservative. Fourth, financial statements emphasize substance over form.

The principles of income under PAI 1984, among others, cover the following items (p. 17). First, revenue is an increase in the number of assets and a decrease in liability of a business entity arising from the delivery of merchandise/services or other business activities in a period. Based on this definition, PAI 1984 adopted income statement orientation. Second, as a general rule, income is recognized at the time of its realization. In this case, PAI 1984 applied a realization doctrine for accounting purposes.

PAI 1984 further elaborated on the realization principle as described in the following (p. 18). First, a business entity recognized revenue from product sales transactions on the sale date, usually constituting the date of product delivery to the customer. Second, a service company recorded revenues from its services when having performed the service and issued the invoice. Third, the entity posted revenue from the use of its assets/economic resources by other parties (such as interest income, rent, and royalties) when time passed or when the parties used the entity's assets.

In some instances, under PAI 1984, the entity might make a deviation of revenue recognition based on the principle of realization (pp. 18-20). First, First, revenue recognition took place when production was complete. Second, revenue recognition referred to the percentage of completion method. Third, revenue recognition occurred when payments were received. Fourth, revenue was recognized when under a consignment agreement, a consignee sold goods to the customer.

In general, PAI 1984 described the principles of expenses as follows. First, costs recognized had to be in line with the period when revenue was recognized (e.g., cost of goods sold and sales commission expense). Second, expenditures were recorded based on systematic cost allocation throughout the period that produced benefits (for example, fixed asset depreciation and intangible asset amortization).

PAI 1984 explicitly regulated the calculation of income tax based on accounting profit or taxable profit at a rate according to tax regulations (p. 23). Besides, PAI 1984 also regulated accounting treatment for income taxes. The entity had to recognize deferred tax from temporary differences arising from the different treatment between accounting rules and tax rules (p. 24).

The third milestone in the development of accounting in Indonesia took place in 1994 (Putri, 2010, p. 41). At that time, IAI codified the Financial Accounting Standards ("SAK") per 1994, which referred to the International Accounting Standards ("IAS") issued by the IASC. The codification also included the 1989 Conceptual Framework (IASC, 1989) so that there was no difference between the IAI's 1994 conceptual framework (IAI, 1994) and IASC's 1989 conceptual framework. The term "SAK" replaced "PAI" because it aimed to avoid misunderstandings that could often occur and to name according to the meaning (IAI, 1994).

Under the 1994 Conceptual Framework (IAI, 1994), there are two underlying assumptions: (1) accrual basis, and (2) going concern. Specific for accrual basis, to meet the objectives of financial statements requires their preparation to refer to the accrual basis of accounting. Based on this basis, a reporting entity recognizes the effects of transactions and other events when they occur (and not as cash or its equivalent is received or paid). Besides, the company posts them in the accounting records and reports them in the financial statements of the periods to which they relate. Such accounting treatment depicts that the application of realization doctrine still existed even though IAI has shifted its accounting orientation from the US accounting standards to IAS. The occurrence of transactions became a prerequisite for accounting recognition.

According to Pramuka (1998, pp. 362-363), the total revision of accounting standards in 1994 was also due to several factors. First, the influence of accounting standards and practices from the United States declined. Second, many accounting academics graduated from universities outside the United States (for example, Australia and the United Kingdom). Third, IAI has also become a member of the IASC. Finally, IAI decided to adopt IAS in 1994 (pp. 362-363).

In subsequent years, SAK kept being revised continuously, both in the form of improvements and the addition of new standards since

1994 (p. 41) until finally, IAI adopted IFRS in 2012. Before IFRS convergence in 2012, IAI revised SAK seven times (1 October 1995, 1 June 1996, 1 June 1999, 1 April 2002, 1 October 2004, 1 September 2007, and 1 July 2009). IFRS convergence in Indonesia revised SAK as of 1 July 2009 (IAI, 2016a, p. 16) by referring to IFRS as of 1 January 2009.

Based on the discussion above, before IFRS convergence, the accounting paradigm in Indonesia was under the industrial era with the same characteristics as described by Shortridge & Smith (2009). The features were (a) a rules-based approach in the formulation of accounting standards, (b) income statement orientation in the measurement concept, and (c) HCA for the quality of the information in financial statements. However, FVA has begun replacing HCA for some Statements of Financial Accounting Standards issued by IAI in line with the adopted IAS.

*B. The Development of Tax Accounting before IFRS Convergence*

The development of tax accounting in Indonesia is inseparable from the tax laws, to which the accounting rules for tax purposes refer. Table 1 summarizes the provisions governing bookkeeping for tax purposes. Since the enactment of the Company Tax Ordinance in 1925 until now, the term used in the tax rules is bookkeeping, not accounting. According to Gunadi (2009, p. 4), the name “bookkeeping” has been widely well-known in the world of taxation. For taxation, the technical aspects of accounting in the form of recording transactions until financial statements (balance sheet and income statement) are considered sufficient to assist the process of calculating and determining the tax. Aspects other than bookkeeping in accounting do not constitute the taxation domain and are not in the place where the tax provisions govern them. Weygandt et al. (2013, p. 5) emphasize that the accounting process includes bookkeeping and bookkeeping usually only includes the recording of economic events. In other words, bookkeeping is part of accounting.

Table 1 describes that bookkeeping for tax purposes is deductive since it aims to enable taxpayers to calculate taxable income. According to Foo (1988, p. 32), although Company Tax Ordinance (1925) required financial reports as taxpayers’ basis to calculate corporate income tax, the calculation usually referred to negotiations between tax officers and taxpayers so that the tax assessment did not use information in financial statements. As seen in Table 1 (item 3 letter j & k), PAI 1973 did not become the reference for taxpayers to calculate corporate income tax since they referred to Company Tax Ordinance (1925). From 1984 until now, tax accounting arrangements were under two tax laws: UU KUP (Law No. 6 of 1983) and UU PPh (Law No. 7 of 1983) and their amendments.

Table 1: Comparative Bookkeeping Provisions for Tax Purposes

No	Description	(Company Tax Ordinance, 1925)	(Law No. 6 of 1983; Law No. 7 of 1983)	(Law No. 9 of 1994)	(Law No. 16 of 2000)	(Law No. 28 of 2007)
1.	The existence of bookkeeping definition	-	-	√	√	√
2.	The objective of bookkeeping is to compute taxable income	√	√	√	√	√
3.	The organization of bookkeeping					
a.	as an obligation	√	√	√	√	√
b.	performed in Indonesia	√	√	√	√	√
c.	based on good faith and reflecting the actual situation or business activities	-	√	√	√	√
d.	requiring the tax authority's approval of changes in accounting methods or fiscal years	-	-	√	√	√
e.	using the Indonesian currency, Indonesian language, Latin letters, and Arabic numbers	√	√	√	√	√
f.	using other languages as the language of instruction and other signs according to the Minister of Finance's permission	√	-	-	-	-
g.	using foreign languages and currencies other than Rupiah permitted by the Minister of Finance	-	√	√	√	√
h.	based on the consistency principle	-	√	√	√	√
i.	using a cash basis or accrual basis	-	-	√	√	√
j.	using a means or system commonly used in Indonesia, for example, based on PAI, unless tax legislation determines otherwise	-	√	√	-	-
k.	using a means or system commonly used in Indonesia, for example, based on SAK, unless tax legislation determines otherwise	-	-	-	√	√
4.	Bookkeeping contains:					
a.	regular records of cash, lists of debts, and receivables	√	-	-	-	-
b.	regular records of cash and banks, list of debts and inventory list	-	√	-	-	-

Table 1: Comparative Bookkeeping Provisions for Tax Purposes

No	Description	(Company Tax Ordinance, 1925)	(Law No. 6 of 1983; Law No. 7 of 1983)	(Law No. 9 of 1994)	(Law No. 16 of 2000)	(Law No. 28 of 2007)
c.	regular records of the condition of assets, liabilities or capital debt, income and expenses/costs, as well as the total acquisition and delivery price of goods or services, subject to value-added tax (10% or 0%) or sales tax on luxury goods.	-	-	√	-	-
d.	regular records of assets, liabilities, equities, income, and expenses/costs, as well as the total acquisition and delivery price of goods or services	-	-	-	√	√
6.	Elements of financial statements					
a.	List of income	√	-	-	-	-
b.	Profit loss calculation	-	√	√	-	-
c.	Income statement	-	-	-	√	√
d.	Balance sheet	√	√	√	√	√
7.	Obligation to keep accounting records					
a.	within ten years	√	√	√	√	√
b.	in Indonesia	-	-	√	√	√

Note: Summarized by the authors by referring to relevant tax laws, as mentioned in the table header above.

Before 1984 the bookkeeping provisions referred to Company Tax Ordinance (1925). Since 1984 until now, bookkeeping arrangements have been under Law on General Rules and Taxation Procedures or “UU KUP” (Law No. 6 of 1983), which had been amended three times in 1994 (Law No. 9 of 1994), 2000 (Law No. 16 of 2000), and 2007 (Law No. 28 of 2007). During 1984-1994, bookkeeping provisions were also under UU PPh (Law No. 7 of 1983). However, after 1994 bookkeeping rules were no more under UU PPh but merged into UU KUP (Law No. 9 of 1994; Law No. 16 of 2000; Law No. 28 of 2007). The abolition of bookkeeping provisions under UU PPh in its 1994 amendment aimed to make an orderly tax law structure between formal administrative provisions and substantive material provisions (Gunadi, 2016, p. 222). Therefore, UU PPh (Law No. 7 of 1983) and its amendments in 1991 (Law No. 7 of 1991), 1994 (Law No. 9 of 1994), 2000 (Law No. 17 of 2000), and 2008 (Law No. 36 of 2008) focus on substantive material provisions, such as tax subjects, tax objects, allowable deductions, taxable income, and tax rates.

UU PPh 1983 (Law No. 7 of 1983) and UU KUP 1994 (Law No. 9 of 1994) explicitly stipulate that bookkeeping must refer to PAI compiled by IAI unless tax legislation determines otherwise. Such an arrangement became the legal basis underlying taxpayers’ bookkeeping to apply to PAI 1984. Then, starting from 2000 until now, UU KUP the parliament amended in 2000, and 2007 (Law No. 16 of 2000; Law No. 28 of 2007) explicitly stipulates that bookkeeping must apply SAK unless tax legislation determines otherwise.

Based on the phrase “... unless tax legislation determines otherwise” as stipulated under the elucidation of Article 28 paragraph (7) of the law (Law No. 16 of 2000; Law No. 28 of 2007), there are at least three possibilities that may occur in tax accounting. First, tax provisions do not have their own rules, so the tax accounting refers to financial accounting under SAK. This matter will not result in any differences. For example, the presentation of financial statements for tax purposes applies a certain accounting standard concerning how to present financial statements because no specific tax rules determine otherwise. Second, tax provisions have their own rules so that tax accounting is different from financial accounting. The various treatment will impact the gap between accounting income and taxable income. For instance, tax rules do not allow donation expenses accrued by the company. Third, the tax provisions have their arrangements, but these arrangements are the same as financial accounting regulations. For example, income tax law regulates a specific treatment for foreign exchange gain/loss. Nevertheless, the tax rule stipulates that tax treatment refers to accounting treatment so that tax accounting and financial accounting have the same treatment.

As described in Table 1 in each tax law amendment, a particular provision always explicitly mentions accounting standards to which taxpayers have to refer for performing bookkeeping for tax purposes. Such an arrangement implicates that tax accounting is dependent on the financial accounting system applied in a period.

SAK stipulated under UU KUP (Law No. 16 of 2000; Law No. 28 of 2007) does not refer to a specific standard. So, SAK, which UU KUP means, depends on IAI that has Financial Accounting Standard Body or “DSAK” as the standard-setting body. Before the 2012 IFRS convergence, IAI issued three accounting standards: (1) PSAK, (2) SAK ETAP, and (3) SAK Syariah. PSAK or Statement of Financial Accounting Standards are subject to IFRS adoption and then becomes the mandatory reference for only publicly listed companies, financial institutions, and state-owned companies. SAK ETAP is Financial Accounting Standards for Entities without Significant Accountability as a local GAAP not converged with IFRS. SAK Syariah is the standard for Islamic teaching-based transactions.

How taxpayers compute their income tax, do not refer to the above accounting standards. They apply UU PPh (Law No. 7 of 1983) and its amendments. To interpret these laws, GoI may issue implementation regulations in the form of government regulations, Minister of

Finance's regulations, or Director General of Taxes' rules, depending on its authority and the hierarchy of the Indonesian laws.

Based on UU PPh above, corporate taxpayers must compute their income tax liabilities based on their net income reported in their income statements. Their taxable income refers to their accounting/book income with some tax adjustments for non-taxable items and non-deductible expenses. This income tax computation method was under the self-assessment system so that the tax system necessitated an understanding of the implementation of acceptable accounting standards (Murwanto, Khanna, & Zijl, 2011, p. 158). Thus, from the beginning of the modern tax system under the self-assessment model in 1983, GoI pressured IAI to issue PAI 1984 for taxpayers' guidance in their keeping accounting records for tax purposes. Such a condition became the starting point for the development of tax accounting in Indonesia.

Referring to the analysis of Shortridge & Smith (2009), five characteristics of the accounting paradigm in the industrial era (see Figure 1) are also applicable to tax accounting thoughts adopted under UU KUP and UU PPh and their amendments. The first characteristic is the rules-based approach. UU PPh also applies this approach to provide legal certainty to all taxpayers. Putra (2014, p. 58) investigated the objectives of Indonesian tax reforms in 1983, 1994, 2000, and 2008. Putra stipulates that the principle of legal certainty always became one of the tax principles underlying income tax reforms (p. 58).

The certainty maxim originated from Adam Smith (1776). Based on the certainty principle, the formulation of tax regulations uses clear language so that taxpayers understand and know from the beginning (Iwin-Garzyńska, 2014, p. 62). Meanwhile, tax authorities can only act under clear tax regulations (p. 62). Seligman (1920, p. 291) places this certainty tenet into the group of administrative principles because it relates to the taxation system and implementation.

The second characteristic is transaction-focused, and it is in line with the accrual basis and the realization doctrine adopted under the definition of income. Article 4 paragraph (1) of UU PPh (Law No. 7 of 1983) formulated the definition of income consisting of five elements. They are (1) any additional economic capacity, (2) received or accrued by taxpayers, (3) both originating from Indonesia and from outside Indonesia, (4) usable for consumption or to add to the wealth of the Taxpayers concerned, and (5) by name and in any form.

The income definition above has never changed at all, although UU PPh was subject to four-time amendments (1991, 1994, 2000, and 2008) since its first enactment in 1983 (Law No. 7 of 1983). Of the five elements of income, as described above, there are two elements related to the concept of tax accounting that focuses on the calculation of taxable income. The first element is the addition of economic capabilities. The second is the accounting treatment, which refers to the accrual concept. Both aspects need further analysis to reveal tax accounting problems arising from IFRS convergence, and we analyze both in the following paragraphs.

The first, phrase "...any additional economic capacity..." in the income definition adopts the income concept from the S-H-S concept (Schanz-Haig-Simon) (Mansury, 1994, p. 24). However, according to Mansury (1994, p. 24), UU PPh (Law No. 7 of 1983) does not fully adopt the S-H-S concept of income. Most tax economists agree that the S-H-S idea is an ideal starting point for formulating income for tax purposes (Mansury R. , 1996a, p. 23). The S-H-S model has a central theme in the accretion theory of income. The accretion concept constitutes the only theory that produces the notion of income that enables the application of the "ability to pay principle" (Mansury R. , 2000, p. 39).

The reason for not fully adopting the S-H-S concept is the difficulty of calculating the actual income (Mansury R. , 1996a, p. 23) since the S-H-S model applies mark-to-market taxation (Weisbach, 1999, p. 95). and imposes a tax not only on realized gains but also on unrealized gains from increases of asset values (capital appreciation). The S-H-S system considers the rise in asset value as the additional purchasing power for the asset owner, although the owner only holds and does not sell the asset. According to Mansury (1994, p. 24), income becoming tax objects under UU PPh (Law No. 7 of 1983) includes only realized income, and the national tax policy-makers have agreed to this formulation.

Therefore, according to Mansury (1994, p. 31), to strengthen the application of the concept of income as an additional economic capability only covers realized income, the income definition put the following phrase "... received or accrued by taxpayers ...". This phrase becomes the second element necessitating further analysis. The phrase refers to the accounting concepts of cash basis and accrual basis (p. 31).

As described under Subsection A above, the accounting concept, which was in force when the Indonesian parliament enacted UU PPh in 1983, adopted to PAI 1973. Then, when UU PPh (Law No. 7 of 1983) came into force on 1 January 1984, the accounting concept of the accrual basis was based on PAI 1984. Both PAI 1973 and PAI 1984 referred to the U.S. accounting principles. Mansury (1994, p. 31) stipulated that the definition of income under UU PPh (Law No. 7 of 1983) applied the realization rules. Unfortunately, no elucidation of the law explicitly mentions the realization doctrine, even in all of its amendments.

Referring to the description under Subsection A, the concept of realization under UU PPh, which Mansury (1994, p. 31) meant above, is in line with the realization rule under PAI 1984. Two arguments underlie this matter. First, the elucidation of Article 13 paragraph (1) of UU PPh (Law No. 7 of 1983) stipulates that the tax accounting basis was Indonesian Accounting Principles compiled by IAI. At that time (from 1984 until 1994), only PAI 1984 became the reference for tax accounting. Second, from 1995 through 2000, tax accounting rules also referred to bookkeeping held in a way or system commonly used in Indonesia, for example, based on Indonesian Accounting Principles, unless tax legislation determined otherwise. This rule was under the elucidation of Article 28 paragraph (4) of UU KUP (Law No. 9 of 1994), The Indonesian Accounting Principles applicable in that period was only PAI 1984.

The third characteristic is the allocation of cost or matching costs with revenues. Article 6 paragraph (1) of UU PPh (Law No. 7 of 1983)

and its amendments states that allowable deductions must relate to the income definition under Article 4 paragraph (1) of UU PPh. Besides, one of the implementation regulations (Government Regulation No. 94 of 2010) explicitly mentions that the recognition of costs and income refers to the matching of the expenses against revenues. In the case of the costs capitalized into fixed assets, Article 11 of UU PPh also allows taxpayers to depreciate their assets used for obtaining, collecting, and securing income.

The fourth characteristic is the historical cost accounting (HCA). Article 10 of income tax law stipulates that measuring assets must refer to the cost of acquisition. Besides, Article 11 of income tax laws requires taxpayers to depreciate their fixed assets based on the acquisition costs of the assets. Taxpayers must also amortize their intangible assets based on the acquisition costs of the assets under Article 11A of the laws.

Some considerations underlie the use of HCA. First, HCA refers to the book value of assets, based on the price at the time of payment, as an element of financial statements (Greenberg, Helland, Clancy, & Dertouzos, 2013, p. xiii). HCA focuses on actual events that occurred in the past and uses the assumption of a stable monetary unit (Riahi-Belkaoui, 1999, p. 28). HCA applies the matching principle and the realization principle (p. 28), so that income statements arise from the matching process between revenue (the value obtained from the transactional exit price) and costs (the value derived from the transactional input price)

The fifth characteristic is reliability, which is synonymous with verifiability. Based on respondents' comments on the meaning of reliability, IASB (2010, p. BC3.25) concluded that what it means closely resembles its notion of verifiability. Financial statements are verifiable when divergent independent and knowledgeable observers could obtain consensus even though not complete agreement. To verify taxpayers' tax reporting, tax officers perform an audit as stipulated under Article 28 of UU KUP (Law No. 6 of 1983) and its amendments. Therefore, under the tax laws, taxpayers must report income tax returns clearly, correctly, and completely.

### *C. The Development of Tax Accounting after IFRS Convergence*

Factually, the 2012 IFRS convergence in Indonesia has not led GoI and parliament to revise existing tax laws, including those relating to bookkeeping provisions. However, many researchers have stated that the IFRS implementation has increased taxation issues. Some of the authors are Saptono (2012), Samuel et al. (2013), Nengzih (2015), Herath & Melvin (2017), Kiryanto & Lestari (2018), and Wahidah & Ayem (2018). Some of the impacts are related to the characteristics underlying IFRS implementation. Even though the decision-usefulness theory adopted before the global IFRS adoption is still relevant to IFRS adoption/convergence, a revolutionary change in accounting fundamentals/thoughts has been happening. The features of the accounting paradigm under the information era, as Shortridge & Smith (2009) explain in Figure 1, are also applicable to analyze tax accounting issues after IFRS convergence in Indonesia.

The first tax issue is whether the formulation of taxation rules can adopt a principles-based approach because tax regulations require legal certainty and precise arrangements. However, unclear tax provisions due to the implementation of a principles-based model could lead to subjective professional judgments from taxpayers' perspectives and tax officers' views. Their divergent perspectives could increase potential tax disputes and compliance costs. The second tax problem focuses on economic events, instead of transactions, which the characteristic of representational faithfulness underlies. The potential problem is how taxpayers can provide evidence to the tax officers requiring supporting documents and finding difficulties in reconciling numbers in financial statements to the transaction evidence. The third tax matter relates to fair value accounting. The question is whether mark-to-market measurement under IFRS can replace HCA adopted by existing income tax regulations. The imposition of income tax on unrealized gains arising from the capital appreciation of holding financial, fixed, or intangible assets could conflict with the ability to pay principle.

To enhance the comprehensiveness of our analysis on the development of tax accounting thoughts after the IFRS convergence in Indonesia, we have carried out in-depth interviews with the resource persons. Based on our in-depth interviews, Aرسال (2020), Samingun (2020), Santosa (2020), Dharmawan (2020), and Kusuma (2020) entirely agree to say that no significant development of tax accounting thoughts have occurred after IFRS convergence, while financial accounting thoughts have developed significantly. They also stipulate that the gap between financial accounting and tax accounting is increasing. Book-tax conformity is decreasing (Samingun, 2020). In practice, the increased difference results in increased adjustments in tax reconciliation (Kusuma, 2020; Dharmawan, 2020).

Santosa (2020), as a policymaker in DGT, is aware that the tax accounting application in Indonesia is not separable from UU KUP and UU PPh. Santosa (2020) understands that the existing laws have not changed after the IFRS implementation so that tax accounting in Indonesia has also not experienced significant changes. Anyway, although still applying the rules-based approach and HCA, Santosa (2020) states that UU KUP still allows tax accounting to adopt IFRS. It is because the elucidation of Article 28 paragraph (7) of UU KUP does not explicitly specify SAK, to which taxpayers must refer in their bookkeeping. As described in Subsection B, before IFRS convergence IAI issued three accounting standards, including PSAK converged with IFRS.

One example showing that tax rules adopt PSAK in line with IFRS, according to Santosa (2020), is the tax treatment for foreign exchange gains/losses that have to refer to the applicable Indonesian accounting standards. It means that tax treatment does not differ from accounting treatment before and after IFRS convergence, although tax rules remain unchanged.

In the information era, one tax accounting problem that makes it "complicated," according to Aرسال (2020), is how to interpret the elucidation of Article 28 paragraph (7) of UU KUP (Law No. 28 of 2007). The formulation of the law took place before IFRS convergence and adopted accounting concepts under the industrial accounting paradigm. When facing economic transactions in the information period, tax officers will adopt tax rules enacted in the context of the industrial period. Potential tax disputes could emerge because of accounting paradigm conflicts between FVA versus HCA and economic event-focused versus transactions-focused.

What Arsal (2020) says about the complexity of legal interpretation above is in line with Dharmawan (2020). As a tax manager in a public company whose core business is in a global telecommunication operator, Dharmawan (2020) sometimes found different interpretations from tax officers in a tax audit for some unclear provisions.

To decrease the book-tax difference, as described above, Arsal (2020) says, "We need to have a bridge, and it is the policymakers' primary responsibility." Samingun (2020) also agrees with Arsal (2020). Arsal (2020) further proposes to Directorate General of Taxes ("DGT"), Fiscal Policy Agency (Ministry of Finance) or "BKF," and their stakeholders (IAI, accounting academics, tax consultants, and tax accounting practitioners) to jointly discuss and solve the current gap. Arsal (2020) states that if accounting rules and tax rules can get closer, the tax reconciliation will automatically be insignificant. If at any time the accounting report can be the basis for tax reporting without having to make very significant adjustments, the compliance cost will significantly decrease.

Anyhow, in the proposal of joint discussion between DGT and its stakeholders, Arsal (2020) recommends that tax provisions do not need to adopt accounting rules fully because the attempts to amend tax regulations will be massive. Besides, it could increase taxpayer compliance costs. Conversely, it will be impossible to make accounting rules adopting tax rules fully. However, some cases of the book-tax gap can be simplified when the level of risk is still relatively simple (Arsal, 2020).

For a practical solution, as a tax professional, Kusuma (2020) proposes DGT to issue technical guidance immediately. With this guidance, taxpayers can avoid the confusion resulting from the increased gap. In the next step to solving the increased difference because of IFRS, according to Kusuma (2020), it will better for tax rules to be able to adopt fair value concepts due to the changing world. As a tax practitioner, Dharmawan (2020) also supports Kusuma (2020)'s proposal above. Dharmawan (2020) proposes DGT issue implementation guidance concerning what accrual basis means based on UU PPh (Law No. 7 of 1983) in the context of the fair value accounting era. Therefore, according to Dharmawan (2020), tax authorities should consider issuing technical or implementation guidance for some grey areas of taxation rules. One of the examples is how to apply an accrual basis under the definition of income, as stipulated in Article 4 paragraph (1) of UU PPh. The policymakers formulated the accrual concept in the provision based on industrial accounting theories, while the recently accounting paradigm is under the information era.

According to Samingun (2020), to solve the income measurement under the FVA vs. HCA issue, tax authorities should firstly consider what tax principles they should apply. The three tax tenets relevant to this matter are legal certainty, ability-to-pay concept, and realization doctrine. However, Samingun (2020) says that DGT and BKF are recently performing internal discussions so that they have not come to the final decision. Before policymakers issue new tax rules to solve the increased book-tax difference, Samingun (2020) proposes taxpayers strengthen tax reconciliation. Unfortunately, Samingun (2020) is still afraid of tax officers' understanding of current income tax regulations. Their diverse knowledge could lead the increased tax disputes coming to the tax court.

Samingun (2020) and Santosa (2020), as the DGT officials, stipulate that both taxpayers and tax officers should understand the position of tax accounting concepts adopted by UU PPh. The act still applies the rules-based approach, the realization rules, and the ability-to-pay model. Tax laws have to implement the rules-based approach because it relates to tax compliance, and taxpayers must comply with prevailing tax regulations (Samingun, 2020). The realization concept is required because it is relevant to the ability-to-pay tenet underlying UU PPh. Taxpayers will have the ability to pay a tax if they can realize income, and the realized income refers to the values of transactions. Therefore, UU PPh adopts HCA to support the realization doctrine and the ability-to-pay concept.

As a consequence, any accrual resulting from the application of FVA under PSAK converged with IFRS will not impact tax imposition. In other words, unrealized income is not taxable yet, and unrealized loss/expense is not deductible for tax purposes. According to Samingun (2020), to increase certainty and ease of administration, DGT and IAI can make a tax reconciliation guidance. In this case, Samingun (2020) is concerned with the increased compliance cost because of no such technical guidelines.

As recently, GoI is performing the third tax reform; Arsal (2020), Samingun (2020), and Santosa (2020), as the DGT officials, have a specific query during their interviews. The question is whether the definition of income under UU PPh (Law No. 7 of 1983) is still relevant and applicable for the next income tax law. Arsal (2020), Samingun (2020), and Santosa (2020) agree to stipulate that tax policymakers must be careful to determine the notion of income according to the upcoming income tax law. Their precautionary attitude relates to the underlying tax principles. However, all interviewees agree that certainty principle and ability-to-pay concept must underlie the forthcoming income tax law because both are closely related to compliance costs.

Anyhow, the definition of income must relate to how the authorities will impose a tax on income. Based on academic literature, GoI and parliament have three options to implement income-based taxation: (1) mark-to-market taxation (Weisbach, 1999, p. 97); (2) realization taxation (p. 97); and (3) hybrid taxation (Schenk, 2004b, p. 503). Mark-to-market taxation means that DGT imposes a tax on unrealized gains arising from capital appreciation. Such a tax system is in line with mark-to-market accounting adopted by IFRS standards and becomes the ideal and pure system of income-based taxation under the S-H-S concept of taxation. Anyhow, Robert Haig, and Henry Simons—as the pioneers of the S-H-S model—each realized that the adoption of mark-to-market taxation is impossible (Kleinbard & Evans, 1997, p. 790). Besides, the big issue stems from the implementation of the ability-to-pay concept.

Realization taxation adopts the realization doctrine so that it will be in line with the ability-to-pay model. In this case, DGT only taxes realized gains, whereas capital appreciation is not taxable yet. Nevertheless, the pure realization taxation, according to Schenk (2004b, p. 355), is inapplicable as the doctrine of realization produces distortion and injustice.

Hybrid or mixed taxation combines mark-to-market taxation and realization taxation. It means that DGT and its stakeholders have to agree to some income subject to mark-to-market taxation and other income subject to realization taxation. Thus, a taxation system with

a hybrid system requires precise definition and line drawings to distinguish the rules (Weisbach, 1999, p. 97).

## V. CONCLUSION

Based on the first objective of this study, this research concludes that before IFRS convergence in 2012, the development of tax accounting thoughts is inseparable from and dependent on the development of accounting thoughts. Since the first tax reform applying the modern tax system in the form of self-assessment concept in 1983, tax accounting under tax laws always has been referring to the prevailing accounting standards with some tax adjustments. Besides, before and after IFRS convergence, the tax accounting paradigm remains unchanged. It relates to the accounting paradigm in the industrial era with the following characteristics: (1) rules-based, (2) transaction-focused, (3) using historical cost accounting, (4) referring to the concept of matching cost against revenue, (5) reliability-based. The shift of financial accounting thoughts from the industrial paradigm to the information one does not result in the change of tax accounting paradigm since the tax laws, to which the tax accounting concept refer, have not changed yet. Consequently, the difference between financial accounting rules and tax accounting rules gets increased.

The second conclusion is that to decrease the book-tax gap requires two approaches. First, conceptually, tax policymakers should perform joint discussions with their stakeholders to make a bridge so that financial accounting rules and tax accounting regulations can get closer, and tax reconciliation will be insignificant automatically. The bridge relates to how DGT imposes a tax on income based on mark-to-market taxation, realization taxation, or hybrid taxation. The tax imposition must apply the principle of legal certainty and the ability-to-pay tenet, increase taxpayers' compliance, and decrease taxpayers' compliance cost. Second, for a practical solution, DGT and IAI should jointly formulate technical guidelines concerning tax reconciliation as the response to the tax implication of IFRS convergence applying a principles-based approach and fair value accounting system.

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# Credit Risk and Financial Performance of Commercial Banks in Kenya

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**Abstract-** Globally, credit risk is one of the significant concerns to banks, and, therefore, these institutions spend a substantial amount of money on managing it with a view of maximizing returns. Financial performance is a very crucial aspect for any institution since the majority of stakeholders use it as a parameter to gauge its viability. This research is anchored on credit risk theory, which postulates that credit risk is negatively related to the financial performance of a firm. The purpose of this study was to investigate the effect of credit risk on commercial banks' performance in Kenya for five years (2014-2018). The study used secondary data from the respective banks' annual financial statements. Descriptive statistics, such as mean and standard deviation, were used to explain the characteristics of the study variables. Also, a multiple regression method was used to examine the effect of credit risk on the banks' performance. It was found that non-performing loans and loan loss provision had non-significant negative effects on the banks' profitability with  $p=0.394$  and  $p=0.653$ , respectively. The research also unveiled that loans and advances (LA) had a significant positive impact on commercial banks' profitability ( $p=0.001$ ). Based on the study findings, commercial banks should be keen on clients' appraisal and loan analysis to mitigate credit risks.

**Index Terms-** Commercial banks, Credit risk, secondary data, performance

## 1. INTRODUCTION

Commercial banks play a critical role in developing the economy of a country, even though their performance is affected by both intrinsic and extrinsic factors (Karim & Alam, 2013). Credit risk is one of the banks' idiosyncratic determinants affecting their performance, and it can be defined as the likelihood that the borrowers might fail to pay the loans (Yesmine, Saif, & Bhuiyah, 2015). Banks with higher loan volume and lower credit risk perform better than those without (Mauricio, Moya, & Arturo, 2014). According to Ally (2014), asset quality, which is measured by the ratio of non-performing loans (NPL) to total loans (TL), has a significant adverse effect on the banks' performance.

Kolapo, Ayeni, and Oke (2012) opine that credit risk can be evaluated using loan loss provision (LLP), non-performing loans (NPL), and loans and advances (LA). Sound credit risk management can reduce loan default and increase commercial banks' performance. To enhance higher profitability, banks need to institute loan administration strategies, such as utilizing credit information bureaus before deciding whether to approve or decline loan requests (Ogboi & Unuafé, 2013).

The presence of a high level of nonperforming loans means that there is poor management of credit in the bank (Ally, 2014). NPL reduces interest income and leads to loan loss provisioning, hence reducing the banks' profitability. Commercial banks tend to be profitable when they enhance their lending activities. To mitigate the continuous growth of NPLs, banks must be keen on credit analysis, and the regulatory authorities must ensure that all the financial institutions comply with provisions of the prudential guidelines (Kolapo et al., 2012).

Loan loss provision can be reduced through efficient credit risk management techniques, strict credit policies, and restructuring of non-performing loans (Alexiou & Sofoklis, 2009). Moreover, credit managers should enhance their recovery efforts on non-performing assets to boost the profitability of their financial institutions (Nahang & Araghi, 2013).

Sometimes, a positive association is experienced between credit risk and banks' profitability in instances where the financiers charge high-interest rates and fees on their credit customers (Boahene, Dasah, & Agyei, 2012). Kaaya and Pastory (2013) argued that credit risk is not a bad situation because it is a reflection of the banks' portfolio growth, hence the higher the risk, the higher the return. Further to this, the authors opined that banks ought to maintain the capital reserve and adopt a sound mechanism to manage and reduce default.

Non-performing are costly to recover; hence they affect the profitability, liquidity, and the normal operations of the banks' activities (Almekhlafi, Almekhlafi, Kargbo, & Hu, 2016). According to Căpraru and Ilnatov (2014), credit risk hurts the growth of financial institutions, and this trend can be reversed if the banks' management adopts efficient monitoring of loan indicators to optimize costs. Moreover, quite often, there is a strong inverse relationship between credit risk and profitability of the banks; hence loan officers should adopt the best practices of managing these risks to enhance the institutions' performance (Ramadan, Kilani, & Kaddumi, 2011).

In Kenya, research shows that a change in banking risk has a significant effect on financial institutions' performance (Lukorito, Muturi, Nyang'au, & Nyamasege, 2014). Olweny and Shipho (2011) argue that banks specific factors, such as credit risk, significantly influence profitability more than the market factors. Study shows that banks with high-quality asset portfolios and low NPLs perform better than others (Ongore & Kusa, 2013). According to CBK's prudential guidelines, loan loss provisioning is essential for all classifications, and commercial banks must provide for 20%, 100%, and 100% for Substandard, Doubtful, and Loss, respectively (CBK, 2013).

For quite sometimes, the majority of banks in Kenya have been recording poor performance due to a high level of NPLs in their asset portfolios. For instance, a report by CBK (2019) indicates that the ratio of gross NPLs increased from 12.03% in 2018 to 12.78% in 2019, and this increment negatively affected the profitability of these institutions.

Although many studies have been conducted on the impact of credit risk on banks' performance, their findings are still inconsistent. For example, Yesmine et al. (2015) and Kolapo (2012) found that a rise in LLP led to the deterioration in banks' performance. On the contrary, similar studies by Boahene et al. (2012) and Tariq, Usman, Mir, Aman, and Ali (2014) unveiled that loan loss provision had a positive effect on commercial banks' performance. Furthermore, there is little research on the impact of credit risk on banks' performance in Kenya. Therefore, the current study seeks to bridge these gaps.

The rest of the paper is organized as follows: Section 2 presents literature reviews, section 3 is about research methodologies, section 4 highlights the findings and discussion, and section 5 gives the conclusion and recommendation of the study.

## 2. LITERATURE REVIEW

This section entails the theoretical review, conceptual framework, and an overview of past studies on the effect of credit risk on the financial performance of commercial banks in Kenya.

### 2.1 Theoretical Review

This study is anchored on the Credit Risk Theory, as explained below.

#### 2.1.1 Credit Risk Theory

Merton (1974) opined that there is a relationship between credit risk and the capital structure of the firm. According to Merton, a company is considered to default if its asset value is less than its outstanding debt. In such circumstances, the lenders are paid an amount equivalent to the asset, and the shareholders get nil. Therefore, according to this theory, credit risk has an adverse effect on the profitability of a firm. In another study, it was postulated that a financial asset is prone to credit risk not only at maturity but throughout its lifetime (Longstaff & Schwartz, 1995).

In their research on credit risk and financial performance of banks, Kajirwa and Katherine (2019) found a significant negative association between credit risk and banks' ROE, hence confirming the theory. They further noted that an increase of NPL to total LA reduced the banks' financial performance. Similarly, Almekhlafi et al. (2016) established that NPL had a significant negative impact on performance, thus consistent with the theory. However, some studies are not in line with this theory. For instance, Ogboi and Unuafe (2013) found out that LLP positively affected performance and Boahene et al. (2012) unveiled that credit risk and banks' performance had a positive-significant relationship.

### 2.2 Credit Risk and Financial Performance

This section dives into various aspects that constitute credit risk, e.g., NPLs, LLP, and LA.

### 2.2.1 Non-Performing Loans and Financial Performance

NPLs are assets that have not been paid for at least ninety days (CBK, 2013). Studies show that NPLs have an adverse impact on banks' performance, and, therefore, for these institutions to enhance their profitability, they must adopt sound risk management approaches and strict lending policies (Alexiou & Sofoklis, 2009; Million, Matewos, & Sujata, 2015; Nasserinia, Ariff, & Fah-Fan, 2014). However, some studies reveal that NPLs have a positive relationship with commercial banks' profitability (Boahene et al., 2012; Naceur & Omran, 2011; Weersainghe & Perera, 2013). Therefore, based on the inconsistent findings on the impact of NPLs on banks' performance, it is hypothesized that:

*H1. There is no significant effect of NPLs on the performance of commercial banks in Kenya.*

### 2.2.2 Loan Loss provision and Financial Performance

Loan loss provision is the amount of money that reduces the magnitude of bad loans to the corresponding amount on the balance sheet (CBK, 2013). According to the CBK's prudential guideline, banks should make a 20% provision for substandard loans and 100% provision for loans in doubtful and loss categories. Basel Committee on Banking Supervision (BCBS) (2001) recommended that banks should always identify bad credits to determine the extent of making loan-loss provisions. Research indicates that LLP has a significant negative effect on banks' performance (Kaaya & Pastory, 2013; Samad, 2015). On the contrary, some studies show a positive association between LLP and the banks' profitability (Ogboi & Unuafe, 2013; Tariq et al., 2014). Due to such mixed findings, it is postulated that:

*H2. There is no significant effect of LLP on the performance of commercial banks in Kenya.*

### 2.2.3 Loans and Advances and Financial Performance

Loans and advances are financial assets derived from the delivery of cash by a lender to a borrower in exchange for a promise to pay on a specific date, usually with interest (CBK, 2013). Based on BCBS (2001), loans constitute a bulk of the banks' asset, and if credit risk is mitigated, their profitability will increase. Almekhlafi et al. (2016) argue that although loans are riskier assets, they form a significant part of the banks' revenue. Kolapo, Ayeeni, and Oke (2012) noted that credit facilities are significant determinants of banks' profitability; hence bank officers should adopt prudent credit analysis in their quest to grow their loan portfolios. This study hypothesizes that:

*H3. There is no significant effect of LA on the performance of commercial banks in Kenya.*

### 2.2.4 Financial Performance

In this study, Return on Equity (ROE) was used as a proxy to evaluate the financial performance of banks for five years. ROE can be derived by evaluating the ratio of net income to total shareholders' equity. ROE shows the extent of efficiency of managers in using assets to generate income (Lan, 2012).

## Empirical Review

Kolapo et al. (2012) examined the effect of credit risk on commercial banks' performance in Nigeria. They collected data from five banks' financial statements for eleven years. Their findings indicated that a 100% rise in NPLs reduced performance (ROA) by 6.2% and a 100% increase in LA enhanced performance by 9.6%. Yesmine et al. (2015) studied the elements of banks' financial performance by comparatively analyzing the national and private banks in Bangladesh for the period 2008-2014. Their findings unveiled that credit risk had a significant adverse effect on the banks' performance. Finally, they concluded that a rise in the ratio of LLP to total loans reflected poor credit management and deterioration in profitability. One weakness in their research is that they didn't incorporate foreign commercial banks as part of their sample.

Alexiou and Sofoklis (2009) studied the determinants of the Greek banking sector's performance over the period 2000-2007. Their study established that credit risk had a significant negative impact on banks' performance. The study observed that banks in Greece had a higher level of NPLs than those in the EU, and drastic measures were needed to combat the situation. For the banks to enhance their profitability, the study recommended the adoption of excellent risk management strategies, strict credit policies, and the restructuring of NPLs.

Kaaya and Pastory (2013) investigated the impact of credit risk on the profitability of eleven banks in Tanzania. From their research, it was found that credit risk had a negative impact on the performance of banks. However, the effect of NPLs on the banks' performance wasn't significant. Almekhlafi et al. (2016) examined the impact of credit risk on banks' performance in Yemen for 1998-2013. In

their study, secondary data was used to explore the performance of six banks. The findings from their research indicated that NPLs negatively affected return on assets (ROA). Moreover, the effect of credit risk management on performance was found to be similar across banks in Yemen.

By using the panel data for 2000-2010, Ramadan (2011) investigated the causes of Islamic banks' performance in the Jordanian market. From their results, credit risk had a significant positive effect on the institutions' returns. Furthermore, their study unveiled that the impact of banks' specific factors on performance was significantly different among the Islamic banks. A survey by Samad (2015) on the determinants of commercial banks' profitability in Bangladesh established that the loan deposit ratio and LLP to total assets had a significant impact on the institutions' profitability. Weersainghe and Perera (2013) researched the influencers of commercial banks' performance in Sri Lanka for the period 2001-2011. They established that credit risk had a non-significant positive association with performance.

Ogboi and Unuafe (2013) investigated the effect of credit risk on the performance of commercial banks in Nigeria and established that loan loss provisions (LLP) had a positive effect on ROA. A study by Million et al. (2015) found out that LLP had a significant positive effect on the performance of commercial banks. Tariq, Usman, Mir, Aman, and Ali (2014) investigated the causes of commercial banks' performance in Pakistan over the period 2004-2010. Their findings revealed that loan LLP had a positive impact on the profitability of banks. Boahene et al. (2012) investigated the relationship between credit risk and performance of six selected commercial banks in Ghana for the period 2005-2009. From the results, it was unveiled that credit risk and banks' performance had a positive-significant relationship. It was concluded that in order to achieve excellent results, banks increased the percentage of default risk elements in their loan rates beyond the actual default risk to increase their profitability.

### 3. METHODS

The study used a quantitative approach to collect secondary data from the published financial statements of commercial banks in Kenya over the period 2014-2018.

#### 3.1 Sample Size

A census sampling method was used to select the entire population of 43 commercial banks for the study. According to Sekaran and Bougie (2016), this method is suitable when dealing with a small population. However, out of the 43 banks, only 31 met the inclusion criteria since 3 of them were under receivership while the other 9 banks' data could not be found online.

#### 3.2 Model Specification

The model for this study was selected based on the work of Kolapo et al. (2012), Poudel (2012), and Almekhlafi et al. (2016), who conducted studies on credit risk and commercial banks' profitability. According to this model, commercial banks' performance is determined by credit risk variables, such as NPLs, LLP, and LA.

Therefore, the model equation becomes;  
$$ROE = \beta + \beta_1 NPL + \beta_2 LLP + \beta_3 LA + \epsilon_i$$

Where;

ROE: Return on Equity

NPL: Non-Performing Loan

LA: Loan and Advances

LLP: Loan Loss Provision

$\beta$  = Constant parameter

$\beta_1, \beta_2, \beta_3$  = Coefficients of predictor variables

$\epsilon_i$  = Error term

Therefore, transforming the equation into natural logarithm it becomes;

$$\ln ROE = \beta + \ln \beta_1 NPL + \ln \beta_2 LLP + \ln \beta_3 LA + \epsilon_i$$

### 4. RESULTS AND DISCUSSION

#### 4.1 Descriptive Statistics

As shown in Table 1, the average return on equity (ROE) for the 31 banks was 0.098. This implies that each shilling from the shareholders' equity generated a profit of Kes 0.098. Moreover, the findings indicate that the average non-performing loan (NPL) was Kes 6.851 billion, average loan loss provision (LLP) was Kes 2.566 billion, and the average loans and advances stood at Kes 74.15 billion. The results of this study concur with the CBK (2019) report, which indicated that commercial banks performed poorly due to a high level of non-performing loans.

**Table 1 Descriptive Statistics**

Variables	N	Minimum	Maximum	Mean	Std. Deviation
ROE	31	-.24	.2424	.098	.10
Non-performing loans (Kes ‘million’)	31	487.47	28776.5478	6851.21	6901.19
Loan loss provisions (Kes ‘million’)	31	151.95	14377.1370	2565.99	3051.52
Loans and advances (Kes ‘million’)	31	5532.800	378802.2000	74149.84	90144.49
Valid N (listwise)	31				

#### 4.2 Credit Risk and Financial Performance

In this study, credit risk was measured using NPLs, LLP, and LA. The following are the results relating to these variables.

##### 4.2.1 Non-Performing Loans and Financial Performance

A multiple regression analysis was conducted to determine the effect of non-performing loans on the financial performance of banks. From the results (Table 2), NPLs had a non-significant negative impact on ROE ( $p=0.394$ ) at 0.05 level of significance. Therefore, the null hypothesis that there is no significant effect of NPLs on the performance of commercial banks in Kenya was accepted. The results of this study agree with Kaaya and Pastory (2013), who found a non-significant effect of non-performing loans on the banks’ profitability. However, this study’s findings differ with Yesmine et al. (2015), Alexiou and Sofoklis (2009), and Almekhlafi et al. (2016), who established that credit risk had a significant and negative impact on banks’ performance. Furthermore, the outcome of this research is not in line with Nasserinia et al. (2014), who reported that NPLs had a significant positive relationship with the banks’ net interest margins.

##### 4.2.2 Loan Loss Provision and Financial Performance

The findings in Table 2 reveal that LLP had a non-significant negative effect on the banks’ return of equity ( $p=0.653$ ) at 0.05 level of significance. Based on the results, the null hypothesis that there is no significant effect of LLP on the performance of commercial banks in Kenya was accepted. The findings of this study confirm Merton’s (1974) theory that credit risk is negatively related to the financial performance of a firm. However, the results of this study don’t tally with Samad (2015), Ogboi and Unuafe (2013), and Tariq et al. (2014), who found that loan loss provision affected the banks’ performance positively.

##### 4.2.3 Loans and Advances and Financial Performance

According to the findings (Table 2), loans and advance had a significant positive impact on the banks’ performance ( $p=0.001$ ) at 0.05 level of significance. Therefore, the null hypothesis that there is no significant effect of LA on the performance of commercial banks in Kenya was rejected. The findings of this study are in line with Ramadan (2011), Samad (2015), and Boahene *et al.* (2012), who unveiled that LA significantly affected banks’ performance. On the contrary, the results of this study differ with Weersainghe and Perera (2013), who established that that credit risk had a non-significant positive relationship with profitability.

**Table 2 Coefficients**

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-6.920	1.224		-5.653	.000
1 Ln NPL	-.284	.328	-.398	-.867	.394
Ln LLP	-.160	.352	-.241	-.455	.653
Ln LA	.766	.197	1.167	3.892	.001

a. Dependent Variable: Ln ROE

### 5. CONCLUSION AND RECOMMENDATIONS

The study used a regression model to examine the effect of credit risk on the financial performance of commercial banks in Kenya. From the findings, an R Square of 0.479 was derived. This implies that 47.9% of the variation in banks’ financial performance was contributed by credit risk, and 52.1% of the variation in the performance was due to the error term or other variables not studied.

Also, it was revealed that non-performing loans and loan loss provision had non-significant negative impacts on the banks' performance with  $p=0.394$  and  $p=0.653$ , respectively. However, LA had a significant positive effect on commercial banks' profitability ( $p=0.001$ ).

To reduce NPLs, commercial banks should meticulously appraise their clients before advancing any credit to them. Credit officers should enhance their recovery efforts on non-performing loans through the adoption of appropriate risk management approaches. Moreover, the commercial banks' regulator should strictly enforce prudential guidelines through periodic supervision of financial institutions.

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# Sustainable Performance Criteria for Prefabrication Construction System

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**Abstract-** Prefabrication has been considered an effective alternative to conventional building. It has gained an increasing amount of attention over the last few decades towards achieving sustainable goal. To develop prefabricated housing and address challenges in construction industry, the Indian government is encouraging prefabricated construction system. A critical review was conducted to identify the potential usage of prefabrication construction system compared to conventional construction methods. Through a comprehensive review of relevant literatures it was observed that, prefabricated construction system has become increasingly popular and widely promoted due to its potential to improve the construction environment, quality and productivity.

**Index Terms-** Prefabrication, Sustainable, Economic, Social, Environmental

## I. INTRODUCTION

According to a report titled Brick by Brick: Moving towards 'Housing for All', by RICS (Royal Institution of Chartered Surveyors), in association with international property consultant Knight Frank, by the year 2030, more than 40% of the Indian population will live in urban India, as against the current figure of 34%, which is likely to create a demand for 25 million additional affordable housing units. The report estimates that the current housing shortage in urban areas is around 10 million units. Most of the housing shortage lies in the Economically Weaker Section (EWS) and Lower Income Group (LIG) segment. This problem has been growing exponentially with increasing in urbanization. In urban areas, India has a great challenge to achieve the target of 10 million houses by 2022 [1]. The massive housing deficit, highlighted by the problem of affordability cannot be tackled through conventional technology utilized in the construction industry. Emerging technologies will play a vital role in effective implementation of policies like Housing for All [2]. A growing awareness of environmental, social and economic problems associated with contemporary architecture and industry have led business leaders, corporations and nations across the world to adopt practices that are deemed to be more sustainable over the long term. While at present most of these practices have been aimed at reducing resource consumption, energy use and emissions, there really hasn't been

a drastic or fundamental redesign of the entire approach to the process of visualisation and creation of the built environment. Revolutionary housing concepts like the 'India Concept House'- a prefabricated building solution-can help achieve cost savings both in the short term and over the life of the structure [3]. This study is focused on critical review on adoption of prefabricated construction and identifying such challenges faced by the prefabricated technology and providing amicable solutions to the challenges identified at the industry level.

## II. DEFINITIONS

Prefabrication is the act of collecting segments of a structure in a manufacturing process or other assembling site, and transporting complete congregations or sub-gatherings to the development site where the structure is to be constructed [4].

Industrialized Building System (IBS) has become a term to represent those terminologies base on research in the context Malaysian construction industry. The term IBS is widely used by the government, practitioners and researchers in this country to represent industrialization in construction. The term IBS is defined as an innovative process of building construction using the concept of mass-production of industrialized systems, produced at the factory or onsite within controlled environments, it includes the logistic and installation aspect of it, done in proper coordination with systematic planning and integration [5].

Capsule unit is a term refers to a prefabricated living space that accommodates the everyday essentials of a person. The replaceable capsule units are prefabricated and assembled in factories and then installed into a concrete core which contains the public utilities as stairs, elevators, plumbing and electrical systems [6].

According to Modular Building Institute, Modular construction is a process in which a building is constructed off-site, under controlled plant conditions, using the same materials and designing to the same codes and standards as conventionally built facilities – but in about half the time. Buildings are produced in “modules” that when put together on site, reflect the identical design intent and specifications of the most sophisticated site-built facility – without compromise.

According to International Building Code 2015 (G223-15), Relocatable building is defined as a partially or completely assembled building constructed and designed to be reused multiple times and transported to different building sites.

### III. SUSTAINABLE ASPECTS

Prefabricated construction is considered as a sustainable construction approach due to its different advantages related to cost reduction, energy efficiency, and environmental conservation. The following section deals with the comparisons categorized by economic criteria, social criteria, and environmental criteria between prefabrication and on-site construction method have been identified. This creates a valuable base for the development of sustainable performance criteria

#### A. Economic Criteria

Almost every paper on success criteria in prefabrication construction never forgets to mention about two criteria namely cost and time which are often grouped under project efficiency dimension. Reducing cost and time are major concerns for both consumers and manufactures in the building industry. When compared to conventional construction methods, the prefabricated construction system provides significant reductions in time [7, 8, 9, 10, 11]. Construction time for prefabrication is less than half of on-site construction [12]. Up to 70% time saving can be achieved when compared in-situ construction and average reduction in construction time can achieve 20% when compared with onsite construction [13]. In case of prefabrication system, site preparation and prefabrication of components can occur simultaneously, and the erection process is fast [13, 14]. Further, prefabrication is independent of adverse weather which has almost no impact on the schedule of the prefabrication manufacturing [13]. This also reduces the construction time of projects using the prefabricated construction when compared to conventional construction.

When compared to conventional design, the prefabrication design has different complexities and pre-project planning is quite important for prefabrication construction system. Prefabrication require more engineers, quality controllers and skilled labourers, these requirements will increase the cost of the design phase [11]. The higher initial and transportation costs are the main economic hurdles of prefabricated versus conventional construction methods [15]. From a multiple case studies carried out by many researchers the total cost of prefabricated construction is significantly higher than that of conventional construction methods [16,17,18,19,20]. Further, from various research papers it was observed that cost of pre-cast may vary with the type and the size of construction. For a small project the cost of pre-cast increases due to no production of elements in bulk. However, for bigger projects the cost may decrease significantly [21,22,23,24]

#### B. Social Criteria

Social criteria of construction projects reflects the extent to which the lifecycle of construction projects meets the demands of anticipated or existing social demands. Compared to economic and environmental criteria, social criteria associated with construction projects are the least explicit in the “triple bottom line” principle of sustainable development [25]. The social criteria namely, workers’ health and safety, health of occupants, labour availability, traffic congestion and community disturbance were taken into account by many researchers in the comparative

study of prefabrication construction system with conventional construction practices. When compared to the conventional construction practices prefabrication construction system improve workers health and safety due to cleaner and good working environments. Prefabricated elements are manufactured in a factory in controlled setting to reduce on site construction activities and construction duration. This reduce construction noise, dust and other pollutants faced by nearby community. The prefabrication construction method is beneficial in urban areas where traffic conjunctions may be avoided [13, 26, 27].

Further, in the construction industry, safety plays a vital role as well as a challenge for contractors and owners. Improving safety performance for construction projects should be among the one of the important priorities of construction practitioners. In recent decades many construction studies have been conducted to identify safety risks and improve safety performance in this industry. From various studies it was concluded that construction jobs at manufacturing plants are potentially safer than on-site operations, and the majority of the accidents occurred on site. Off-site construction can improve safety performance in various ways [28, 29, 30, 31].

#### C. Environmental Criteria

According to the International Energy Agency report 2019, the buildings and construction sector accounted for 36% of final energy use and 39% of energy and process-related carbon dioxide (CO<sub>2</sub>) emissions in 2018, 11% of which resulted from manufacturing building materials and products such as steel, cement and glass [32]. India is currently at a crucial juncture where it is aiming for economic growth to meet the basic needs of its 1.3 billion people. The construction sector is highly resource and energy intensive, it is therefore imperative that it moves towards a path of environmental sustainability. The transformation in construction industry will play a vital role in reducing energy consumption in India. Prefabrication construction system improves sustainability in construction and provides environmental benefits [33,34]. The sustainable benefits of prefabricated buildings have been addressed in many studies. Prefabricated buildings result in fewer emissions than conventional buildings in the construction phase [35]. Environmental criteria namely, construction waste, pollution generation, energy consumption and water consumption were accounted by many researchers in their studies to compare benefits of prefabrication construction system with that of conventional methods. [36, 37]

Construction industry produces a large amount of construction waste during various phase and is generally regarded as a major contributor for the degradation of environment. The application of prefabrication construction system shows significant reduction in wastage, which can be achieved compared with the conventional methods of construction.[31, 38, 39, 40]. A study shows that the reuse of materials in prefabricated steel buildings saves about 81% of embodied energy and 51% of materials by mass. Prefabricated houses also reduce CO<sub>2</sub> operating emissions by approximately 50% in annual households [41,42]

#### IV. CONCLUSION

A critical review was conducted to evaluate the sustainable performances of prefabrication construction compared with conventional construction. The review mainly focused on the sustainable performances in the construction phase based on the sustainable triple bottom line: economic, social and environmental aspects. Prefabrication is economical when compared to other conventional methods, prefabrication is a cost and time saving construction method which assures quality of concrete to its maximum extent. From various studies it was concluded that construction jobs at manufacturing plants are potentially safer than on-site operations. Further, prefabrication construction system improve workers health and safety due to cleaner and good working environments. This review confirms that prefabrication has many environmental benefits over conventional approaches in the construction phase and has greater performances regarding sustainable construction in terms of construction waste, energy consumption, site disruption, water consumption, and pollution generation.

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# Role of Primary cemented Bipolar hemiarthroplasty for comminuted unstable intertrochanteric fractures in elderly patients.

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**Abstract-** Management of unstable intertrochanteric femur fractures in elderly provides various challenges. Our study takes into account 20 patients with unstable intertrochanteric femur fractures treated with primary cemented bipolar hemiarthroplasty rather than the traditional internal fixation procedures. All results obtained showed a favorable outcome with respect to early mobilization, reduction in hospital stay and prevention of comorbidities related to prolonged bed rest post operatively.

**Index Terms-** Cemented Bipolar Hemiarthroplasty, intertrochanteric fractures, elderly

## I. INTRODUCTION

Fractures of weight bearing joints are common especially in the setting of the increasing prevalence of osteoporosis and osteopenia in India.(1)(2) Hip joint fractures in particular are common in patients > 65 years of age(3) and form a large percentage of orthopedic emergency ward admissions. It is estimated that more than 50% of osteoporotic hip fractures will occur by the year 2050(4) Thus, the need to assess the success and efficacy of the treatment modalities of these fractures is imperative.

Treatment of intertrochanteric (IT) fractures has changed extensively over time. The choice of treatment also depends on whether a fracture is stable or unstable(5), age(6) and presence of comorbidities such as rheumatoid or osteoarthritis (7). The spectrum of surgeries includes - internal fixation, hemiarthroplasty, total hip arthroplasty. Though internal fixation is preferred for younger patients who are healthier with good bone stock, Osteosynthesis is fraught with number of complications in older patients with poor bone stock and extensive comminution at the fracture site due to osteoporotic bones(8)(6). Further comparisons have been made comparing unipolar vs. bipolar hemiarthroplasty, cemented vs. uncemented hemiarthroplasty, internal fixation vs. total hip arthroplasty and the likes(9). For unstable IT fractures, since the fracture line is in the posteromedial wall or the greater or lesser trochanter in unstable fractures, it increases the risk of complications(10). Therefore, the ideal choice for treatment of these fractures which will one that allow earliest possible full weight bearing to prevent complications associated with recumbence(11).

In this study we present our experience with the use of cemented bipolar hemiarthroplasty in the treatment of patients aged > 60 years with unstable intertrochanteric fractures.

## II. MATERIALS AND METHODS

We conducted a retrospective review of all patients admitted to MMIMSR, Mullana Ambala with unstable intertrochanteric fractures between Jan 2017 and December 2018. This study was approved by the ethics committee at MMIMSR.

### *Data collection*

Patient demographics such as age, sex, side and mode of injury of patient were collected from patient medical records. We also collected data regarding length of hospital stay, duration to full weight bearing and any surgical complications. Pre-operative X-Rays were done and the Boyd and Griffin Classification was used to classify the fractures.

### *Statistical analysis*

We used descriptive statistics to summarize patient demographics and post-operative outcomes. We report mean values for age, duration of stay and time to weight bearing. All statistical analysis was performed on Microsoft excel (2007, Microsoft Corporation, U.S.A)

### *Operative technique*

A preoperative Pelvis with B/L Hip X-ray AP and lateral views was done for templating and determination of appropriate size of stem, head and femoral offset. All procedures were performed within 24 hours of admission by the same surgical team after due clearance from the Department of Anaesthesia at MMIMSR.

The Modified Gibson posterolateral approach was utilized in lateral decubitus position. After proper exposure the femoral cut was made with extra precaution to avoid injury to the greater trochanter. Reaming of appropriate size of the femoral canal was done and trail reductions were performed. After determination of exact length, offset, and version cemented stem was introduced into the medullary canal and fixed with meticulous second generation cementing techniques. Head component of appropriate size was fixed and the hip was reduced. Medial bone loss was reconstructed using cement mantle. Calcar Prosthesis was used in 1 case with a 1.5 month old IT femur fracture with severe bone loss. The unstable greater trochanter was reduced and fixed either with an encirclage wire or sutured with the help of Ethibond No 5 sutures. Short external rotators were sutured and incision was closed in layers.

Post-operative DVT prophylaxis was given in the form of Ecosprine 150 mg tab as per the ACCP criteria to all the patients. Postoperative X-rays were obtained. Sutures were removed 2 weeks post op and patients discharged with a detailed post-operative hip replacement rehabilitation protocol.

On the 1<sup>st</sup> post-operative day, patients were allowed full weight bearing ambulation with the help of a walker. A follow up protocol of 6 weeks, 3 months, 6 months and 1 year were followed for all 20 patients in our study. Serial radiographs and Harris Hip Score was used for clinical evaluation at each follow up.



Image 1: showing comminuted IT fracture managed with bipolar hemiarthroplasty and GT fixed with encircling wire



Image 2: 1.5 old month IT femur fracture with severe bone loss managed with Calcar prosthesis.



Image 3: Comminuted IT femur fracture managed with bipolar hemiarthroplasty

### III. RESULTS

Out of the 20 patients selected in our study, 12 patients were female and 8 were male with a mean age of 67.4 years. 13 sustained fracture after trivial fall at home while 7 sustained injury in a motor vehicle accident. According to the Boyd and Griffith classification, 16 patients had a Type I, 2 had Type III and 1 Type IV intertrochanteric femur fracture. One patient with trochanteric fracture (initial x ray not available) was managed at a government hospital where the operating surgeon had tried to put a sliding hip screw but somehow surgery was abandoned mid-way. She had gross posteromedial bone loss and was managed with a calcar prosthesis (Img. 2)

No reported case of any significant postoperative limb length discrepancy was recorded however 3 patients had a shortening of less than 2cm on the operated side.

No case of deep infection was observed in our study even at 12 month follow up. Mean hospital stay was 12.9 days and mean duration for full weight bearing 4.05 days. No case of prosthesis loosening was reported in our study at 12 months follow up.

At 12 months follow up Harris Hip score revealed 80 % cases were in the good to excellent category while 10 % fell into the fair category with an average HHS of 80.

### IV. DISCUSSION

Hip fractures particularly trochanteric femur fractures have become a major cause of morbidity and mortality in the elderly. The role of bipolar hemiarthroplasty in the surgical treatment of IT fractures in the Indian population has not been looked at in depth. Understanding the pros and cons of this technique is extremely crucial to improve treatment outcomes of IT fractures In Asia, particularly a 2-3 times increase in the incidence is being seen in almost every country. Unstable trochanteric fractures have shown a mortality rate of 20% in the 1<sup>st</sup> postoperative year(12). The traditional management of internal fixation when used for unstable IT in osteoporotic bone could lead to excessive collapse, implant failure, prolonged duration of immobilization and the morbidities associated with them.

In spite of the fact that several studies support union rates as high as 100% with internal fixation of stable intertrochanteric fractures, they fall short showing failure rates of 56% when it comes to unstable counterparts of the same,(13)

The severely osteoporotic nature of the elderly proximal femur along with poor capacity of bone healing tend to delay weight bearing and active mobilisation in spite of a perfectly reduced post-operative picture. The list of complications with prolonged hospital stay and a longer duration of bed rest especially in the elderly is long and grim. Thus an alternative to not just provide a good fixation but also help tackle the innumerable issues that are associated with a prolonged non ambulatory duration needed to be addressed.

The first to deviate from the traditional internal fixation and attempt a primary prosthesis in intertrochanteric femur fracture was Tronzo(14). Since then, various studies have been published comparing the advantage of primary hemiarthroplasty for IT fractures and concluded that primary cemented hemiarthroplasty when done correctly showed favorable outcomes in patients aged more than 70 years by eliminating the complications of internal fixation and faster return to ambulation.(15)

Hemiarthroplasty alleviates several of the morbidities that are associated with internal fixation for IT femur fractures.

Complications like severe collapse due to poor bone quality in elderly which could lead to a post-operative limb length discrepancy, painful limp, prolonged duration of immobilization and an overall poor quality of life are well documented.(15)

The modern bipolar hip prosthesis with advancement and understanding of the biomechanics of the hip provides several advantages of a good range of motion, rapid rehabilitation and a prolonged life without complications like loosening or wear and tear.

The results of our study were comparable to the existing recorded data. Owing to the early mobilization, there were no complications like bed sores, chest infections in any of the patients.

Fixation of the greater trochanter which was done in 8 out of the 20 cases proves to be an important step for early mobilization and favorable outcome in primary arthroplasty in unstable IT femur fractures.

Primary hemiarthroplasty when done meticulously in experienced hands not only provides a stable well fixed hip but also plays a major role in fighting potentially fatal complications related to prolonged recumbence post injury in the elderly.

## V. LIMITATIONS

Owing to the small sample size, rare complications post bipolar hemiarthroplasty like infections, loosening, peri-prosthetic fractures etc. could not be analysed in our study. Future studies comparing both internal fixation and hemiarthroplasty to address these limitations need to be done.

## VI. CONCLUSION

Old, unstable IT femur fractures when managed with cemented bipolar hemiarthroplasty have a significant role in improving patient outcomes by reducing hospital stay and aiding in early mobilization.

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# Effect of probiotic addition on survival and growth performance of white-leg shrimp (*Litopenaeus vannamei*) in earthen pond

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**Abstract-** Study was conducted to evaluate the effect of probiotic on the survival and growth performance of white-leg shrimp (*Litopenaeus vannamei*) in earthen ponds. Two treatments were carried out including treatment 1 where probiotic was added in every 7 days and a control where probiotic was not added, triplicate for each treatment, shrimps (2.9 cm in length; 0.26 g in weight) were stocked at 50 ind/m<sup>2</sup>. After 60-day of culture, the result showed that shrimps in the probiotic added treatment were significantly better performance in term of length and weight than without probiotic added treatment. However, the survival and production of shrimp was not significantly higher than the without probiotic added treatment.

**Index Terms-** white-leg shrimp, *Litopenaeus vannamei*, probiotic, growth performance, survival, production.

## I. INTRODUCTION

Shrimp farming is now increasingly intensive, making the water environment polluted by the use of many feeds and chemicals. At the same time, it affects the quality of shrimp after harvest so the study of using biological agents is a positive trend to contribute to environmental stability and limit disease in ponds through farming models combined with biofloc. According to Avnimelech (2012) the waste treatment system of suspended substances in water containing heterotrophic bacteria predominates, with high potential for use in limiting water exchange and as a food source for shrimp.

Probiotics is used very popular to balance bacteria and increase water quality in ponds. Probiotics can help to reduce toxins in ponds such as NH<sub>3</sub>, NO<sub>2</sub><sup>-</sup>, H<sub>2</sub>S ... Improving water color, balancing ecosystems, decomposing organic substances, preventing algae blooms and absorption of the nutrient from decomposed algae, helping shrimp absorb good feed, reducing feed consumption, stimulating immune system and disease resistance (Farzanfar, 2006; Hari *et al.*, 2006; Adel *et al.*, 2017). Application of probiotics is limit use of chemicals and antibiotics in aquaculture. Probiotics have advantages over chemicals and antibiotics in that minimizing toxins that are harmful to shrimp as well as affecting shrimp quality in the future. But now, most shrimp farmers use probiotics unreasonable, only applied when the pond encounters environmental problems or shrimp health, without the need to periodically fertilize to create the initial

erosion in overwhelming the pathogen. In addition, the improvement of immune, survival and production of shrimp by probiotics addition has been demonstrated under laboratory conditions in many previous studies (Garriques and Arevalo, 1995; Vaseeharan and Ramasamy, 2003; Hari *et al.*, 2004). However, probiotics in the market is vary in quality. So that, the present study was tested the effect of local probiotics on shrimp performance rearing under earthen pond condition.

## II. MATERIALS AND METHOD

### 2.1 Experimental design

The study was arranged with two treatments (T) including the treatment with probiotics addition and other without addition of probiotic (control treatment). triplicate for each. Shrimp seeds were reared in earthen ponds at 50 ind./m<sup>2</sup> in water salinity of 30 ‰. Probiotic powder including *Lactobacillus* sp. 10<sup>8</sup> CFU/g, *Bacillus subtilis* 10<sup>8</sup> CFU /g, *Saccharomyces cerevisiae* 10<sup>8</sup> CFU/g, *Nitrobacter* sp. 10<sup>7</sup> CFU/g, *Nitrosomonas* sp. 10<sup>7</sup> CFU/g và Enzyme of *Aspergillus oryzae* was added to the culture at 10 g/m<sup>3</sup> in the every 7 days. Shrimps were reared for 60 days and no water exchange was applied.

### Management

A commercial feed (Grobtest; 40% protein) was provided for shrimp at 2-3 times/day by 5-7% of shrimp's body weight.

### Sample collection and analysis

Temperature, pH of culture water was measured in every day at 7:00 and 14:00. Total ammonium nitrogen (TAN), nitrite (NO<sub>2</sub><sup>-</sup>), alkalinity was measured in every 7 days by test-kit (Sera. Gemany)

Individual length and weight of shrimp was measured in every 15 days, 30 shrimps from each treatment was randomly sampled and measured for body length and determined individual length by analytical balance (Sartorius. 0.00 g), then shrimps were put back to the ponds when the data was completely obtained. Afterwards, growth performance data of experimental shrimp consisting of daily weight gain (DWG), specific growth rate (SGR) and survival; was calculated using the following equations:

Weight gain (g) = final weight - initial weight

Daily weight gain (DWG; g/day) =  $\frac{\text{final weight} - \text{initial weight}}{\text{cultured days}}$

$$\text{Specific growth rate (SGR; \% / day)} = \frac{100(\ln \text{ final weight} - \ln \text{ initial weight})}{\text{cultured days}}$$

FCR = feed provided (dry weight)/weight gain (wet weight)

Survival of shrimp was determined at the end of experimental period.

$$\text{Survival (\%)} = 100 \times \frac{\text{final number of shrimps}}{\text{initial number of shrimps}}$$

## 2.2 Statistical analysis

Dataset of each treatment was calculated to get mean and standard deviation by Microsoft Excel software and statistically processed one-way ANOVA factor and the Tukey-HSD test by Statistica 7.0.

## III. RESULTS AND DISCUSSION

The average temperature in the morning and afternoon was much different in whole experimental period. The average temperature in the morning ranged from 27.2 to 27.6 and the afternoon in the range of 30.6 - 31 °C. pH level was not widely fluctuated, the morning pH of the treatments was 7.9, for the afternoon pH ranged from 8.3 to 8.4. The temperature for suitable growth of shrimps is recommended from 25 - 32 °C, pH is from 7.5 to 8.5 (Boyd, 2002). Thus, the temperature and pH values of the current experiments are within the appropriate limits for whiteleg shrimp growth.

**Table 1. Physical parameters**

Treatment	Temperature (°C)		pH		TAN (mg/L)	NO <sub>2</sub> <sup>-</sup> (mg/L)
	7:00	14:00	7:00	14:00		
T1	27.2±0.6	31.0±1.2	7.9±0.3	8.3±0.2	0.14±0.29	0.14±0.61
T2	27.6±1.1	30.6±1.4	7.9±0.4	8.4±0.2	0.10±0.24	0.06±0.21

TAN concentration was in range 0.10 – 0.14 mg/L and NO<sub>2</sub><sup>-</sup> was 0.06 - 0.14 mg/L. In probiotic added treatments, the NO<sub>2</sub><sup>-</sup> concentration was 0.04 mg/L, it was lower than in the control treatment (0.08 mg/L). The appropriate TAN concentration for shrimp's growth is less than 2 mg /L (Chanratchakool, 2003) and NO<sub>2</sub><sup>-</sup> is less than 4.5 mg/L (Chen and Chin. 1988). Thus, the TAN and NO<sub>2</sub><sup>-</sup> in current study was within the allowed range for shrimp. The results of alkalinity was recorded from 116 to 126 mg/L, this level is suitable range for shrimp because the alkalinity level for shrimp is recommended from 80 to 200 mgCaCO<sub>3</sub>/L (Ching, 2007).

An average initial length of shrimp was 2.9 cm/ind. The size of shrimp increased through experimental period. The length of shrimp with 7.6 cm/individual on 30<sup>th</sup> day was recorded in probiotics added treatment, but there was significantly higher than the control (Table 2). However, the individual length of shrimp on 45<sup>th</sup> day to the day end of experimental period, the size of shrimp in probiotics added treatment was significantly better than the control (p < 0.05).

**Table 2. Individual length (cm), weight (g) and production (ton)**

Biological parameters	T1	T2
Length of shrimp on 30 <sup>th</sup> day	7.1 ± 0.8 <sup>a</sup>	7.6 ± 0.7 <sup>a</sup>
Length of shrimp on 45 <sup>th</sup> day	8.3 ± 0.8 <sup>a</sup>	9.2 ± 0.9 <sup>b</sup>
Length of shrimp on 60 <sup>th</sup> day	9.3 ± 0.97 <sup>a</sup>	10.3 ± 0.91 <sup>b</sup>
Weight of shrimp on 30 <sup>th</sup> day	3.2 ± 1.1 <sup>a</sup>	3.8 ± 1.0 <sup>a</sup>
Weight of shrimp on 45 <sup>th</sup> day	5.1 ± 1.5 <sup>a</sup>	6.0 ± 1.9 <sup>b</sup>
Weight of shrimp on 60 <sup>th</sup> day	6.8 ± 2.0 <sup>a</sup>	8.2 ± 2.0 <sup>b</sup>
DWG (%/ngày)	0.11 ± 0.02 <sup>a</sup>	0.13 ± 0.02 <sup>b</sup>
SGR (g/ngày)	5.43 ± 0.18 <sup>a</sup>	5.57 ± 0.15 <sup>b</sup>
Survival (%)	96.4 ± 3.3 <sup>a</sup>	98.4 ± 2.1 <sup>a</sup>
FCR	1.2±0.1 <sup>a</sup>	1.1±0.1 <sup>a</sup>
Production (ton/hecta)	3.758±213 <sup>a</sup>	4.350±304 <sup>a</sup>

Figure in the same line having the same letters are not significantly different (p>0.05); SGR: specific growth rate; DWG: daily weight gain; Food conversion ratio: FCR

The initial weight was 0.26 g/individual. The results showed that the shrimp in the probiotic supplementation treatments were better growth than the control treatments for whole experimental period (Table 2). Ziaei-Nejad (2006) reported that the presence of useful microorganisms can stimulate endogenous enzymes produced by shrimp that to increase the activity of digestive enzymes in shrimp digestive tract, and lead to

increase food absorption. It therefore contributes to improved survival growth and FCR reduction.

The daily weight gain (0.13 g/individual) and the specific growth rate (5.57 %/day) was the highest in T2 (supplemented with probiotics) which was statistically significant (p<0.05) compared to the control. Because the presence of probiotics in ponds helps to reduce harmful factors like NH<sub>3</sub>, H<sub>2</sub>S... In order to

improve the living environment for shrimp to maintain the density of organic decomposing bacteria.

Survival of shrimp after 60 days of culture between treatments ranged from 98% - 99% of which in the probiotic supplementation treatment reached 99% higher than the control treatment, but there was no statistically significant ( $p > 0.05$ ) between the two treatments.

Feed conversion ratio (FCR) of shrimp in the probiotic supplemented treatment was lower than the control treatments because the shrimp in the probiotic supplementation had better growth than the shrimp in the control treatment. should have led to a low feed coefficient. according to Toi et al. (2013), probiotics are a source of digestive enzyme, this enzyme also with the host enzyme will help digest food better, thus leading to better shrimp growth of target animal.

Due to the higher growth and survival rate of the probiotic supplement than the control treatment, this resulted in a higher shrimp yield, as well. Shrimps fed with probiotic supplements experienced growth in length. The weight and survival rate was higher than the control treatment. Probiotic-treated shrimp have lower feed conversion ratios and higher yields than non -probiotic reared shrimp. The results of this study indicated that probiotic for shrimp culture is recommended to achieve the best yield results.

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# Spider Silk: Structure and application

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**Abstract-** the nature is full of mysteries and engages the full minded persons and scholars to itself throughout the world, the nature presents these mysteries on a wide variety of events and inside the complex world of different creatures. There are millions of creatures that have individually strange characteristics and life condition. There are things that are in-depth scientific and debate-raising facts with these creatures which most of them are hidden and need to be discovered. Spider silk and webs are one of this mysteries. Due to low rate of degradability, toughness, elasticity and biosynthetic characteristics, the spider silk evaluated to have many scientific uses and application. Hence here in this paper, I a bit more want to discuss on spider silk uses and application on some of life-related matters. And a bit on its structure and specifications.

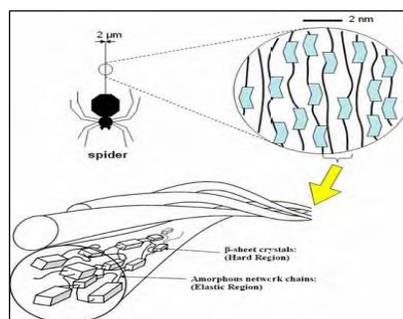
**Index Terms-** Amino acids, Fiber, Mystery, Nature, Spider, Spider web, Web

## I. INTRODUCTION

Spider is an incredible and extraordinary creature, and can be found almost everywhere in the world, such as industrial and residential areas, gardens, jungles and so on. Apparently for most of the people it looks creepy and horrific. But may be a hidden hope and a breakthrough for many science fields including medicine and environment. According to the scientist there are around 40000 species of spiders consisting a couple of groups and families. This creature has proved to be an excellent silk producer among other silk-produced insects. Inside a spider's body,

thread is stored as a highly concentrated liquid. It transforms to a solid thread when it leaves the body [2]. This silk is made of a fiber protein called fibroin, this protein is full of Amino acids of alanine  $\text{CH}_3\text{CH}(\text{NH}_2)\text{COOH}$  and glycine which is produced by a special gland on its abdomen called spinneret. [5]

Spiders use many form of silks from an array of structures, which range from simple life lines to shelter for moulting, from egg sacs, webs and to ballooning. Orb-web spinning spiders produce different types of multifunctional and high performance fibers. This nature production has mechanical, biomechanical and biochemical properties which is unique in nature.



**Fig. 1.** Schematic representation of the hierarchical microstructure of spider silk (adapted from Elices [2]).

Biodiversity, elasticity, toughness, strength and flexibility in spider-produced silk has made it an important factor to open a new track for further development of technology in most fields of the applicable sciences.

Values for the stiffness, strength, extensibility and toughness of a two species spider silks, along with values

for other biomaterials and selected man-made materials, are presented in Table 1. [1]

## II. USAGE AND APPLICATION

Let's talk about spider. To most people, they are creepy, they are gross, and they are... possibly a key to medical and industrial breakthroughs? Well not the spider themselves, but their silk! Spider silk has many potential applications in construction and medicine. It is stronger than steel and more elastic than a rubber band.

Spider silk has outstanding mechanical properties despite being spun at close to ambient temperatures and pressures using water as the solvent. The spider achieves this feat of processing by judiciously controlling the folding and crystallization of the main protein constituents, and by adding auxiliary compounds, to create a composite material of hierarchical structure [6].

A common garden spider can produce as many as seven types of silk, each made up of different sequence of proteins, in recent years scientists have suggested using spider silk to construct products as diverse as biodegradable water bottles, papers that cannot be torn, and even flexible bridge suspension cables! Think about that for a moment: the bridges of the future being suspended by the spider silk! Well, sort of. The spider silk would actually be mixed in with other materials to make something like an alloy. For example, researchers were able to meld spider silk and human skin in to Spiderman-like body armor. The hybrid skin was able to repel a slow-moving bullet fired from a 22-caliber rifle. If scaled up, spider-silk body armor could be three times stronger than Kevlar [2].

At one time, spider silk was commonly used as thread in optical devices such as telescopes, microscope and microscopic rifle sights. Some companies are trying to create airbags from spider silk composites. Instead of blasting you back in your seat, a spider silk airbag could envelope you, in the same way a web does, and the silk could absorb the force of impact. Virtually nobody has had a sufficient amount of spider-silk material to make a full-scale test of these product ideas. [2] Also it was reported that the web of *Nephila* was used by the

fisherman of the Indo-Pacific Ocean to catch small fish. [4]

Professor Gors Makenli and his colleagues inspiring from spiders silk was able to produce polymeric nano composites in Science Institute of Masachoset in 2007, which had a high elasticity and strength, these material are applicable in medical purposes and producing textile which easily cannot be torn [5].

We use spider silk also as additives in cosmetic products such as the shampoos, soaps, creams and nail varnish, enhancing the brightness, and or toughness of the products. Furthermore spider silk fibers could be applied in technical textiles (used, for example, in parachutes and bulletproof vests) which demand high toughness in combination with thinness [4]. And due to posing incredible specifications and characteristics, there are many other uses and application of spider silk. The following separately we will discuss the application of spider silk in the field of medical and environment.

### 1. Spider Silk and Medical Application

On the account of the combination of excellent mechanical properties, biocompatibility and slow biodegradability, and on the more medical side of things spider silk has found tremendous application in bio medical fields, such as tissue engineering and other medical fields. It can be used for growing artificial skin for burn victims. The silk's strength, flexibility, and slow biodegradability may make it an ideal material for growing skin and healing wounds [2]. Silk has been used most extensively as sutures for wound ligation and became the most common natural suture surpassing collagen (Catgut or Chromic Catgut TM, cross- linked collagen) used in the biomedical industry over the past 100 years.

In general, sutures should be strong, handle easily, and form secure knots. Sutures require the following characteristics for general surgical applications [3].

Spider silks have been used as bandages for centuries. Modern science has simply found ways to increase its efficiency, as well as discovered more of its amazing capabilities. In addition to providing a good scaffolding

on which to build skin, spider silk appears to aid in the regeneration of other parts of the body, such as neurons and blood vessels. Some types of spider silk may even have antimicrobial properties! Many surgeons use the thread from silk worms to stitch wounds back together, but spider threads are even thinner! That is important for eye and nerve surgery, where saving space is incredibly important. [2]

Several studies have shown that some of bisphosphonate peptides that have antibacterial activity could be found in the spider silk. Evaluated the antimicrobial activity of the silk of the spider *Pholcus phalangioides* against food born bacterial pathogens.

In addition, venoms of spider have been evaluated for the treatment of the cardiac arrhythmia, Alzheimer's disease, and erectile dysfunction. Carpathian mountain dwellers used the tube of silk produced by a spider species (*Athyus*) to cover their wounds and the silk reportedly facilitate the healing of the wounds because of its antiseptic properties. Also because the silk is rich in vitamin K, it's considered to be effective in blood clotting. [4] And still there are uses and practical application medical and biomedical fields need to be discussed in other science papers.

## 2. Spider Silk and Air Pollution

Combustion gases are much more harmful to people than pollutants deriving from the industry, because they spread in higher concentrations, on lower heights in the direct vicinity of people. Air pollution causes annually about 6% of all recorded fatal cases. The pollution coming from transport is responsible for half of them. [8]

The most dangerous are benzene, polycyclic aromatic hydrocarbons (PAH), dust and heavy metals. Dust is a serious threat. Coal particles have very high absorption capacity and therefore diverse toxic substances settle easily on their surface, including carcinogenic hydrocarbons and heavy metals. Dust participates in transporting them inside the human body. It irritates eyes, skin and respiratory tract (pneumoconiosis). Diesel engines are main source of dust emission [8].

As spider webs absorb air pollution from the environment, they can be useful indicators of air quality.

The advantages of application of spider webs are as follows: low cost of samples collection, availability of the research material, secluded location preventing their destruction by weather conditions (falls, wind, snow) and people, noninvasiveness of studies (no need of killing animals), easy collection of samples. Moreover, studies conducted so far show that cumulative ability of webs is an additional advantage. Such ability, being a consequence of its chemical structure, gives a unique opportunity to assess an air pollution level in a long-term period, contrary to the classic measurements which could only deliver information about the temporary state of the environment. Additionally, measurement of concentrations of pollutants is usually carried out with expensive and inconvenient equipment (large-sized and noisy apparatus).

On the opposite, webs collection from tunnel walls is fast and enables one to study a long-term influence of pollutants only by single examinations (e.g. 7 or 30 days).[8]

Zumudzki and Laskowski (2012) studied the biodiversity and future of spider communities along a metal pollution gradient as well, and concluded that spiders community may be attracted by the heavy metals not only directly but also by indirect effect of pollutants. The level of heavy metal in spider web can be used for both quality control and also for determination of environmental contamination or pollution. Spider web has been demonstrated as effective indicator of heavy metals attributed to particulate emission. Spider cobweb have also been used for the monitoring of pollution in industrial and residential areas. And spider have been used as bio control agent in reducing pollution of insect's pests on farmlands. (Hose et al 2002) in most developing countries, monitoring pollution may be too expensive because of the economic situation. If the instrument for monitoring is available, handling and maintenance may pose a problem. Because the maker may not take in to consideration the weather condition of the country, therefore there is a need to look for inexpensive ways of monitoring trace metals in our environment. [8]

Now for all scientist out there who are not too fond of insects at all, there is still hope! So the next time you are about to squish a spider, take a moment to appreciate

one of the nature’s most incredible creatures. And may be consider sparing its life; it might just save yours one day. [2] Some benefits and concerns of silk are detailed in Table 1 below.

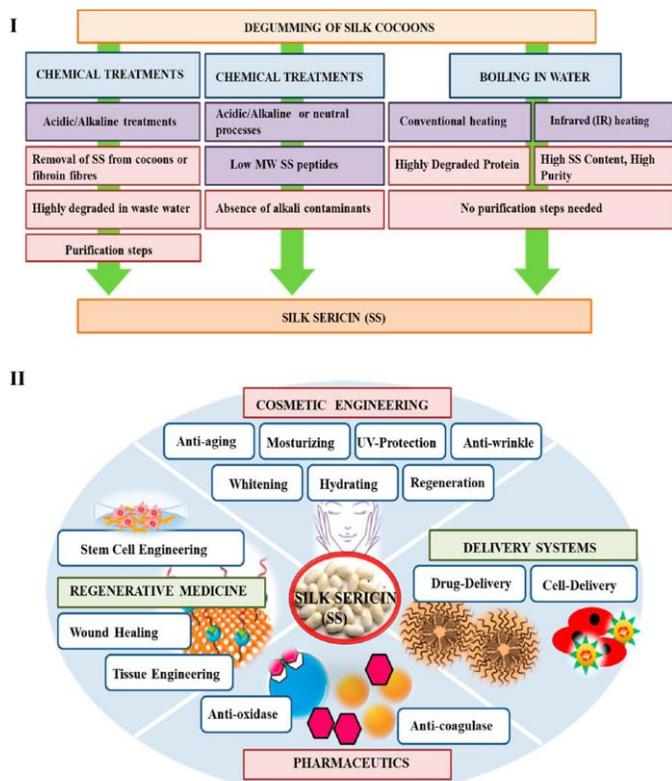


Figure 2. (I) Different methods of obtaining silk sericin from cocoons. (II) Biomedical applications of silk sericin.[9]

### III. CONCLUSION

Spiders are incredible creatures, and all the issues related to the spiders silk are really amazing, the spider silk demonstrated to have strength, elasticity, toughness biochemical properties and slow biodegradability characteristic. The silk with all said properties have a full range and outstanding usage and application. It still is being analyzed and evaluated in more detailed, as a result there would be a lot of fields that the spider silk can elaborate theme.

Spider silk will make us able to have more sufficient and precise eye and nerve surgery; modern, strong and suspended bridges; micro scale and Nano scale machineries and robots to have a discovery path inside vessels and complicated structures of human body, for further exploration and analysis of our body. Taking advantages from spider silk, our environment will experience more freshness and would present a clean breath for everyone, since the determination and monitoring of air pollution would be easier and cost effective and many other potential application. In all these development and provocative approaches, spider silks would have been playing a key and remarkable role continually.

We speak about around 40000 of spider species composed of a variety of groups and families, each of which produces silk that poses their individual behavior, characteristics, synthesis and structures. Depending to these, a major prospection come to our mind for a vast field of researches and explorations in the coming future, which would have changed the track of our innovation. Then it is for us to consider a moment for appreciation of spiders. At the conclusion scientist, scholars and researchers should seek every available opportunities to find out, what else is behind the creating of this incredible and strange creature to be discovered and put to the service of humanity.

IV. APPENDIX

Table 1  
 Benefits and concerns with the use of silks for biomedical applications [7]

**Benefits**

Novel mechanical properties of some silks that are superior to any other natural fiber and rival many high performance fibers

Natural fiber with a long standing history of use in clinical applications

The ability to process silks in aqueous solutions for subsequent formation of films and other material formats, with relatively simple insolubilization via exposure to alcohols and other environmental factors

Easily chemically modified with surface decorations, such as adhesion sites or cytokines, due to the availability of amine and acid side chains on some of the amino acids

Genetically tailorable composition and sequence to moderate specific features, such as molecular weight, crystallinity, solubility

Slow rates of degradation in vitro and in vivo, this is particularly useful in biodegradable scaffolds in which slow tissue ingrowth is desirable

No known risk of bioburden

**Concerns**

Adequate removal of contaminating sericin from silkworm silk to avoid biocompatibility problems

Slow degradation of crystalline (β-sheet) regions

Aborted proteolytic attack by macrophages and giant cells leading to encapsulation and the formation of a granuloma

Potential sensitization to silk fibroin resulting in an allergic response upon exposure to the biomaterial

Table 2.  
 Tensile mechanical properties of spider silks and other materials  
 (The Journal of Experimental Biology 202, 3295–3303)

Material	Stiffness, (GPa)	Strength (GPa)	Extensibility	Toughness (MJ m <sup>-3</sup> )	Hysteresis (%)
<b>Materials</b>					
<i>Araneus MA silk</i>	10	1.1	0.27	160	65
<i>Araneus viscid silk</i>	0.003	0.5	2.7	150	65
<i>Bombyx mori cocoon silk</i>	7	0.6	0.18	70	
<i>Tendon collagen</i>	1.5	0.15	0.12	7.5	7
<i>Bone</i>	20	0.16	0.03	4	
<i>Wool, 100%RH</i>	0.5	0.2	0.5	60	
<i>Elastin</i>	0.001	0.002	1.5	2	10
<i>Resilin</i>	0.002	0.003	1.9	4	6
<i>Synthetic rubber</i>	0.001	0.05	8.5	100	
Nylone fibre	5	0.95	0.18	80	
Kevlar 49 fibre	130	3.6	0.027	50	
Carbon fibre	300	4	0.013	25	

High-tensile steel	200	1.5	0.008	6
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# A Framework For Social Coastal Vulnerability In Indian Context

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**Abstract-** Coastal areas are highly vulnerable to the climate change, especially to sea level rise & its related extreme events. Extensive research has been carried out in the past two decades on impacts of climate change with major focus is on the coastal zone. Several international approaches have been developed to assess the vulnerability of coastal zone due to climate change and sea level rise. In spite of India having a very long coastal line, very limited studies have been carried out to assess the vulnerability of its coastal zone. This highlights the need for preparing planning measures in India, where more than 1/3rd of the population is located in the coastal zones. This paper presents a framework for assessment of the social coastal vulnerability in Indian scenarios.

The paper draws information extensively from available reviews and reports on existing international frameworks & vulnerability mappings which act as a guide in the formation of the framework for the Indian context. Pressure & release model (PAR model), Socio-spatial model & Sustainable Livelihood Framework are examined to identify the parameters considered in the global level. Scotland's third National Planning Framework for flooding & Finland's Climate disadvantage mapping methods are reviewed to classify indices according to their dimensions of vulnerability. The indices used are sorted with their functional relationship with sea level rise vulnerability through detailed analysis and expert opinions. They were then classified into five categories (most relevant, relevant, partially relevant & negligibly relevant) according to its importance in sea level rise vulnerability in Indian context. Weightage has been given to each category for analyzing the social coastal vulnerability of Indian cities. Finally a general framework has been formulated with 10 domains & 26 indicators which can be used to understand the exposure possibilities, sensitivity & adaptive capacities of any coastal area in India.

**Index Terms-** Sea level rise, Vulnerability, Coastal vulnerability, Social coastal vulnerability index, Exposure, Risk, Adaptive capacity

## I. INTRODUCTION

Sea-level rise (SLR) due to climate change is a serious global threat: The scientific evidence is now overwhelming (1). Recent studies shows that rise in sea level is much greater than the earlier estimation in the Intergovernmental panel for climate change (IPCC) and other scientific studies (2). From 1961 to 2003, the average rate of sea level rise (SLR) was  $1.8 \pm 0.5$  mm/yr and for the 20th century, it was  $1.7 \pm 0.5$  mm/yr (3). Based on revised estimates the sea level rise until 2100 will be between 1.0-2.0 m, compared to the earlier estimate between 0.4-1.0m. Vulnerability is the degree to which a system reacts adversely to the occurrence of a hazardous event. The quantification of vulnerability largely depends on the conception of the source of the risk and what element of value to humans is threatened. There is widespread concern regarding SLR induced coastal flooding & erosion on coastal communities and infrastructure (4). This is partly driven by the concerns related to climate & sea-level rise, and it reflects societal concern over the impacts on human infrastructure & activities rather than the sustainability of the coastal environment itself (5).

Extensive research has been carried out in the past two decades by many researchers on potential and observed impacts of climate change on natural and social systems (6) with major focus is on the coastal zone. Several international approaches have been developed to assess the vulnerability of coastal zone due to climate change and sea level rise (7)

In spite of India having a very long coastal line of 7517 km, very limited studies have been carried out to assess the vulnerability of its coastal zone. The computation of coastal vulnerability index involves the estimation of physical vulnerability index and social vulnerability index. Literature reviews reveal that the importance of social parameters is ignored in most of the studies. Also there is no framework for identifying social parameters that should be considered while studying a vulnerability assessment. This paper presents a framework for the social coastal vulnerability in Indian scenarios by analyzing the various existing frameworks through case studies.

## II. METHODOLOGY

This paper is not a comprehensive literature review; it draws information extensively from available reviews and reports on existing frameworks in international level & vulnerability mappings which act as a guide in the formation of the framework for the Indian context. Initially an extensive literature review was carried out to understand the basic concepts of SLR, factors contributing to SLR, its impacts and coastal vulnerability. Various international & national case studies are reviewed to figure out the selection of parameters in vulnerability studies. Later three existing frameworks were studied and analyzed in order to understand indices considered in the global level. Then classification of indices according to their dimensions of vulnerability was analyzed through international case studies. Finally this paper draws a general framework with indices & their relative importance that can be used for assessment of sea level rise of any coastal area in India.

## III. LITERATURE REVIEW

### 3.1 GENERAL STUDIES

#### (A) *Climate change & Sea level rise*

Climate Change refers to any changes in climatic condition over a period of time (usually 30 years) whether due to natural variability or as a result of human activities that increases the concentration of greenhouses gases (GHG) in the global atmosphere (3). A stronger greenhouse effect will warm the oceans and partially melt glaciers and other ice, increasing sea level. Ocean water also will expand if it warms, contributing further to sea level rise. (3) Thus Sea-level rise is one of the after effects of global warming. The change in sea level (mean sea level) at the coast is defined as the height of the sea with respect to a local land benchmark, averaged over a period of time, such as a month or a year, long enough so that fluctuations caused by waves and tides are largely removed (3).

#### (B) *Factors contributing to sea level rise*

Two main factors contribute to Sea level rise are (i) thermal expansion of sea water due to ocean warming & (ii) water mass input from land ice melt and land water reservoirs (8). Warming of the ocean has contributed 0.8-1mm/yr of sea-level change during 1901-2010; whereas thermal expansion accounts for about 25% of the observed SLR since 1960 and about 50% from 1993 to 2003. Although not monotonic through time, glacier contribution to SLR from 1993 to 2009 may be ~30% and total land ice mass loss explains ~60% of the rate of SLR. (8)

#### (C) *Historic & future SLR*

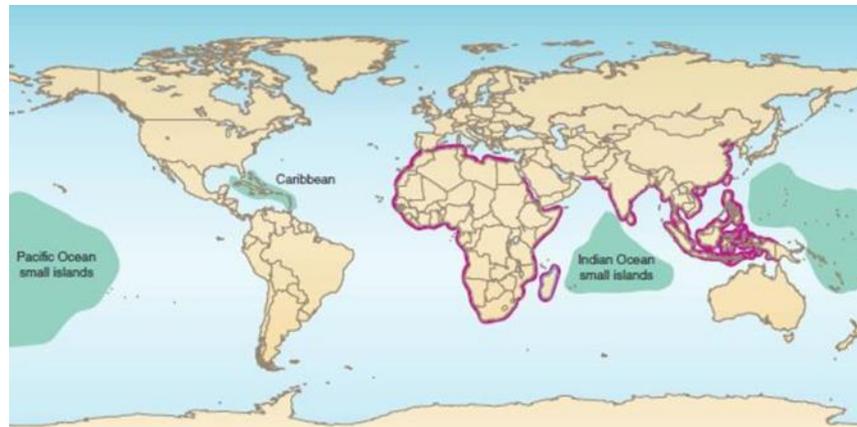
Although mean sea level remained nearly stable since the end of the last deglaciation (~3000 years ago), tide gauge measurements available since the late 19th century indicate that sea level has risen by an average of  $1.7 \pm 0.3$  mm/year since 1950 (8). Since the early 1990s, SLR has been routinely measured by high-precision altimeter satellites. From 1993 to 2009, the mean rate of SLR amounts to  $3.3 \pm 0.4$  mm/year. According to IPCC report, the predicted sea level fluctuation of 21st century gradually increases at the rate of 1-2 mm per year. The projected rise from 1990 to 2100 is 9–88 cm with a mid-estimate of 48 cm. Based on revised estimates the SLR until 2100 will be between 1.0 and 2.0 m, compared with 0.4 and 1.0 m estimated earlier (9).

#### (D) *Impact of SLR*

The immediate physical impacts of sea level rise are submergence, increased flooding of coastal land, as well as saltwater intrusion of surface waters. Long-term effects also occur as the coast adjusts to the new conditions, including increased erosion and saltwater intrusion into groundwater. Coastal wetlands such as saltmarshes and mangroves will also decline. These physical impacts in turn have both direct and indirect socioeconomic impacts, which appear to be overwhelmingly, negative (8).

#### (E) *Most vulnerable countries*

As the magnitude of climate induced SLR increases, the impacts will be more apparent, especially in certain low-elevation coastal zones. *Figure 1* shows the regions vulnerable to coastal flooding due to climate-induced sea-level rise around the world (8).



**Fig 1: World map showing regions vulnerable to coastal flooding due to climate induced sea-level rise**

■ Vulnerable island region

■ Vulnerable coastal area

[ Source : *Sea-Level Rise and Its Impact on Coastal Zones*, 2010 ]

Most countries in South, Southeast, and East Asia appear to be highly threatened because of the widespread occurrence of densely populated deltas, often associated with large growing cities (8). According to the studies, the most significant change estimated was in Asia and particularly in India. As India has a high population density, and a long coastal line, people living in low lying coastal areas will be at a higher risk than earlier estimates. More sophisticated revision of sea level estimates more than 3.5 crore population at risk in India. The coastal line along Mumbai to Kolkata and Chennai to central Kerala, along with some parts of Gujarat will face a colossal risk in the next 30 years. (10)

#### (F) Coastal vulnerability

The concept of coastal vulnerability is based on human value judgments concerning risk to various elements of natural & human environment from a variety of sources (11). Since vulnerability is affected by a diverse range of parameters, it is common to refer it as 'indices' to express their combined effect (12). Several coastal vulnerability indices have been developed by researchers to assess the vulnerability of sea level rise to human activities and infrastructure (13).

Although there are different perspectives on the meaning of coastal vulnerability, the main purpose of vulnerability assessment is to provide information to guide the process of adaptation and enhance society's adaptive capacity. A vulnerability index therefore aims to simplify a number of complex and interacting parameters, represented by diverse data types, to a form that is more readily understood and therefore has greater utility as a management tool. There is no 'one size fits all' index of coastal vulnerability' that can be applied at all scales. The components that contribute to vulnerability, the data availability and type, and the utility of an index approach vary with scale & place (14).

#### (G) Coastal vulnerability index (CVI) - components

A coastal vulnerability index (CVI) was used to map the relative vulnerability of the different segment of the coast due to sea-level rise. A multi-scale coastal vulnerability index uses a function of the physical nature of the coast (which controls its ability to respond to perturbation), the nature (frequency and magnitude) of the perturbation (the forcing factor) and the degree to which such changes impact on human activities or property (15). Hence computation coastal vulnerability index involves the estimation of physical vulnerability index and social vulnerability index.

**Coastal Vulnerability = physical parameters + social parameters**

#### (H) Importance of physical parameters

The physical variables can vary according to the selection to the specific target site, taking into account its geographical and morphological peculiarities, especially referring to a low-lying area. Generally, physical variables like tidal range, significant wave height, sea level rise, shoreline change rate, geomorphology, shoreline erosion/accretion, slope and elevation are used as the parameters (15). These parameters are dependent and show the direct impacts or reciprocal feedbacks. For eg: if the slope is low & gentle, there is high risk for inundation. Similarly

if the shoreline rate change is negative, that is, the shore is eroding, it becomes wider and gentler. Most of the vulnerability studies consider only physical parameters for their calculations.

### (I) Importance of social parameters

As per the reports of AR5 (IPCC, 2014b), the framing of vulnerability has shifted from the former natural science (physical) perspective towards a perspective where vulnerability is defined as a factor determined by the socio-economic, policy, and environmental context. Though, disasters might be of bio-geophysical origin, the actual impacts of all disasters are concerned with individuals & society. Moreover, the capacities of a population to resist & recover from impacts are largely determined by their socio-economic factors.

## 3.2 APPROACHES ON COASTAL VULNERABILITY

### (A) INTERNATIONAL

The Coastal Vulnerability Index (CVI) was first developed by Gornitz (13) to climate change, particularly sea-level rise for United States coastal considering inundation, flooding and susceptibility to erosion. Many coastal vulnerability index (CVI) /coastal sensitivity index (CSI) was later developed with modifications to the original. CVI of Gornitz (1989) had included seven physical parameters in the vulnerability analysis along with the two social parameters such as population & population density. In the later studies, researchers began to consider more social parameters since vulnerability is understood in terms of people being vulnerable and so needs socio-economic variable. Location, infrastructure (economic value), institutional setup economic and human are some of the social variables considered in various studies.

Table :1 gives the summary of variables considered in vulnerability assessment from international researchers.

**(B) Table 1: Summary of International literatures on vulnerability assessment**

Reference	Area of study	Physical variables considered	Social variables considered	Remarks
Vivien Gornitz & Kanciruk, (1989)	U.S.A	Rock type, Landform, vertical land movement, Shoreline displacement, tidal range, wave height, Shoreline length	Population & population density	Formed Coastal vulnerability index (CVI) considering inundation, flooding and susceptibility to erosion
Carter (1990)	Ireland	Shoreline change, slope, sea level changes, tidal range, wave height	coastal features, coastal structures, access, land use	Developed a Sensitivity index
Yamada K (1995)	South Pacific island countries	In the three "hard" systems, one is 'natural environment'  In the three "soft" systems, which encompass the less tangible elements. One of them is coastal system	In the three "hard" systems, 2 others are "people, and infrastructure"  In the three "soft" systems, remaining are institutions, sociocultural factors, and economic system	Approach that uses relative scores to evaluate different adaptation options in a variety of scenarios
J.Shaw (1998)	Canada	Tidal level, surges, coastal retreat, rock type, sea level, wave height, shoreline displacement rate, erosion rate	Not considered	Calculated as sensitivity index

E. Doukakis (2005)	South Greece	Coastal slope, subsidence, displacement, geomorphology, wave height, tidal range	Not considered	Coastal vulnerability index (CVI) Most vulnerable – river delta & coastal lagoon
Boruff et al., 2005	USA	Not considered	Principal components analysis was ‘Census-derived social data’	Social coastal vulnerability index (SoVI) was calculated

Development in GIS brought a leap in analysis of vulnerability. A GIS based coastal vulnerability index for wave-induced erosion in Northern Ireland has been developed by McLaughlin et al., (2002) incorporating of socioeconomic variables such as population, cultural heritage, roads, railways, land use, conservation status.

From these literature reviews it is concluded that the overall vulnerability index constitutes of the sum of three indexes; ie coastal characteristics, coastal forcing and socio-economic factors. Most of the studies had incorporated social indices for the better assessment of vulnerability.

### (C) NATIONAL

The vulnerability of the Indian coastal region to the consequences of the estimated sea level rise has been studied by Indian researchers, considering only physical parameters viz elevation, exposure and slope. The table below shows the variables considered in vulnerability assessment by national researches.

**(D) Table:0 Summary of national literatures reviews on vulnerability assessment**

Reference	Area of study	Physical variables considered	Social variables	Remarks
Hegde and Raju, 2007	Mangalore coast, India.	Geomorphology, regional coastal slope, shoreline change rates	Population.	Here CVI was an indication of relative vulnerability Mangalore coast to coastal erosion hazards
Rao et al., 2008	Andhra Pradesh, India	Geomorphology, coastal slope, shoreline change, mean tidal range, significant wave height	Not considered	CVI was prepared by integrating the differentially weighted rank values of the five physical variables only
Dwarakish et al., 2009	Udupi coast in Karnataka state	Shore-line change rate, sea-level change rate, coastal slope, mean tidal range, coastal geomorphology	Not considered	Six variables are classified under geologic variables & physical variable. Finally inundation mapping is done
Srinivasa et al., 2010	Orissa coast, India	Geomorphology, coastal slope, shoreline change, mean tidal range, significant wave height, sea level change, coastal regional elevation, tsunami run up,	Not considered	They use 6 basic variables along with additional geologic process variable, i.e., coastal regional elevation & additional physical process variable, i.e., tsunami run-up. Most parameters are dynamic in nature & GIS processed.
Arun and Pravin, 2012	Chennai, India	a) Shoreline Change b) Sea Level Change Rate c) Significant Wave Height d) Tidal Range e) Coastal Elevation; f) Near-shore Bathymetry; g)	Not considered	Though the study claims that they have considered socio-economic conditions as additional important variables, no quantitative / qualitative data is given to establish that.

		Geomorphology Extreme Strom Surges	h)	
Murali et al., 2013	Puducherry coast. India	physical-geological parameters (slope, geomorphology, elevation, shoreline change, sea level rise, significant wave height and tidal range	population, Land-use/ Land-cover (LU/LC), roads and location of tourist places	Tsunami of Dec 2004& Thane cyclone of 2011 caused extensive human & economic losses. Devastation caused by these events highlighted the need for vulnerability assessment with more social variable

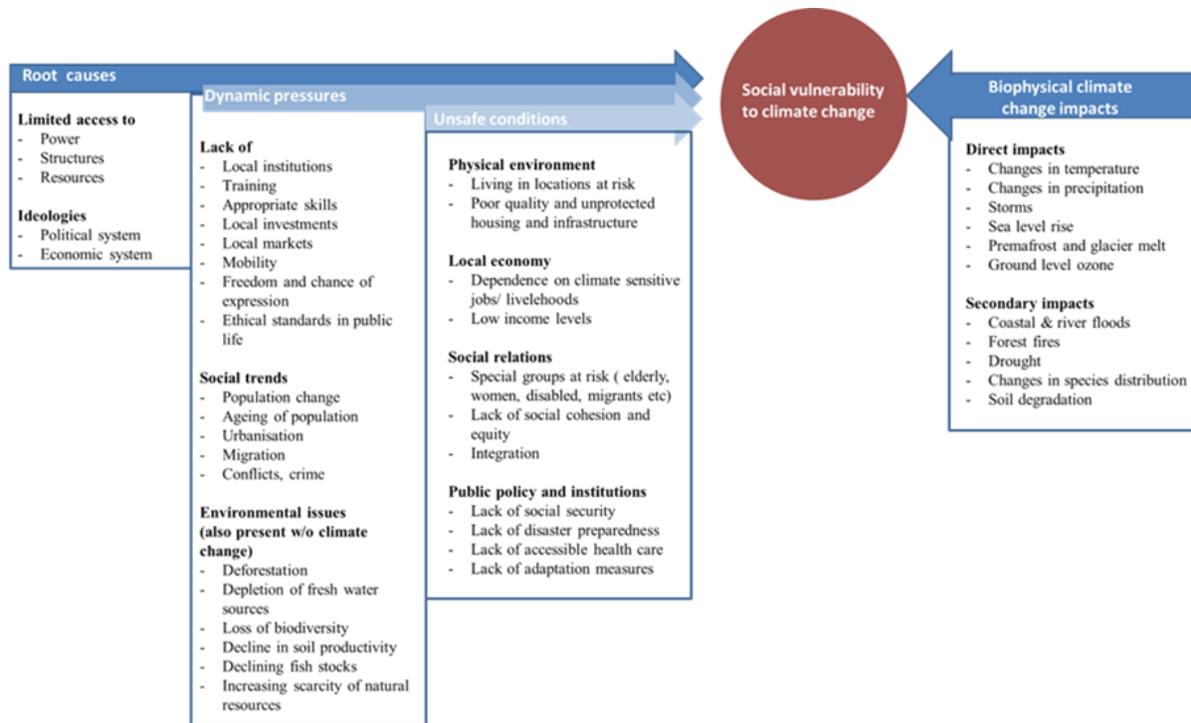
In the earlier studies of vulnerability assessments, researches were mainly focused on the basic parameters like Shore-line change rate, sea-level change rate, coastal slope, mean tidal range, coastal geomorphology etc. When the researches gets more focused into specific problems like erosion or coastal flooding, more physical or dynamic parameters were added according to the need. Thus coastal elevation, bathymetry, tsunami run up etc gets added. Only after the occurrence of extreme events like tsunami, researchers are highlighting the need for vulnerability assessment with more social variables, since the people & their socio-economic circumstances are the bottom end elements that finally get affected.

From the national literature reviews is seen that the importance of social parameters are ignored or not considered in studies with emphasis. This may be due to lack of a framework for identifying social parameters that should be considered while studying a vulnerability assessment. Therefore it can be presumed that the vulnerability studies may get biased results without focusing on the actual problems.

### EXISTING FRAMEWORKS FOR SOCIAL COASTAL VULNRABILITY

#### (a) Framework 1- PAR Model

The pressure and release model (PAR model) is for showing how disasters occur when natural hazards affect vulnerable people. It is a systematic representation of four categories of the factors driving vulnerability. Their vulnerability is rooted in social processes and underlying causes which may ultimately be quite remote from the disaster event itself. (16) The basis for the PAR idea is that a disaster is the intersection of two opposing forces: those processes generating vulnerability on one side, and the natural hazard event on the other. The image resembles a nutcracker, with increasing pressure on people arising from either side – from their vulnerability and from the impact (and severity) of the hazard for those people. The ‘release’ idea is incorporated to conceptualize the reduction of disaster: to relieve the pressure, vulnerability has to be reduced (16). ( Fig AA-1).



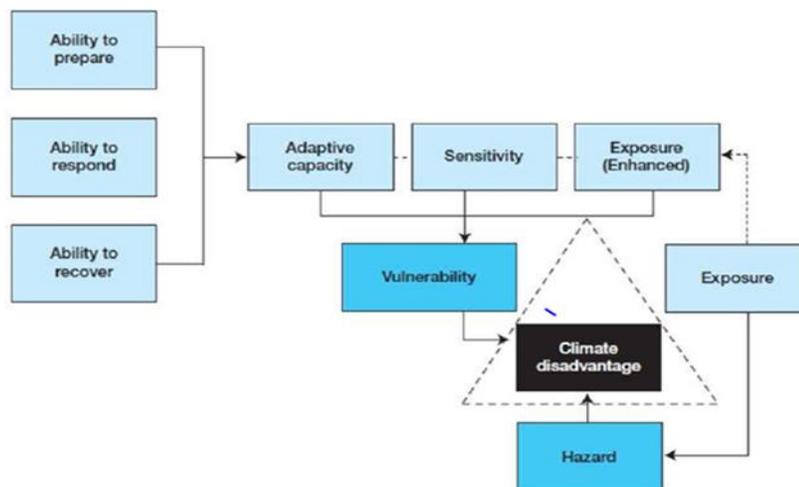
**Fig 2: The drivers of vulnerability to social impacts of climate change**

( Source : (17) adapted from: ; Blaikie, P. M. et al., 2003)

According to this scheme, drivers of social vulnerability are represented as a gradient of individual characteristics, which range from general systemic issues(distribution of power, and resources in society) to local/regional drivers (including governance, socio-economic situation in the area, and availability of natural resources) to finally socio-economic, institutional, and physical conditions of the individual’s living conditions. These factors can contribute to reducing or increasing climate related vulnerability as much as biophysical climate impacts (18).

(b) Framework 2 - Socio-spatial model

This framework was developed for a research project funded by the Joseph Rowntree Foundation in the United Kingdom. It is based on the concept of “risk triangle” where climate disadvantage (understood as the degree to which an external event has the potential to convert into losses in human well-being) is realized when vulnerability of communities coincides spatially with the hazard-exposure (19).( fig 3)



**Fig 3 : Conceptual framework of climate disadvantage and vulnerability to climate change**

(Source : (Lindley, 2011))

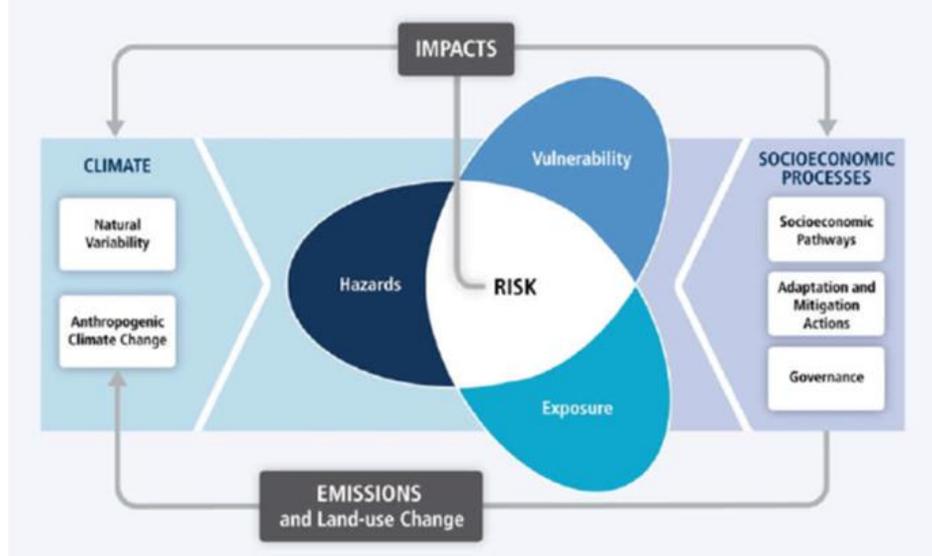
The concept of vulnerability is disaggregated into sensitivity (personal factors driving vulnerability, such as age and health), enhanced exposure (environmental factors, such as characteristics of housing or presence of green space that can either mitigate or exacerbate climate impacts locally), and adaptive capacity (social factors, such as income level, ability to speak the official language, length of residence in the area). Adaptive capacity in turn is split into the ability to prepare for respond to, and recover after extreme weather events (19). This framework is powerful for urban analysis as it brings together characteristics defining individual land social elements of vulnerability with spatial characteristics that define exposure and enabling features of the environment that promote preparedness, response capacity, and ability to recover. This approach has been used to map and assess climate vulnerability across the United Kingdom (19).

(c) *Framework 3- 'Sustainable Livelihood Framework'*

SLF focuses on people, it seeks to gain an accurate and realistic understanding of people's strengths or "capitals" and identifies five types of assets or capitals upon which livelihoods are built, namely:

- human capital (education/health)
- social capital (networks/norms)
- natural capital (land/air/water)
- physical capital (infrastructure/ economy)
- financial capital (savings/income/social support).

The SLF views vulnerability as the context that frames the external environment in which people exist. This framework mainly deals with 'risk' & 'vulnerability'. Risk is defined as the likelihood of occurrence of (external) shocks and stresses plus their potential severity, whereas vulnerability is the degree of exposure to risk (hazard, shock) and uncertainty, and the capacity of households or individuals to prevent, mitigate, or cope with risk (20). (fig 4).



**Fig 4: Concept of vulnerability and elements defining driving forces.**

Source: IPCC (2014a)

The framework is intended to be a tool for planning and management to assess the many factors that influence poverty and how it can be eliminated. It is one of the most widely used livelihoods frameworks in international development practice. These were used in the studies from European context.

The analysis of the above frameworks related to social vulnerability shows some common traits with regards to specific issues, the most important one being the distinction between different aspects of social vulnerability, i.e. sensitivity, exposure and adaptive capacity. All indices are associated with these aspects. The potentials & problems of an area therefore can be logically assessed when organized in the terms of sensitivity, exposure & adaptive capacity. Moreover it can be seen that varies indices that are globally used in any studies are age, health, income level, institutional set up and housing.

## IV. CASE STUDIES

## (a) Scotland

The consequential increase of risk flooding is recognized in Scotland's Third National Planning Framework. As per their studies, by the 2050's, rainfall on the wettest day in winter is projected to change in the range of -5% to 25% across regions in Scotland, under the high emissions scenario, with a central estimate (50% probability) of 10% increase (UK Climate Projections, 2009). So in order to develop policy responses for vulnerable groups, a Mapping Flood Disadvantage Report for Scotland was prepared (21). It was made with 14 domains & 34 indicators. Their dimensions of vulnerability have been marked separately to understand its sensitivities & abilities. The assessment of the levels of social vulnerability has revealed the most vulnerable areas and number of people affected. (Table-3)

**Table 3: Indicators used in Mapping Flood Disadvantage in Scotland 2015**

Domain	Indicator	Dimension of vulnerability				
		Sensitivity	Ability to prepare	Ability to respond	Ability to recover	Enhanced exposure
Age	% people under 5 years old	y				
	% people over 75 years old	y				
Health	% people whose day-to-day activities are limited	y				
	% households with at least one person with long term limiting illness	y				
Income	% people in routine or semi-routine occupations		y	y	y	
	% of long term unemployed people		y	y	y	
	% households with dependent children and no adults in employment		y	y	y	
	Number of Income Support claimants		y	y	y	
	Number of Job Seeker Allowance claimants		y	y	y	
	Number of Pension Credit claimants		y	y	y	
Information use	% people with <1 year residency in the UK		y	y	y	
	% people who do not speak English well		y	y	y	
Insurance	% new addresses located in flood risk areas		y	y	y	
	Number of historic flood events		y	y	y	
Local knowledge	% addresses in Flood Warning Target Areas		y	y		
	% new residents (< 1 year) arriving from outside the local area		y	y		
Tenure	% social rented households		y			
	% private rented households		y			
Mobility	% of Incapacity Benefit/Severe Disablement Allowance claimants			y	y	
	% people living in medical and care establishments			y	y	
	% households with no car or van			y	y	
Social networks	% children of primary school age			y	y	
	Number of voluntary organisations focused on local community			y	y	
	% single pensioner households			y	y	
Physical access	% people working further than 30km from home			y		
	Road density			y		
Crime	Number of domestic breakings			y		
Access to health services	Travel time to GP surgery (private transport)				y	
	Travel time to GP surgery (public transport)				y	
Housing characteristics	% households with the lowest floor level: ground floor					y
	% households with the lowest floor level: basement or semi-basement					y
	% caravans or other mobile or temporary structures					y
Physical environment	% urban land cover					y

( Source : Kazmierczak et al., 2015 )

## (b) Finland

In 2015, the Helsinki Region Environmental Services Authority (HSY) commissioned a data study and mapping exercise to identify the spatial distribution of social vulnerability to climate change impacts (high temperatures and flooding) in Helsinki Metropolitan Area (22).(Table-4)

**Table 4: List of indicators used in mapping social vulnerability to climate change in Helsinki Metropolitan Area**

Code <sup>a</sup>	Indicator	Aspect of vulnerability	Weight in vulnerability to flooding	Weight in vulnerability to heat	Sensitivity	Dimensions of social vulnerability to flooding				Dimensions of social vulnerability to heat			
						Ability to prepare	Ability to respond	Ability to recover	Enhanced exposure	Ability to prepare	Ability to respond	Enhanced exposure	
i_1	Location within 1km from a railway station	Access	0.25	0			Y						
i_2	Accessibility zone	Access	0.25	0			Y						
i_3	Percentage of households with no car	Access	0.25	0			Y						
i_4	Access in case of emergency	Access	0.25	0			Y						
i_5	Percentage of people with basic studies	Information	1	1		Y	Y	Y		Y	Y		
i_6	Percentage of children 0-6 years old	Age	0.5	0.5	Y								
i_7	Percentage of people over 75 years old	Age	0.5	0.5	Y								
i_8	Percentage of unemployed in labour force	Income	0.25	0.25		Y	Y	Y		Y	Y		
i_9	Percentage of economically inactive people in the population	Income	0.25	0.25		Y	Y	Y		Y	Y		
i_10	Percentage of long-term unemployed in the labour force	Income	0.25	0.25		Y	Y	Y		Y	Y		
i_11	Median household income	Income	0.25	0.25		Y	Y	Y		Y	Y		
i_12	Occupancy rate	Overcrowding	0.5	0			Y	Y					
i_13	Percentage of households containing 7 or more people	Overcrowding	0.5	0			Y	Y					
i_14	Percentage of dwellings in flats	Housing	0	1									Y
i_15	Percentage of water area in the grid cell	Physical environment	0	0.33									Y
i_16	Percentage of total green space area in the land area	Physical environment	1	0					Y				
i_17	Percentage of low vegetation area in the land area	Physical environment	0	0.33									Y
i_18	Percentage of area covered by trees in land area	Physical environment	0	0.33									Y
i_19	Percentage of students in the population	Social networks	0.33	0		Y	Y	Y					
i_20	Percentage of single person households	Social networks	0.33	0.5		Y	Y	Y		Y	Y		
i_21	Percentage of school age children in the population	Social networks	0.33	0.5		Y	Y	Y		Y	Y		
i_22	Percentage of rented households	Tenure	0.5	0.5		Y	Y	Y		Y	Y		
i_23	Percentage of dwellings rented from ARA	Tenure	0.5	0.5		Y	Y	Y		Y	Y		

(Source: Kazmierczak, 2015)

The analysis was based on the approach of Climate Just tool, i.e. a spatial analysis of social vulnerability determined by adaptive capacity (ability to prepare for, respond to and recover after extreme weather events), sensitivity (related to age), and enhanced exposure (type of housing and presence of green space) (18)

From the analysis of case studies, it is observed that certain indices are common in both the case studies. It is also evident that the selection of indices follows a similar pattern & considers personal factors like age, health, literacy; social factors like population, GDP, road and environmental factors like location & land use.

## V. INFERENCE

From the literature study, the indices used in various occasions were understood. The indices were sorted with their functional relationship with sea level rise vulnerability through the expert opinions and detailed analysis. These have been classified into most relevant, relevant, partially relevant, negligibly relevant & not relevant according to their importance to SLR vulnerability in Indian context.

The indicators sorted were also given the weightage based on its importance. The red colour shows highly relevant index in sea level rise studies. The orange colour indicators are relevant & green colour indicators are negligibly relevant. As the number of indicators in the study increases, more precision can be obtained.

Indicators considered in the framework and their domains are listed below:

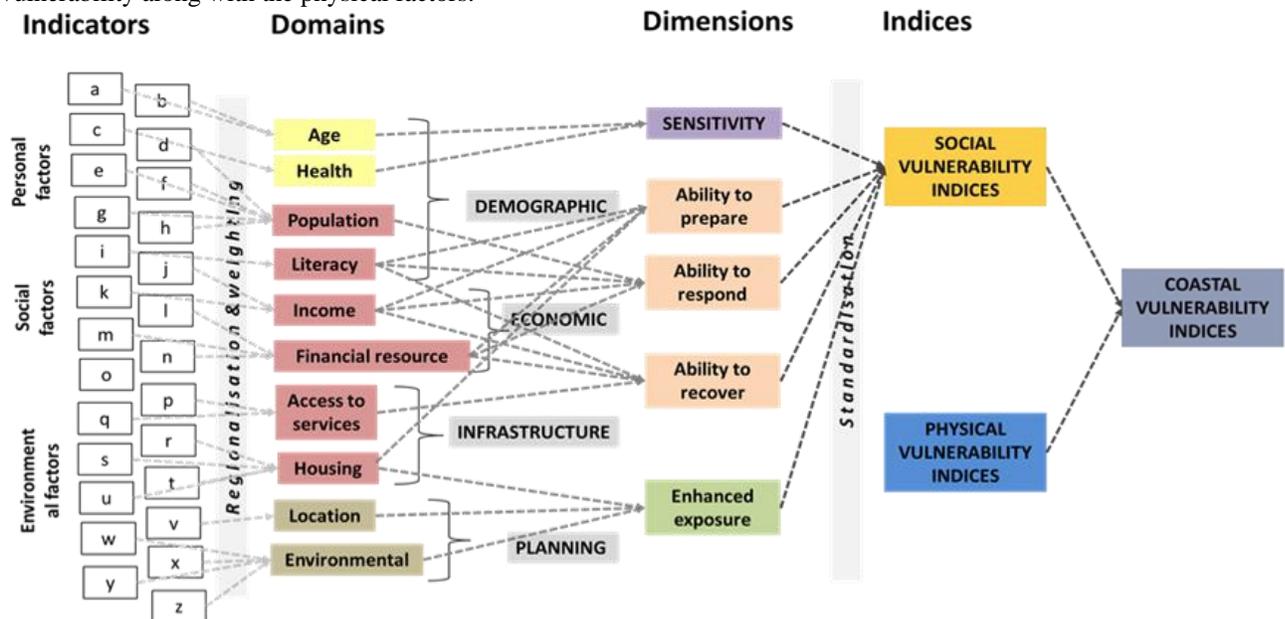
	DOMAIN	THEIR INDICATORS
1	AGE	a. Percentage people under 5 years old b. Percentage people over 65 years old
2	HEALTH	c. % households with at least one person with long term limiting illness
3	POPULATION	d. Population density
		e. Annual growth of population
		f. Population at a risk due to sea level rise
		g. % of working population
4	LITERACY	h. Migration rate
5	INCOME	i. Literacy rate
6	FINANCIAL RESOURCE	j. Unemployment rate
		k. Proportion of alone-pensioners in household
		l. Agriculture dependency
		m. 2ndry & 3rdy dependency

	DOMAIN	THEIR INDICATORS
	FINANCIAL RESOURCE	n. GDP
		o. Tourist arrival
7	PHYSICAL ACCESS & ACCESS TO SERVICES	p. Drainage q. Road density
8	HOUSING	r. No: of houses in flood exposed areas
		s. Legal entitlements
		t. % social rented households
		u. % of slum population
9	LOCATION	v. Proximity of CBD to sea
10	ENVIRONMENT	w. Change in Land use
		x. % of urban area
		y. % of coast line
		z. Occupancy rate

<span style="display:inline-block; width:15px; height:15px; background-color:red; border:1px solid black;"></span> Most relevant	<span style="display:inline-block; width:15px; height:15px; background-color:orange; border:1px solid black;"></span> Relevant
<span style="display:inline-block; width:15px; height:15px; background-color:yellow; border:1px solid black;"></span> Partially relevant	<span style="display:inline-block; width:15px; height:15px; background-color:lightgreen; border:1px solid black;"></span> Negligibly relevant

### VI. RECOMMENDATIONS

The framework for social coastal vulnerability index can be framed with 26 indicators & 10 domains which can be used to understand the exposure possibilities, sensitivity & adaptive capacities of any coastal area in India. It considers demographic, economic, infrastructure as well as planning conditions of an area while examining its vulnerability along with the physical factors.



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# Ethnic Conflicts Influencing Socio-Economic Development of Border Communities, a case of Abagusii and Kipsigis, Kenya

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**Abstract-** “Ethnic conflicts are a global menace, with the highest frequency in newly democratic African countries. They are marked with deficiency in communication, or lack of peaceful coexistence that hampers interaction between members of different ethnic groups. They have also caused havoc as loss of human life, poor inter-ethnic relations, forced human displacements, destruction of property, cattle rustling, slowed economic growth and increased cases of sexual and gender-based violence. The recurrence of ethnic conflicts along the border in the study location has been a common phenomenon, it was therefore, imperative that this study sought to assess the ethnic conflicts influencing socio-economic development of border communities between the Kipsigis and Abagusii of Bomet Central Sub-County and Borabu Sub-County respectively. The objective of the study was to: analyze multiparty democracy development influence on ethnic conflicts between the Abagusii and Kipsigis along the border. The study was informed by the Theory of Ethnic Conflict and Identity theory. The researchers used correlation research design adopting both qualitative and quantitative methodologies. The study was carried in Borabu and Bomet Central Sub-Counties with a target population of 243,610 individuals from the two Sub-Counties. A sample population of 384 respondents determined by Mugenda and Mugenda formula was used in the study involving; youth leaders, church leaders, community elders, national government administrators and non-governmental organization directors. Data collection instruments included questionnaires, interview guides, observation and document review. The qualitative data collected from the field was coded and edited in conformity with research objective of the study while quantitative data was analyzed thematically. The analyzed data was presented using descriptive statistics in form of figures and tables. The study adhered to ethical standards including anonymity of respondents and voluntary participation. The finding on the objective of the study was that multiparty democracy influenced ethnic conflicts among border communities through ethnic and regional choice, multiparty elections and multiparty disagreements. The study concluded that, besides communities perceiving resource sharing being underlining causes of conflicts, multiparty democracy in Kenya has a place too in influencing ethnic conflicts especially among border communities. The study recommends that sensitization of communities on multiparty democracy and good governance through elected leaders.

**Index Terms-** Conflict, Cross-border, Ethnicity, Democracy, Socio-economic development

## I. INTRODUCTION

### 1.1. Background to the Study

In world history, ethnic clashes have been deemed as a part of transnational politics. In contemporary societies, war has turned out as the most well-known type of furnished clashes. The United States of America saw some of the most violent confrontations between the white settlers and indigenous Indians and later the Spanish. The Indian population was considered as subordinate, as belonging to the second type of society (Barber, 1998). Immigrants to America have a degree of ethnic identity as Jamaican, Haitian as well as black. The immigrants faced some of the most chilling aspects of ethnic oppression, as they are immediately assigned to membership of a group identified with minority historical oppression.

Inter-ethnic conflicts in Africa have continued to cause havoc; fueling violence in among other countries such as: Chad, Rwanda, Congo, Nigeria, Central African Republic (CAR), Somalia, Kenya, South Sudan and Sudan. Most of these conflicts were made more violent by the design in which European colonialists carved Africa, drawing borders according to Europe’s national conflicts and interests, in total disregard of historic territories of African ethnic groupings; therefore forcing traditionally hostile ethnic groups under one flag (Lamphear, 1994).

Ethnic conflicts and violence in Kenya have been characterized by such historic events as the repeal of Article 4(2) of the Kenyan constitution; which cleared path for a multi-party popularity based state established on national qualities and standards of administration. Different ethnic communities aligned themselves to parties led by political leaders of either their ethnic group or region. Such an arrangement led to ethnic antagonism and hatred that was evidenced in the country in the 1992 general elections. Ethnic clashes between the Kipsigis and the Abagusii communities along the borderline were evidenced during this time (Rugege, 1995).

The Kipsigis community belongs to a Nilotic ethnic group with their origin from the Nilo-Saharan language family. The Kipsigis originated from southern Sudan. During pre-colonial era, the Kipsigis community was identified through their “warrior element”, meaning combatants. The common economic activities among the Kipsigis were herding and agriculture (occasionally cash crops like wheat, pyrethrum, tea and coffee). Living on the fertile highlands in Western parts of Kenya, the Kipsigis at present also grow maize among other food crops (Saltman, 1977). On the other side, the Abagusii originated from the Congo basin. They entered Kenya from Uganda through Mount Elgon to Goye Bay near Lake Victoria, and then moved into Kano plains and Kabianga, where they experienced a lot of calamities and therefore went back to their present settlement in Kisii and Nyamira Counties which borders the Kipsigis to the West. The Abagusii are well known in agricultural activities like bananas, maize, pineapples and sugarcane farming (Bosire, 2013).

To the Center for Multi-Party Democracy {CMD} (2015:113) “Kenya experiences frequent ethnic conflicts though 75% of those conflicts are deemed to be minor skirmishes”. Severity of these conflicts between the Kipsigis and Abagusii are witnessed during general election encounters; in 1992 general elections, during the 2007/2008 post-election election crisis and the 2013 general elections. Such encounters have led to mass emigrations of ethnic minority communities to other geographic parts.

The Coalition for Peace in Africa {COPA} (2011) argues that “common factors that have been distinguished as principle wellspring of episodes of shared viciousness incorporate; provincial approaches, political actuation, inaccessibility of land, water and field assets, loss of customary eating land, cows stirring in Kenya, absence of elective wellsprings of job, fears of psychological warfare, badgering , robbery and coercion”. It is evident that common fueling factors behind many ethnic conflicts are resource-based and political influence, where neighboring communities face hostility and disagreements in sharing already meager resources amicably.

The Kipsigis and Abagusii as neighboring ethnic groups have been locked in conflicts sporadically exploding to violence time and again. This occurs mainly within the community borders along the Borabu and Bomet Central Sub Counties. The Bomet Central/Borabu boarder serves as the boundary and administrative boarder between the Bomet and Nyamira counties, as well as the demarcation between the lands of the kipsigis, a Kalenjin sub-ethnic living on the Bomet County, and the Abagusii, a Bantu sub-ethnic, most commonly known as Abagusii of Nyamira County. The study will seek to assess the influence of such ethnic conflict on the socio-economic development between the border communities.

## 1.2. Statement of the Problem

The Kipsigis and Abagusii ethnic communities of Bomet Central and Borabu Sub-Counties borderline have experienced a lot of continuous conflict, insecurity, frequent cattle rustling and periodical cycle of political election conflicts which has caused social disorders at the border region. Although much has been written on inter-ethnic conflicts in the world and Kenya specifically, scanty information related to ethnic conflicts between the Kipsigis and Abagusii of the Bomet Central and Borabu border exist. Scholars like Rutto (2014) and Mwangi and Njuguna (2005) have written much on the history of the Abagusii and Kipsigis respectively, but, they have not cited much on the ethnic conflicts between the two communities. A few of the studies carried out along the border share the idea that, the conflicts between the Kipsigis and Abagusii have much to do with politics of the region. Other studies like the Kiliku Report (1992) points to economic resources especially land. Omwenga (2016)., Chepkemoi *et al* (2017) studied the influence inter-ethnic conflicts along Borabu-Sotik and Chebilat-Borabu borders respectively. This study however, was carried out along the border of Borabu-Bomet Central Sub-Counties, to assess the influence of ethnic conflicts on socio economic development of the border communities.

## 1.3. Research Objective

The objective was to: Analyze multiparty democracy development influence on ethnic conflicts between the Abagusii and Kipsigis along the border. The objective was supplemented by the following research question: What is the influence of multiparty democracy development on ethnic conflicts between the Abagusii and Kipsigis along the border?

## 1.4. Justification of the Study

Several scholars have written extensively on ethnicity and intra and inter-ethnic relations. Some of them are: Kakai (2000) on inter and intra-ethnic conflicts., Waller (1985, 1993) on ethnicity and identity in East Africa., Matson (1983) on water resources and conflicts in the Middle-East, Mwanzi (1977) on the history of Kipsigis., Ogot (1976) on ethnicity, nationalism and democracy, Ochieng’ (1974) on pre-colonial history of the Abagusii of Kenya., Muriuki (1974) on ethnicity in Africa, Kipkorir (1973) on agricultural changes in the Kipsigis land., Were (1967) on towards genocide in Kenya and Osogo (1966) on ethnicity and its management in Africa. Different reasons have been give to explain the causes of inter-ethnic conflicts in Kenya. Ethnic conflicts in Kenya are caused by boundary or land disputes, political issues, leadership disputes, problems over livestock and poor communication. Despite all the efforts, ethnic conflicts along the border between the Abagusii and Kipsigis continue affecting the wellbeing of the people.

## 1.5. Scope of the Study

The study was restricted to the period between 1992 and 2017; this is after the re-introduction of the multiparty democracy in 1992 which fueled hostility among border communities especially between the Kipsigis and Abagusii and the recurrence of ethnic conflicts. The study was further restricted to the Borabu-Bomet Central Sub-County cross-border conflicts between the Kipsigis and Abagusii communities. This is because the two communities have been living in tension with and suspicion of one another since the re-introduction of multi-partyism in Kenya.

## II. LITERATURE REVIEW

### 2.1. The Concept of Ethnic Conflict

Ethnic conflicts do have a political and armed conflict touch; for example there were confrontations between the white settlers, the Spanish and the indigenous red Indians, over which community was supposedly subordinate to the other (Barber, 1998). Smith (2000) observes that real definition of ethnic conflicts is still surrounded with controversies. Ethnic conflicts have their roots based on resource sharing, political and class affiliations. Moreover, some of these conflicts do not explode into violence thus; ethnic conflicts exist as violent and non-violent conflicts, with the latter being inevitable. Violent conflicts can be avoided if right strategies are adopted and applied.

Kipkemoi (2015) in her thesis cites land resource as a core factor in persuading most ethnic conflicts in Kenya. Land is a core factor of production in Kenya and thus groups as well as individuals struggle over it for ownership and production thus, land-based conflicts exist almost everywhere in the country. Since the year 1991, Resource sharing in Kenya after independence has become the key issue in fueling inter-ethnic conflicts whereby, some communities feel they were oppressed and marginalized in resource sharing as compared to other communities. Such cases have existed more specifically along border communities of the Abagusii and Kipsigis.

### 2.2. Multiparty Democracy and Ethnic Conflicts

On global viewpoint on democracy and conflicts, they argue that during the Cold War period, waves of advocacies and debates around liberal democracy, democratic transitions and violence were ushered in in the former Soviet Union and Eastern Europe. There were also renaissances of intra-state wars and conflicts in various parts of the world which illogically “coincided with the process of transitions to democracy” (Lake and Rothchild, 1998:67). However, this is more of dark democracy which is the dark side of improperly managed democratic transitions.

On African perspective, Walle (2009) argues that the political and liberal movements on the African continent resulted into unrestricted media, formation of democratic opposition political parties, trade unions and mass of civil organizations self-governing from the government. Stewart and O’Sullivan (1998) epitomized that the democratic transition However, divisive politics fuels ethnic conflicts especially along border communities like the Abagusii and Kipsigis. The study analyzed the influence of multiparty democracy on socio-economic development of border communities.

The wave of democratic political changes that started in the early 1990s appears to have led to the establishment of democracy in terms of multiparty politics. The emergence of political pluralism has engendered the polarization of particularistic groupings as political parties crystallize mostly on the basis of ethnic and regional interests rather than common ideology or political principles (Dreyton, 1995., Nsongola and Lee, 1997., Jonyo, 2002). This tendency does not guarantee unity and stability in a country. Moreover, state policies of non-accommodation and recalcitrance provide strong push factors for ethnic conflict (Osamba., 2001; Mwangi, 2002).

Nyukiri (1997) argues that, the re-introduction of multiparty politics in Kenya in 1992 had a number of far-reaching impacts, one of which was the eruption of ethnic clashes in the Rift Valley, Nyanza, Western and the Coast regions. Apollos (2010) argues that, since the emergence of multiparty politics in 1992, successive election years have been routinely characterized by sporadic political violence and ethnic conflicts. Elections have been seen not to be “free and fair” as a result of the need to manipulate and create political dominance in certain parts of the country. These works were of importance to this study as they helped the researchers in finding out the contribution of political pluralism in the conflicts between the Kipsigis and Abagusii border communities.

To Musau (2008), the reintroduction of multiparty democracy in Kenya lied upon pressure and coercion from domestic and international partners compelling the Kenya multiparty democracy, which was highly advocated by among other political parties; Forum for Restoration of Democracy (FORD), Kenya African Democratic Union (KADU) and Union for Democratic People (UDP), was deemed to have fueled ethnicity and ethnic conflicts in Kenya. The situation is evident during the general elections and political party nominations.

Elischer (2008), argues that Kenya moved to ‘a democratic camp’ when ethnic violence significantly decreased in 2003 during a peaceful handover of leadership mantle to President Kibaki. Kenya received praises from the global community citing her as an iconic stability in Africa. Unfortunately, all the compliments and hopefulness were dampened with the weaklings of 2007/2008 post-election skirmishes. The violence is believed to be the most vicious and the most horrible ever experienced since Kenya gaining independence. Approximately 1,200 people lost their lives and at least 500,000 families forcefully displaced from their settlements.

Similarly, a report by the Center for Multiparty Democracy {CMD} (2015) alleges that minor clashes are common in Kenya, occurring frequently. However worst ethnic violence were witnessed after the reintroduction of multi-party politics in 1992. The worst ever ethnic division was felt during the 2007/2008 post-election violence. Major conflicts have also led to exoduses of ethnic minority communities with roots in other geographical areas. The study assessed the influence of multiparty democracy on ethnic conflicts among the border communities of the Abagusii and Kipsigis.

Mokua (2013) on multiparty political influence on the wellbeing of communities cites that though Abagusii and the Kipsigis, just like other communities in Kenya, along borders live with different dialects, traditions and cultures, and historical cattle-rustling disputes, many lived in harmony during ‘one-party system’. Harmonious coexistence suddenly “changed after the 1992 general elections in which violence broke up. This pattern was to be repeated again in subsequent general elections. It is clear that multiparty democracy of 1992 influenced negative ethnicity in Kenya with disagreements and tensions between border communities fueling ethnic conflicts. The study analyzed the multiparty political influence in fueling ethnic conflicts between the Abagusii of Borabu and Kipsigis of Bomet Central Sub-Counties.

### 2.3. Conceptual Framework

Kombo and Tromp (2006:98) define the “conceptual framework as a set of ideas and principles taken from relevant fields of inquiry and used to structure subsequent presentations”. A conceptual framework therefore, shows the Dependent Variable (DV) and the Independent Variable (IV) as shown diagrammatically in Figure 2.1.

The study was guided by the following conceptual framework. This study was anchored on the theory of ethnic conflict by Caselli and Coleman (2012) and identity theory by Eidelson *et al* (2003).

### 2.4. Theory of Ethnic Conflict

The theory highlights the role of ethnic distance in leading to ethnic conflict; it states that; “ethnic groups are more likely to crash the more pronounced the differences between the groups that mark the ethnic cleavage. Supposing ethnic communities are grouped with letter A and B. According to the theory, dominant group A is the dominant group, we are more likely to observe exploration of group B by group A if (i) the ethnic distance between A and B is large; (ii) the country’s endowment of appropriate resources is neither too small nor too large; (iii) group B has high per-capita income; (iv) group A has low per-capita income; (v) group A is small; and (vi) the efficiency costs of exploitation are modest.” This theory is relevant to the study as both the Kipsigis and Abagusii may perceive that they have mutual suffering resulting in negative attitude to each other. However, it is not empirically established whether the case is as such in realism. The group conflicts arise on suspicion of political favoritism or command of the resources to one another’s disadvantage.

A conflict may be limited to one individual, who is conflicted within himself (the intrapersonal conflict). Team-conflicts are sometimes unavoidable and predictable, conflict is defined as “an activity which takes when conscious beings (individuals or groups) wish to carry out mutually inconsistent acts concerning their wants, needs or obligations”. The inconsistent concerns escalate thus creating a conflict environment which eventually may lead into a fight between the opposing parties. However, processes of conflict management should be encompassed with the principle that all conflicts cannot necessarily be resolved, but learning how to manage conflicts can decrease the odds of non-productive escalation. The theory does not address such factors (Nnoli, 1998).

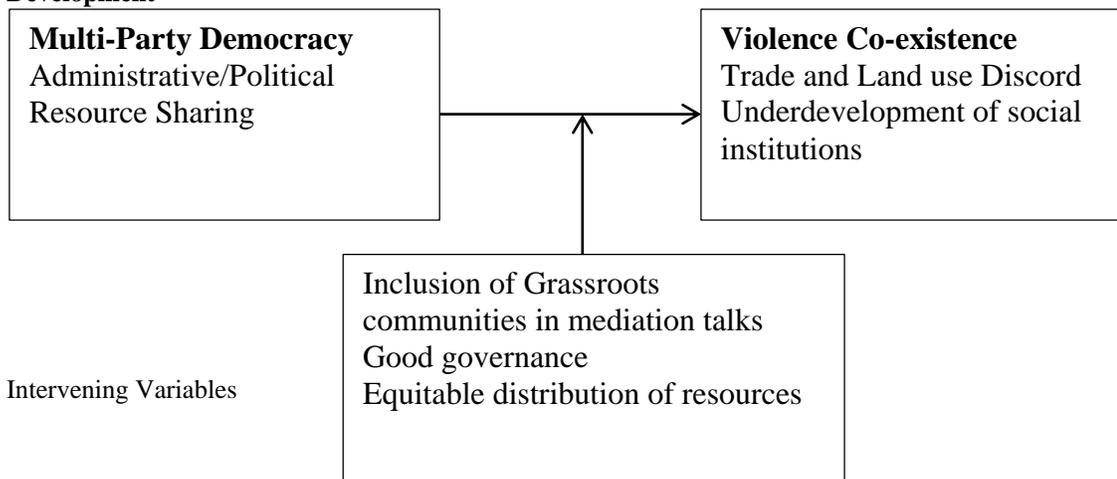
#### 2.4.1. Identity Theory in Ethnic Conflict

Robert (1990) cites identity theory in ethnic conflicts by arguing out that human senses of belonging to a given community can have enormous contribution to an individual’s relation with others i.e. that sense can give him/her the “warmth and strength” of belonging here thus, fighting the outside community becomes inevitable. Identity is often evocative which is mythical or imagined i.e. ethnicity.

### 2.5: Conceptual Model

**Independent Variable**  
**Ethnic Conflicts**  
**Development**

**Dependent Variable**  
**Socio-economic**



**Figure 2.1: Conceptual Model**  
**Source: Researchers, 2020**

The study was conceptualized by the influence of ethnic conflicts as the independent variable operationalized through the influence multiparty democracy, political and administrative representation has in fueling ethnic conflicts along the border. Socio-economic development is theorized as the dependent variable measured through violence levels, trade and land use disagreements as well as the general development of the area along the border between the Kipsigis and Abagusii. An increase or decrease in the dependent

factors will be determined by the intervening variable through factors such as; inclusion in mediation talks, good governance and equitable resource sharing.

### III. RESEARCH METHODOLOGY

#### 3.1 Research Design

Nachmias (2005) defines a research design as a well-laid down plan of procedures used in guiding a given research investigation in data collection, analysis and interpretation of observable phenomenon made. The study adopted a correlation research design; correlation research is descriptive in that it cannot presume a cause-and-effect relationship. It can only establish that there is an association between two or more traits or performance. This involves collecting data on two or more finite variables to determine whether a relationship exists or not. Correlation research further described the nature of the relationship between ethnic conflicts and socio-economic development of conflict affected ethnic groups”. Correlation research helped in identifying the magnitude of relationships that existed between the variables (Kothari, 2011).

This design gave a critical description of the status of ethnic conflict between the Abagusii and Kipsigis communities in relationship to the socio-economic development of the communities and the moderating influence of governance efforts of affected communities. The information gathered through correlation design was used to answer question that had been asked and used. When examining social issues that exist in a community. Hence, this design was adopted to describe and justify the findings related to the socio-economic development of the neighboring communities as a result of conflicts in this study.

#### 3.2 Study Area

The study was carried out in Borabu and Bomet Central Sub-counties of the Abagusii and kipsigis ethnic groups respectively. These sub-counties are housed within Nyamira and Bomet counties respectively. The Kenya National Bureau of Statistics (2012) notes that “Bomet County lies between latitudes 0° 29<sup>0</sup> and 1° 03<sup>0</sup> south and between longitudes 35° 05<sup>0</sup> and 35° 35<sup>0</sup> east. It is bordered by four counties namely; Nakuru to the East, Kericho to the North East, Nyamira to the South and Narok to the West. It has atotal land area of 2037.4km<sup>2</sup>. Bomet East, Bomet Central, Chapalungu, Konoin and sotik. According to the Kenya Population and Housing Census report (2009), Bomet County had a population of 782,531 people. This population is expected to grow to 991,968 by 2020.

Bomet County Integrated Development Plan (CIDP), (2013) confirms that “Bomet Central has the highest population density of 494 people/km<sup>2</sup>, this is due to attractive economic opportunities in the constituency which include the rich agricultural land, commercial activities and the largest urban center Bomet town which also is the administrative center in the country hence large concentration of settlements within this particular area”. The area of study was chosen because of the recurrence of ethnic conflicts and it also borders the Abagusii community in Borabu Sub-County.

Majority of the farmers in the county do practice mixed farming ranging from tea, maize and dairy as the climate is conducive for agricultural production as witnessed by the large tea plantations in the area. The county has no known mineral or precious stones but has a number of rocks which are of economic value to the community (Bomet CIDP, 2013). The study focus was Bomet Central Sub-County which has a population of 126,520 and an approximate area of 261.50 km<sup>2</sup>. The sub-county has the following Wards as shown in Table 3.1:

**Table 3.1: Bomet Central Sub-County Assembly Wards**

Ward	Sub-Locations	Population
Silibwet Township	Kapsimotwo, Silibwet, Chepngaina and Motigo	27,500
Ndarawetta	Teganda, Nyongores, Kabusare and Ngainet	22,069
Singorwet	Singorwet, Aisaik, Kabungut, Mugango and Kitoben	21,796
Chesoen	Kamogoso, Chesoen, Sibaiyan, Kiplelji and Kapkoros	34,476
Mutarakwa	Solyot, Kapsangaru, Kanusin, Leldatet and Tarakwa	20,679
<b>TOTAL</b>		<b>126,520</b>

**Source:** Bomet County Integrated Development Plan, (2013)

The study area for Abagusii ethnic community constituted Nyamira County “situated in the Western highlands of Kenya, it covers an area of 894 km<sup>2</sup> with a total population of 750,000. The population growth rate stands at 2.4%. it borders the counties of Kericho to the East, Bomet to the South East, Kisii to the south, Homabay to the west and Kisumu to the Northwest.

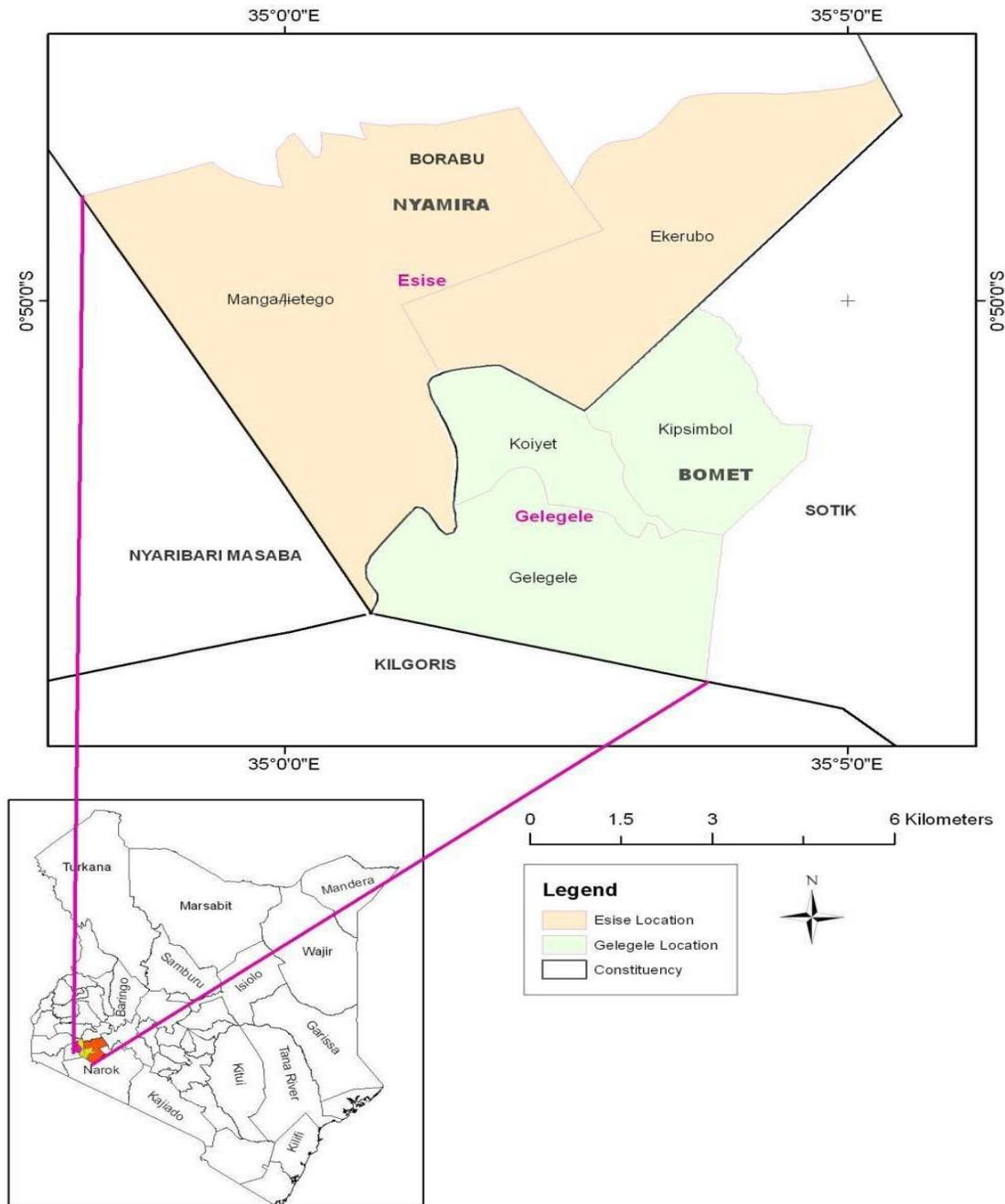
The Borabu Sub-County was the study area of focus due to the recurrence of ethnic conflicts and is populated by both the Abagusii and Kipsigis ethnic communities. The Borabu Sub-County population is 117,090 (Kenya Population and Housing Census, 2009) with an area of 297.70 km<sup>2</sup>. The sub-county has the following Wards as shown in Table 3.2.

**Table 3.2: Borabu Sub-County Assembly Wards**

<b>Ward</b>	<b>Sub-Locations</b>	<b>Population</b>
Mekenene	Mwongori, Mogusii, Kitaru and Nyankononi/Kerumbe	18,976
Kiabonyoru	Omonono, Mokomoni, Nyangoge and Nyaramba	43,664
Nyansiongo	Nyansiongo and Matutu	27,496
Esise	Manga/Raitigo, Ekerubo and Isoge/Kineni	26,965
<b>TOTAL</b>		<b>117,090</b>

**Source:** Nyamira County Integrated Development Plan, (2013)

**Figure 3.1: Map of Borabu and Bomet**



Source: Researchers, 2020

### 3.3 Target Population

Kombo and Tromp (2006) define a population as “a complete set of individual, cases or objects with some common observable characteristics”. The target population for both sub-counties was 243,610. Bomet Central Sub-County had 126,520 people while Borabu Sub-County population is 117,090 (KNBS, 2012). But in this study the target groups were the youth leaders, Church leaders, community elders, National government administrators and Non-governmental Organizations.

In Bomet Central sub-county there were: 3900 Youth Leaders, 1020 Community Elders, 600 Church Leaders, 180 National government administrators and 21 Non-governmental Organizations while in Borabu sub-county there were: 3780 Youth Leaders, 870 Community Elders, 510 Church Leaders, 120 National government administrators and 17 Non-governmental Organizations. Apart from Non-governmental Organizations which were few in both sub-counties, to get the sample size the researchers used Mugenda and Mugenda (2003) formular who suggests that 30% is appropriate while for Non-Governmental Organizations since they were few, we sampled half of them.

### 3.4 Sample Size and Sampling Procedure

The target population of the study was 243,610 for the two Sub-Counties. This is more than 10,000 hence the on this basis, 384 respondents were sampled. Due to variations in number of household units in Bomet Central and Borabu Sub-Counties, a simple random sampling technique was adopted to determine the number of youth leaders, community elders and church leaders.

Purposive sampling identified key informants for the study; National Government Administrators and Non-Governmental Organizations Directors. Key informants are considered as respondents rich with in-depth information related on subject under study. Furthermore, interviews with key informants ensure that gaps left out in other tools like questionnaires (Kombo and Tromp, 2006). Based on this, the study drew 200 respondents from Bomet Central Sub-County and 184 from Borabu Sub-County as shown in Table 3.3.

**Table 3.3: Sample Size for Bomet Central and Borabu Sub-Counties**

	Bomet Central		Borabu		Sampling Technique
	Population	Sample	Population	Sample	
Youth Leaders	3900	130	3780	126	Simple Random
Community Elders	1020	34	870	29	Simple Random
Church Leaders	600	20	510	17	Simple Random
National government administrators	180	06	120	04	Purposive
Non-governmental Organization Directors	21	10	17	08	Purposive
<b>TOTAL</b>		<b>200</b>		<b>184</b>	

Source: Researchers, 2020

#### 3.4.1 Sampling Strategy

In determination of sample size, the researchers used the formula provided by Mugendas’ (Mugenda and Mugenda, 2003). While in determination of sample size of sub-groups. Borg and Gall (1989) formula was used. The formula is presented hereunder;

$$N = Z^2 pq / d^2$$

N=desired minimum sample size

Z=the standard normal deviate at confidence interval of 99% (1.96)

P=proportion in the target population estimated to have the characteristic of population under study (0.8)

Q=1-p(0.2) and

d=level of statistical significance of estimates (0.05) for desired precision thus derivation of multi-stage random sample size was;

$$N = 1.962 * 0.8 * 0.2 / (0.05)^2 = 384$$

### 3.5. Data Collection Instrument

Kothari (2008) reports that the common tools used to collect data include questionnaires, interview guides, observation and document analysis. Oso and Onen (2009) support the use of questionnaires as the instrument of data collection for a rigorous research design. This study employed the use of questionnaires, interview schedules, observation and document analysis.

Revilla (2015) defined a questionnaire as “a research instrument, consisting of a series of questions for the purpose of gathering information from the respondents in which questions should flow logically from one to the next”. This study used both closed and open-ended questionnaires for respondents’ varied opinion on the constructs. This instrument targeted the youth leaders, church leaders and community elders. **Interview guides** targeted views from the Sub-County administrators and elders as they are custodians of policy implementation and logically play the role of key informants on administrative strategies. Interviews were audio-taped by the researchers to confirm what might not be captured while taking notes during the interviews (Orodho, 2005). The questions were designed to appear exactly as the questions were asked. All respondents were given complete attention (Freeman and Matherson, 2009). An **observation checklist** was developed to aid the researchers to note observable features such as destroyed property and trade activities. **Document analysis** checklist was developed to help in identifying relevant documents related to ethnic conflicts and management

### 3.6. Data Analysis Techniques and Presentation

The collected data from the field was first categorized into quantitative and qualitative data: the categorized data was then checked for completeness, usefulness and accuracy. Qualitative data was coded into themes and sub-themes related to the objectives of the study. Quantitative data was subjected to data coding and entry into the statistical computer program, SPSS v23, to check for accuracy and reliability. Descriptive analysis was then conducted on both categories of data to describe the effects of conflict in Borabu and Bomet Central. Analyzed data was presented in form of descriptive statistics i.e. frequency tables and figures. Quantitative analysis further involved the use of inferential statistics; Pearson Correlation Moment and simple regression analysis to explore the relationship between ethnic conflict and socio-economic development of the Abagusii and Kipsigis along the border.

## IV. RESEARCH FINDINGS AND DISCUSSIONS

This section presents an analysis of the findings and discussions on demographic characteristics of respondents as well as objective of the study which was to: analyze multiparty democracy development influence on ethnic conflicts between the Abagusii and Kipsigis along the border.

### 4.1 Response Rate

**Table 4.1: Respondents' Response Rate**

	Targeted Rate	Response Rate	Percentage
Bomet Central Sub-County	200	120	60%
Borabu Sub-County	184	110	60%
<b>TOTAL</b>	<b>384</b>	<b>230</b>	<b>60%</b>

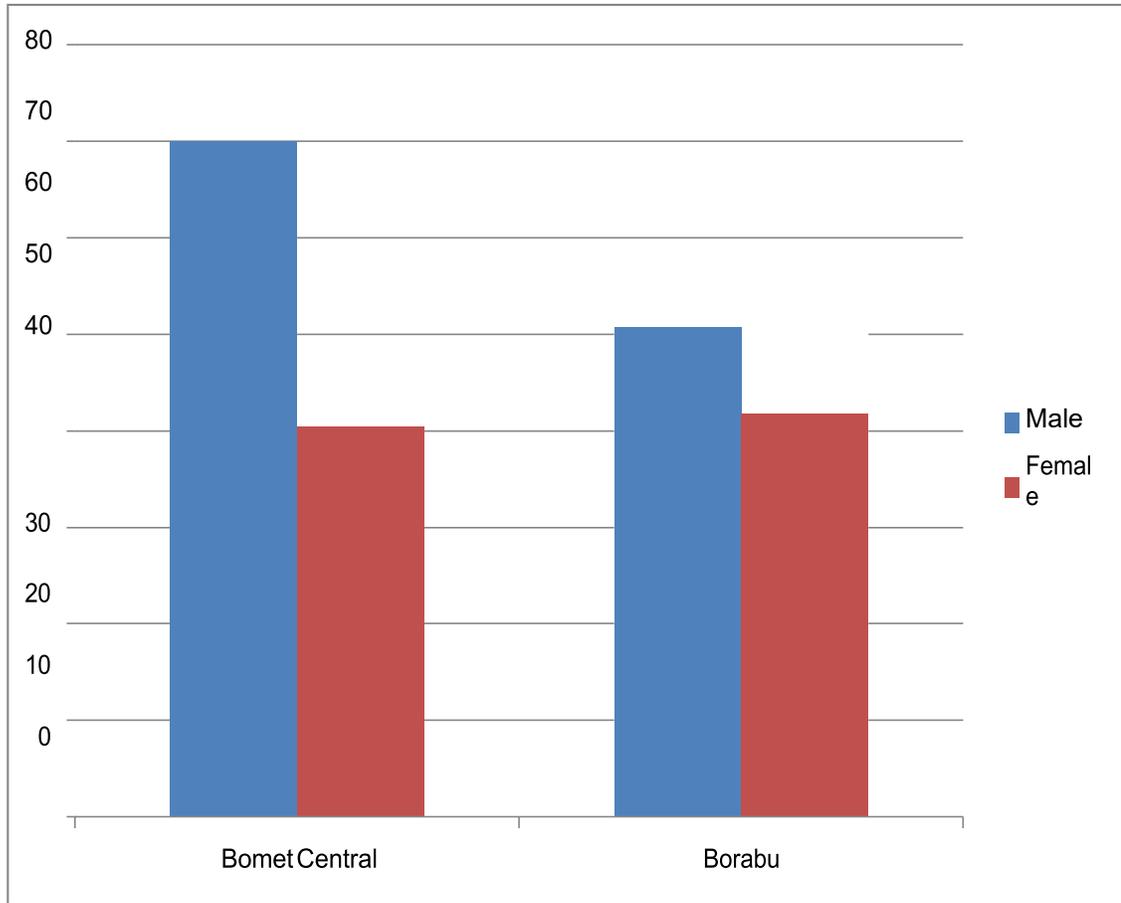
**Source:** Field Data (2020)

The study gained 60% (230) response rate from a target of 384 respondents. Mugenda and Mugenda, (2003) recommends that, where a response rate of 50%, it is deemed adequate for analysis and reporting; 60% is good, 70% and over is excellent. The study therefore, attained a good response rate for analysis and reporting. This clearly shows that the response rate in this study was good.

### 4.2 Demographic Characteristics of Respondents

The study analyzed the demographics of respondents based on the following characteristics; gender, age, education and the main economic activities in the study areas.

#### 4.2.1 Gender



**Figure 4.1: Gender Representation for Bomet Central and Borabu Sub-Counties**  
 Source: Field Data (2020)

The study sought to establish the gender of 120 respondents from the Bomet Central and 110 respondents from Borabu Sub-Counties. Respondents were thus asked to indicate their gender.

The results in Figure 4.1 indicate that 58% (70) were male while 42% (50) were female for Bomet Central Sub-County. The results also indicate that 52% (57) were male while 48% (53) were female for Borabu Sub-County. The study established that most households are headed by male as opposed to their female counterparts. The results skewed against female gender in both Sub-Counties, indicating the persistent disparities that exist due to cultural issues which remain a potential source of conflict within the study areas. Yohannes *et al* (2005), in agreement to the study findings assert that socially, women are marginalized and oppressed through different mechanisms. For example, they are given to their husband (and his family) in rejecting (or killing) of baby girls and whipping women during cattle jumping ceremonies.

**4.2: Age of Respondents**

**Table 4.2: Age of Distribution for Bomet Central and Borabu Sub-Counties**

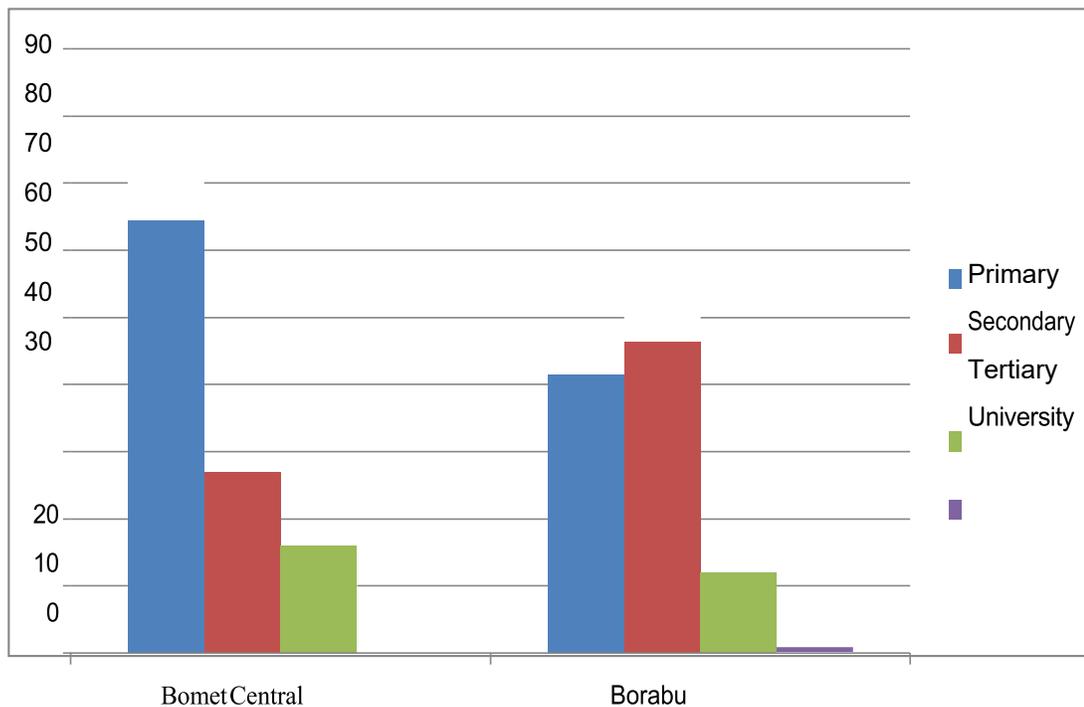
	Bomet Central		Borabu	
	Frequency	Percentage	Frequency	Percentage
20-30 years	22	18%	14	13%
31-40 years	55	46%	52	47%
41-50 years	34	28%	31	28%
50 years and above	09	08%	13	12%
<b>TOTAL</b>	<b>120</b>	<b>100%</b>	<b>110</b>	<b>100%</b>

Source: Field Data (2020)

The study sought to establish age distribution of respondents from Bomet Central and Borabu Sub-Counties. Respondents were thus asked to indicate their age as shown in Table 4.2. The results indicate that those in the age bracket of 20-30 years were 18% (22), 31-40 years were 46% (55), 41-50 years were 28% (34) and those above 50 years were 08% (9) for Bomet Central Sub-County. While those in the age bracket of 20-30 years were 13% (14), 31-40 years were 47% (52), 41-50 years were 28% (31) and those above 50 years were 12% (13) for Borabu Sub-County. The analysis indicates that respondents in the age bracket of 31-40 years were majority in both Sub-Counties at 47% representation.

This age bracket represents young population and according to Mokuia (2013) on ethnic conflicts, young persons are the weakest to be incited to trigger mayhem and instability due to their low levels of economic stability and experience in conflict resolution. Additionally, Mworira and Ndiku (2012) cite ethnic conflicts are attributed to political incitement of young people; who are resource-poor and easy to lure to create tribal tensions.

#### 4.2.3 Education Background



**Figure 4.2: Education Background for Bomet Central and Borabu Sub-Counties**

**Source:** Field Data (2020)

The study sought to determine the educational level of respondents. The results are given in Figure 4.2. The results indicate that out of the total 120 respondents from Bomet Central Sub-County, 64% (77) of respondents had primary education, 23% (27) had secondary education, and 13% (16) had tertiary education while none had university level of education. The results indicate that out of the total 110 respondents from Borabu Sub-County, 42% (46) of respondents had primary education, 48% (53) had secondary education, 9% (10) had tertiary education while 1% (1) had university education.

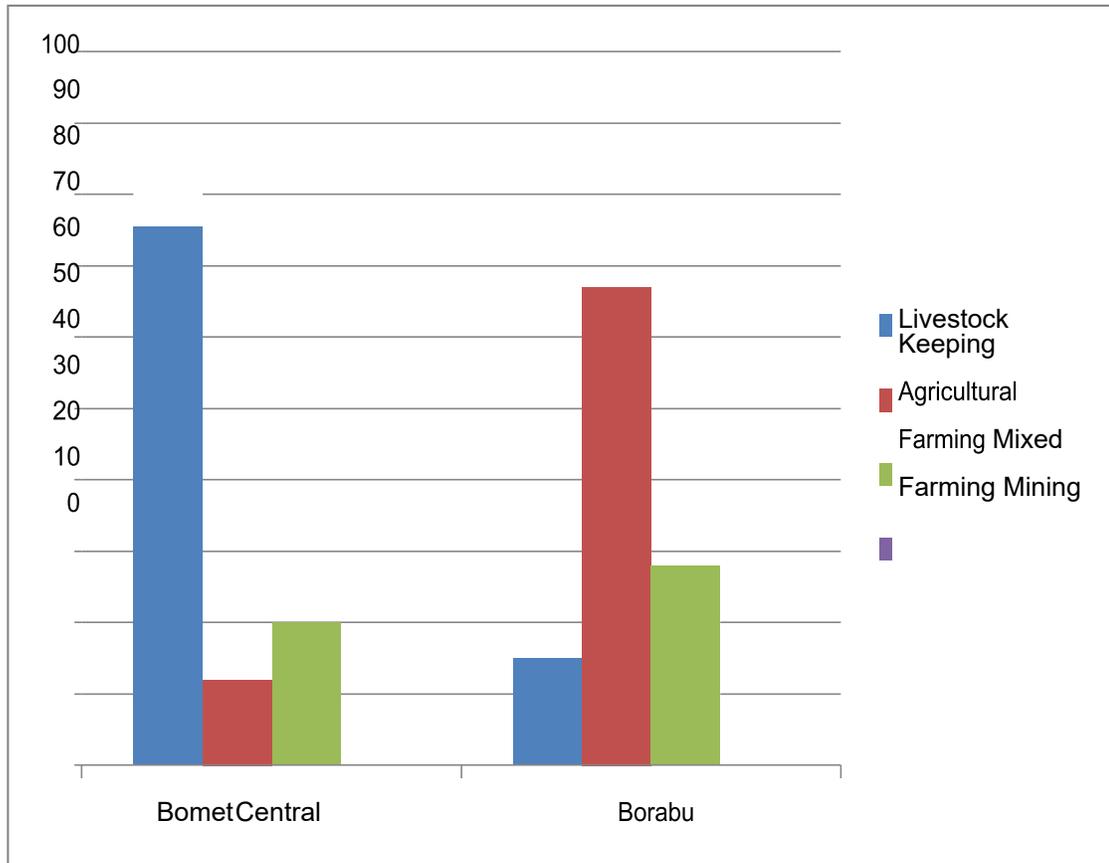
The low education levels are indicative of the fact that majority of the respondents are affected by, low enrollment due to school inaccessibility, displacement and tensions which exist between the two groups. The low education levels can be used to aptly explain the frequent occurrence of ethnic conflicts which remain predominant. The results are in agreement with a report from KNBS (2012) which indicates that less than 15% of Bomet County residents have a tertiary level of education or above while a total of 35% of Nyamira County residents have a university level of education only.

An elder from Silibwet village, Bomet Central Sub-County in response to education levels asserted that:  
*...during ethnic violence, education system is negatively affected due to destruction and displacement of people. Furthermore, here as parents don't send their children to school but rather use boys as herders to their livestock while girls are married off for livestock or land. However, things are changing slowly since the inception of Free Primary Education (FPE) system to cater for the need of the children as well as the peace we have today... (Field Interview at Silibwet village, 23<sup>rd</sup> November, 2019).*

Furthermore, Ombati (2012) in a survey along Abagusii/Kipsigis border revealed that schools in Borabu, Nyamira County, are still affected by the effects of ethnic violence. Some schools have never recovered while others are still feeling the effects for example; Manga Girls High School whose population reduced to 80 from 800 students.

Both communities are affected by high level of illiteracy and school dropout owing to ethnic conflicts which render many families destitute. Additionally, small and light arms held by the locals including machetes, bows and arrows have fuelled tension, which is opined to remain the biggest security challenge in the region.

#### 4.2.4 Main Economic Activities



**Figure 4.3: Main Economic Activities for Bomet Central and Borabu Sub-Counties**

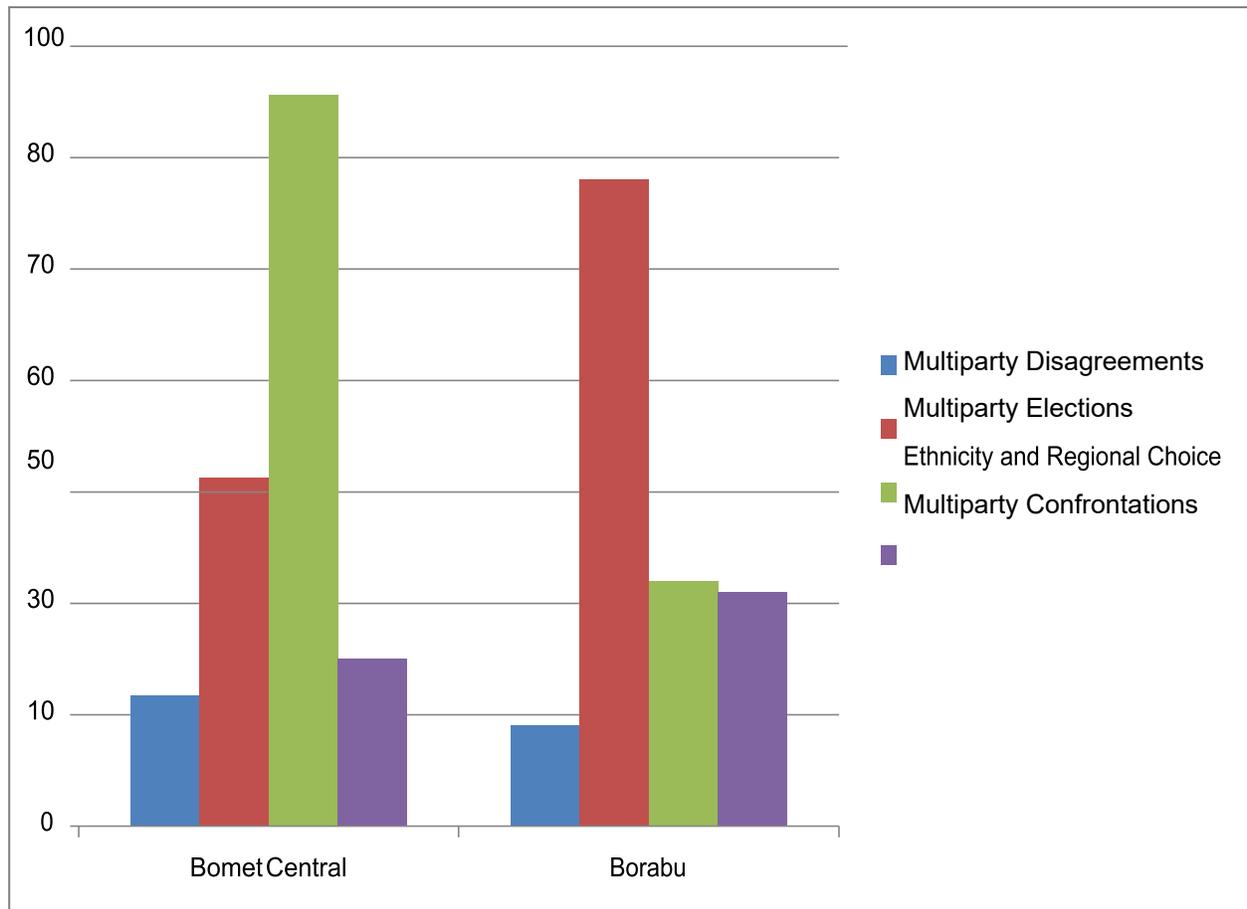
Source: Field Data (2020)

The study sought to determine the main economic activities of respondents. The results are given in Figure 4.3. The results indicate that out of the total 120 respondents from Bomet Central Sub-County, 73% (88) reared livestock, 10% (12) were agricultural farmers and 17% (20) carried out mixed farming. None of the respondents were involved in mining activities.

The results also indicate that out of the total 110 respondents from Borabu Sub-County, 14% (15) kept livestock, 61% (67) were agricultural farmers and 25% (28) were mixed farmers while none was involved in mining. Farming and livestock rearing are the main economic activities in the Borabu and Bomet Central Sub-County respectively. It is imperative that economic activities like livestock keeping and land for agricultural activities could be one of the major reasons of repeated ethnic conflicts among the border communities of the Abagusii and Kipsigis.

#### 4.3 The Influence of Multiparty Democracy Development on Ethnic Conflicts

In answering specific objective one of the study, the researchers pursued facts on the influence of multiparty democracy in fueling ethnic conflicts among border communities. The parameters for measuring multiparty democracy were; multiparty disagreements, multiparty elections, ethnicity, regional choice and political confrontations. The findings are as shown in Figure 4.4:



**Figure 4.4: Influence of Multiparty Democracy on ethnic conflicts**  
 Source: Field Data (2020)

Figure 4.4 presents findings on the influence of multiparty democracy on ethnic conflicts. The results indicate that out of the total 120 respondents from Bomet Central Sub-County, 13% (16) agreed that multiparty disagreements influenced ethnic conflicts while 87% (104) disagreeing, 23% (28) agreed that multiparty elections influenced ethnic conflicts while 77% (92) disagreeing, 51% (61) agreed that ethnicity and regional choice of leaders influenced ethnic conflicts while 49% (59) disagreeing and 13% (15) agreed that multiparty confrontations led to ethnic conflicts while 87% (105) disagreeing.

The results also indicate that out of the total 110 respondents from Borabu Sub-County, 08% (9) agreed that multiparty disagreements influenced ethnic conflicts while 92% (101) disagreeing, 53% (58) agreed that multiparty elections influenced ethnic conflicts while 47% (52) disagreeing, 20% (22) agreed that ethnicity and regional choice of leaders influenced ethnic conflicts while 80% (88) and 19% (21) agreed that multiparty confrontations led to ethnic conflicts while 81% (89) disagreeing. From the findings, multiparty democracy influenced ethnic conflicts among the Abagusii and Kipsigis border communities through ethnicity and regional choice as well as multi-party elections.

Duffield (2012) on elections cite that presidential candidates and their political parties have always got huge following and support from geographical zones dominated by groups whose ethnicity is the same as that for the presidential candidates. Ethnic groups whose presidential candidates win in elections are viewed by the rest of the ethnic groups as being favoured by the ruling government in terms of public appointments. This tendency draws a wedge in the nature of relations and coexistence among the various ethnic groups in the country.

The findings are in tandem with those findings of Mokuia (2013) on multiparty political influence on the wellbeing of communities. Harmonious coexistence suddenly It is clear that multiparty democracy of 1992 influenced negative ethnicity in Kenya with disagreements and tensions between border communities fueling ethnic conflicts. Furthermore, a report by CMD (2015) acknowledges that ethnic conflicts in Kenya occur frequently, since the reintroduction of multi-party democracy in 1992. Worst ethnic violence was witnessed during the 2007/08 post-election.

An administrator from Nyansiongo Ward asserted that:

*...during general elections, confrontations and disagreements are witnessed among the Abagusii and Kipsigis communities bordering each other due to choice of their leaders especially at the presidential level. It has never happened where the two communities supported same presidential aspirant. This is where ethnicity rises to violence and conflicts... (Field interview with an administrator at Nyansiongo, 19<sup>th</sup> December, 2019)*

Contrary to the findings that multiparty democracy influences ethnic violence, Butterfield (2005) argued that conflicts at times accelerate development in various spheres. Conflicts can be about heightened security, institutional development, economic boost, cultural significance, networks and representation. Additionally, peace-building is part of the security dimension focusing on human rights, conflict resolution and social cohesion.

A respondent from Esise argued that:

*...the ethnic violence has led to improved security organs in the area for example; we have a new police post mandated with enhancing security in the area. Other government institutions National Cohesion and Integration Commission have had communal meetings in the area. Development projects have also been initiated in both regions.... (Respondent from Esise Ward, Borabu Sub-County, 27<sup>th</sup> November, 2019).*

It is imperative that multiparty democracy influenced ethnic conflicts among the Abagusii and Kipsigis border communities through elections which are marred with disagreements and confrontations due to ethnicity and choice of leaders to represent them. However, ethnic conflicts also accelerated development in various spheres like heightened security measures, development of various projects, economic boost through trade, cultural significance, networks and Representation through governance.

## V. SUMMARY, CONCLUSION AND RECOMMENDATION

### 5.1 Summary

The study analyzed multiparty development and its influence on ethnic conflicts between the Abagusii and Kipasigis border communities. It was found out that multiparty democracy influenced ethnic conflicts among border communities through; ethnic and regional choice, multiparty elections and multiparty disagreements. However, it was argued that conflicts at times accelerated development in various spheres including security, institutional development, economic boost, cultural significance, networks and representation.

### 5.2 Conclusion

The study analyzed multiparty development and its influence on ethnic conflicts between the Abagusii and Kipasigis border communities. It was concluded that multiparty democracy influenced ethnic conflicts especially among border communities. However, the ethnic conflicts also brought development in the region be it security or networks.

### 5.3 Recommendation

It was found that multiparty democracy has a role in the repeated ethnic conflicts along the border line of the Abagusii and Kipsigis communities. The study therefore recommends that sensitization and awareness programs if put in place to educate the communities on the importance of multiparty democracy in our society. Such an initiative can be championed by the County Governments of Nyamira and Bomet, the non-state actors and the national government through National Cohesion and Integration Commission and CMD.

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# The Relationship Between Maintaining Status As A Socio-Cultural Element And Conflict Dynamism Within Kerio Valley Delta

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**Abstract-** Whereas the Kerio Valley Delta, in Kenya, like many other arid and semi-arid regions has been experiencing pastoralist and ethnic conflicts that has resulted to the increased numbers of humanitarian aid by Non-Governmental Organizations (NGO), there seems to be little empirical focus to isolate the factors relating to maintaining status as factors behind escalation of conflict and the shift in the nature and intensity of the conflict. The study thus, sought to establish the relationship between maintaining status and conflict dynamism within Kerio Valley Delta, Kenya. Two theories, the conflict transformation theory and cultural anchored the study. The study adopted a descriptive survey research design to target the community members in the in the Kerio Valley Delta. The sample size was calculated by getting 400 respondents from the target population. Snowball sampling was used based on the acquaintances who know the resource persons from the community. This study utilized questionnaires and interview schedule to get relevant data from the respondents. The study used descriptive statistics to analyze the quantitative elements of the data received from the questionnaires categorized per objective. The results show that maintaining status enhanced influence on conflicts in the Kerio Valley Delta. The study thus recommends that a systematic and concretized framework to deal with the causes, nature and underpinnings of maintaining status to reduce conflicts should be created.

**Index Terms-** maintaining status, culture, conflict outcomes, conflict dynamism

## I. INTRODUCTION

Conflicts are common phenomena in many regions of the world, especially in dry lands which are endowed with scarce natural resources (Sterzel et al., 2014). Conflict has been one of the devastating phenomena in Africa in the last three decades, with Arid and Semi-Arid Lands (ASAL) being the most vulnerable (Hussein, 2014). Conflict in these areas manifest with violence that is often based on ethnicity; indeed, ethnic connotations to conflicts have been touted as a major cause of conflict after resource-based conflict narrative. Keller (2009) in a study done in the USA on status and power noted that throughout history, the drive for obtaining status and power has been thought of as a fundamental motivator of human behavior and which then become

a precipitate to conflicts when the power shifts. He states that to maintain status and have power is to have control over resources, to have the ability to influence others' behavior, and to be able to act of your own volition. The extent to which the said status can be attributable to conflicts in Kerio Valley Delta therefore needs investigation.

The idea of conflicts over power or power struggles is not new, with many examples of power conflict within other disciplines, such as sociology and political science. For example, in his development of a general theory of conflict processes, the sociologist, Blalock (1989), incorporates the concepts of power and dependency as key components of explaining real world conflicts including warfare, international conflicts, ethnic conflicts, and even interpersonal interactions. Blalock (1989) argues that with its basis around dependency created by a need or desire for certain resources, the notion of power is a key part of conflict processes and influences both the initiation of conflict as well as the outcomes of conflict episodes. Similarly, other sociologists include struggles for power and status as key components in their definitions of social conflict. With this conceptualization, it would be helpful to investigate the extent to which maintaining status has impacted on conflict dynamism in Kerio Valley Delta.

Socio-cultural factors extends to concepts of race, ethnicity, socio-economic class, sexual orientations, political and religious association and conflict would arise from struggles over values, community status, power and resources. According to Geller and Alam, (2010) in a study done in Europe, socio-cultural factors are important in creating and understanding conflict in general, socio-cultural factors feed into the systems dynamics processes. He further states in conflict-torn Afghanistan 'traditional' socio-cultural mechanisms, political culture and power structures are important factors in understanding the conflict. Culture is not something groups belong to but rather a tool that guides action, culture plays a role in our increasingly interconnected lives where we must interact with people from vastly different cultural backgrounds and are exposed to ideologies and events from the other end of the world hence, peace and conflict are culturally influenced processes (Wagoner, 2014). In the 20th century, anthropologists began theorizing about culture as an object of scientific analysis. Some understood culture as being definitive of human nature and used it to distinguish human adaptive strategies from the largely instinctive adaptive strategies of animals, whereas

others used it to refer to symbolic representations and expressions of human experience, with no direct adaptive value (Laland & Brown, 2011).

Maintaining status has contributed to the growing tension and persistent internal conflicts in Cameroon which are potential ingredients for conflict (Sama, 2007). As seen in South Africa the causes of conflict between the San community and other communities is associated with unemployment and unfair treatment which are socio-economic factors (Beyene, 2014). However, Hagg, (2006) states that Cultural diversity can be a tool for conflict resolution and peace-making processes.

In Kenya, conflict and its dynamics have reached unprecedented proportions in the past decade. It has changed in nature, scale and dimension due to a number of factors, including the proliferation of small arms in the region, the commercialization of raiding, high rates of unemployment in pastoral areas, frequent droughts and reduced respect for traditional conflict-solving mechanisms (Bond & Meier, 2005). It is clear that researchers have mostly focused on the economic aspects of cattle rustling creating a gap on the social aspects of it. Some conflicts within and between pastoralist communities, such as raiding and cattle rustling have a long history and to some extent, have become an aspect of traditional pastoralist culture (Kaimba *et al.*, 2011). Thus, the reference to cattle rustling in the study as a culture and a way of maintaining community status. On the one hand, raiding leads to distrust between communities which are prerequisite of conflict (Schilling, et al., 2014). It is therefore imperative to examine the the relationship between maintaining status as a socio-cultural element and conflict dynamism within Kerio Valley Delta

### Statement of the Problem

Whereas the Kerio Valley Delta, in Kenya, like many other arid and semi-arid regions has been experiencing pastoralist and ethnic conflicts that has resulted to the increased numbers of humanitarian aid by Non-Governmental Organizations (NGO) (Kimenju *et.al* 2003; ), there seems to be little empirical focus to isolate the maintaining status factors behind escalating conflict and the shift in the nature and intensity of the conflict. Thus, this study aims at creating an understanding as to what extent socio-cultural factors like maintaining status, tribal identity and cultural belief systems have impacted the dynamics of conflict in the Kerio Valley Delta remains; particularly now that the conflict has escalated and is executed with more creativity and sophistication. This study hopes to fill this gap.

### Research Objective

The research objective was to assess the relationship between maintaining status as a socio-cultural element and conflict dynamism within Kerio Valley Delta

## II. LITERATURE REVIEW

### Conceptual Framework

This study is guided by two theories; the social conflict theory and the culture theory. The social conflict theory was suggested by Karl Marx in 1867 and it claims that the society is in a state of perpetual conflict because of competition for limited resources, it holds that social order is maintained by domination and power rather than consensus and conformity. According to the social conflict theory, those with wealth and power try to hold on to it by any means possible chiefly by suppressing the poor and the powerless (Coombs & Avrunin, 2013) A basic premise of conflict theory is that individuals and groups within a society work to maximise their own benefits. It focuses on competition between groups within the society, it views social and economic institutions as tools of struggle between groups or classes used to maintain inequality and the dominance of the ruling class (Cragun & Cragun, 2006).

**Social conflict theories** assume that competition is the default rather than cooperation, given conflict theorists assumption that conflict occurs between social classes, one outcome of this conflict is revolution, the idea is that change in a power dynamic between groups does not happen as the result of adaptation position control (Andrews, 2012). In Africa, the culture of conflict and violence stems from ethnic, religious, regional, racial differences and class divide. These reflects the diversity of cultures, and increased economic inequalities between the haves and have not. Oftentimes, cultural and economic factors intertwine as causes of conflict, highlighting the complexity of conflicts in Africa. Violent conflicts in Kerio valley between communities living in Baringo, Elgeyo Marakwet and west Pokot counties, have led to unprecedented displacements in the past years (Elfverson, 2016) with more than 30 people dead and many others displaced from their homes and farms from a single episode of conflict. Competition over access to pasture and water and control of dwindling resources along River Kerio, ethnic intolerance and political differences have been blamed for the conflict in the valley. As much as the national government has been blamed for being a bystander, political rivalry is also to blame for the escalating Pokot-Marakwet conflicts dating back to pre-colonial times. The conflicts have in recent times become more violent and complex at least from the fatalities and displacements being reported.

**Culture theory** as espoused by Ogburn (1966) is a subbranch to semiotics and comparative anthropology that is intended to explain the heuristic concepts attendant to culture in practical and scientific terms and format. The 19<sup>th</sup> century saw scholars define culture as the vast portfolio of human activities but others substituted culture with ‘civilization.’ It was until the 20<sup>th</sup> century that culture was viewed using scientific lenses. Consequently, culture was considered as strategies used by human as opposed to the instinctive animal dynamics. Others still looked at culture as symbolic expressions and representations of human action but all looked at culture as distinctive to human nature (Fridgal, 2013).

Culture theory seeks to elucidate the integral relationship between human nature and human actions (Ogburn 1966). Consequently, culture becomes such an essential element of human existence within the human environment and the human adaptation to historical events that comes from it. Furthermore,

now that culture is considered as a principal adaptive instrument of humans and occurs much quicker than human biological evolution, significant cultural modification can be looked at as culture adapting to itself (Ogburn 1966).

Consequently, anthropologists often argue on if human behaviour is dissimilar to animal behaviour in grade more than in kind; they must surely get ways to differentiate cultural norms from sociological behaviour and psychological norms and behaviour. This infers that in the event culture is utilized as a cause to conflicts, it is just a response to distinctive human behaviour. It is in this last argument that this theory becomes relevant to the present study.

### III. RESEARCH METHODOLOGY

#### Research Design

The study adopted a descriptive survey research design. According to Orodho and Kombo (2012), a research design is the strategy, assembly and approach of investigation considered so as to gain answers to research questions and to control variables. The study adopted a survey design to describe the existing research concern by asking individuals about their perceptions, attitudes and values or through observation. This study aimed to investigate maintaining status and conflict dynamism in the Kerio Valley Delta. Since the research problem under investigation was descriptive in nature, a survey research design was considered appropriate for collecting, analyzing and presenting the data. Further, descriptive survey allows for a combination of both qualitative and quantitative research approaches. The descriptive element was useful to describe the status maintained and the conflict dynamics.

#### Study Area

Kerio Valley lies between the Tugen Hills and the Elgeyo Escarpment in Kenya. Kerio valley stretches about 80Km long and 10 Km wide with the deepest point being Cherangani hills and the Tugen Hills. The valley also serves as natural border line in most sections between the counties of Elgeyo Marakwet, Baringo, West Pokot, Turkana and Samburu. The communities living along the valley are predominantly pastoral with Tugen and Marakwets practicing little of crop farming. The Tugen, Pokot and Marakwet are linguistically related groups from the larger Kalenjin ethnic group Pkalya *et. al* (2004). Kerio valley has highly variable and erratic rainfall, the temperatures are high with a mean of between 26°C and 38°C, (Schilling *et.al*, 2012). At Kimwarer in the southern part of the valley, fluoride is mined by the Kenya Fluorspar Company. The southern parts of the valley are settled by the Elgeyo people and the northern part by the Marakwet people. Tugen people live on the slopes of the Tugen Hills. The Valley extends into West Pokot and Marakwet border and ends at border to Turkana County. The valley narrows as it nears Samburu-Turkana border before ending at Lake Turkana. The choice of Kerio valley for this study was informed by the inter-relations of the groups; being pastoral and secondly being Nilotic

have a common practice in raids, and code of conduct relating to the practice, yet for many years, this communities have constantly fought along the valley and no solution has ever been reached as to the ownership or resource use pattern.

#### Study Population

A target population refers to a group of people or study subject who share similar factors and who form the anchor of a study. This study targeted the community leaders and members in the Kerio Valley Delta. It sought to get data from the community elders, members and 'soldiers' from the Pokot, Turkana, Marakwet, Ilchamus and the Samburu. According to available County records they were approximately ten thousand residents.

#### Data Collection Tools

This study utilized questionnaires, focus group discussion guides and key informant interview guides to get relevant data from the respondents. The selection of these tools was directed by the general landscape of data to be put together as well as the objectives of the study. The questionnaires comprised of both closed and open-ended questions so as to offer the respondents the option to reply to that which has not been clearly written down in the questionnaire. Key informant interview guides were designed for the elders from the community, opinion leaders and 'war generals'. The focus group discussions and key informant interviews was recorded and later transcribed.

#### Data Management and Analysis

The study used descriptive techniques to analyse the quantitative elements of the data received from the questionnaires categorized per objective. The descriptive statistics used was the frequency percentages, mean, which indicates the average performance of a group or a measure of some variable, and the standard deviation which indicates how to spread out a set of scores is around the mean. All data was analysed at a level of significance of 95% and the degree of freedom depending on the particular case as was determined. Analysis was done using SPSS version 22 which is a computerized statistical package by encoding responses from questionnaires and interview guides. Data from the interview guides was analysed using narrative analysis where people's quoted words are categorized according to themes and presented in prose based on their relevance to the study objectives. Presentation of this information was done using tables.

### IV. RESEARCH FINDINGS AND DISCUSSIONS

#### Conflict Dynamism

The first part of the study sought to examine the dependent variable that was conflict dynamisms. The results are seen in Table 1

**Table 1 Conflict Dynamism**

	Mean	StD
Conflicts has become our way of life	2.70	0.74
We have been unable to resolve conflicts	2.19	0.95
The conflict has become too much	2.16	0.84
Many people have died as a result of conflict	2.67	0.83
We would wish to resolve the conflict	2.23	0.72
Conflicts have affected education attainment in our region	2.17	1.09
Conflicts have created diminishing economic returns in our region	2.06	1.11
Conflicts have affected our social lives in our region	3.09	0.99

The results above show the extent to which conflict dynamism is significant in Kerio Valley Delta. Looking at the Mean and standard deviation results it is clear that all the aspects were significantly true for the area. Thus, conflicts had become a way of life for the Kerio Valley Delta inhabitants (M=2.70 SD=0.74), they had been unable to resolve conflicts (M=2.19 SD=0.95); the conflict had become too much (M=2.16 SD=0.84); Many people had died as a result of conflict (M=2.67 SD=0.83); They wished to resolve the conflict (M=2.23 SD=0.72); conflicts had affected education attainment in the region (M=2.17 SD=1.09); conflicts had created diminishing economic returns in the region (M=2.06 SD=1.11); and conflicts had affected the social lives in the region (M=3.09 SD=0.99).

This results generally agrees with literature. Basically, cconflicts are mainly manifested as political, economic, environmental, exploitation of natural resources, land clashes, religious differences and lately terrorism and Kenya has continued to be divided on the basis of ethnic, socio-cultural, regional, political and economic lines. As a result, there have been sporadic conflicts among different communities in Kenya (Lenairoshi, 2014). Community divisions along political and ideological lines, gave rise to protracted and institutionalized waves of ethnic and land clashes.

For the Marakwet, Pokot and Turkana, these communities experience high levels of inter-communal violence; much higher than elsewhere in Africa (Dowd & Raleigh, 2013). This violence is perpetrated by identity based communal militias and often involves cycles of attacks and counter attacks (Dowd & Raleigh, 2013). Competition over land ownership and land use drive local conflicts, which is sometimes triggered by the migration of herders in search of water and pasture. This is not helped by a minimal

presence of security and the proliferation of small arms and light weapons.

This is further supported by the focus group results from the selected groups from the regions looked at, namely; Baringo, Turkana, Samburu and the Pokot. They generally observe that conflict is when an enemy attacks them as a community and with an objective of stealing their stock or displace them from their land. They noted that conflict is common, most of the time it is not reported but occurs almost every two months with their neighbors, for the Pokots, its mostly the Turkana and occasionally the Marakwet.

The common conflict is as a result of cattle thefts but also sometimes, people are killed while grazing or while on transit. The group blamed the attacks on the neighbors who attacks them especially when they have low strengths in an area and the aim is normally to displace or revenge. Further, the cause is mostly competition for grazing land, the Turkana came to our land and have now even put an administration from their side. We can never have peace unless the Government moves this people (Turkana).

*The conflicts are normally fought by youth, but they have blessings from their elders. Even the Turkana women participate in conflict unlike our community where women are not supposed to fight. The elders bless and finance the youth while women support them with food and even fight back if they see an enemy. Turkana hate them because we are fighting for the rights of our land which they encroached and do not want to leave. Secondly is that they have fire power because they were provided with arms government as KPRs and also accessed them from neighboring countries.*

An interviewee from Pokot Community, 6<sup>th</sup> Aug 2019, Ameyan, Baringo County.

The Pokots further believe that the that the Governments since the colonial time have been favoring the Turkanas and that is why the Pokot feel undervalued. The injustice has been always there but they don't really know why they are hated. The youths say they post security sentries at all times to the border lines to protect them from raiders from the Turkana community.

**Maintaining Status and Conflict Dynamism**

The overall objective of the study was to ascertain the relationship between maintaining status and conflict dynamism. The results are seen in Table 4.7 and succeeding focus group and interviews.

**Table 4.7 Maintaining Status and conflict Dynamism**

	Mean	StD
My community is highly respected	2.80	0.75
My family is highly respected	2.18	0.87
We fight to maintain the respect	2.27	0.94
The other tribe does not respect us and we must teach them a lesson	2.89	0.83
Generally, We must fight to keep the respect	2.19	0.72
For one to be recognised they must have large stock	3.11	1.02
For one to be respected they must have more than one wife	2.07	1.04
For one to be respected they must participate in raid	2.89	0.79

From Table 1, it is evidently clear that all the statements on maintaining status were significantly valid and true. Thus, the respondents felt that their community was highly respected (M=2.80 SD=0.75); the family was also highly respected (M=2.18 SD=0.87); they fought to maintain the respect (M=2.27 SD=0.94); the other tribe did not respect them and they had to teach them a lesson (M=2.89 SD=0.83); Generally, fought to keep the respect (M=2.19 SD=0.72); For one to be recognised they had to have large stock (M=3.11 SD=1.02); For one to be respected they must have more than one wife (M=2.07 SD=1.04); and for one to be respected they must participate in raid (M=2.89 SD=0.79).

Literature reviewed correspond with the findings from the first overall objective. Keller (2009) in a study done in the USA on status and power noted that throughout history, the drive for obtaining status and power has been thought of as a fundamental

motivator of human behavior and which then become a precipitate to conflicts when the power shifts. He states that to maintain status and have power is to have control over resources, to have the ability to influence others' behavior, and to be able to act of your own volition. The extent to which the said status can be attributable to conflicts in Kerio Valley Delta therefore needs investigation.

Maintaining status has contributed to the growing tension and persistent internal conflicts in Cameroon which are potential ingredients for conflict (Sama, 2007). As seen in South Africa the causes of conflict between the San community and other communities is associated with unemployment and unfair treatment which are socio-economic factors (Beyene, 2014). However, Hagg, (2006) states that Cultural diversity can be a tool for conflict resolution and peace-making processes. Identity plays a crucial role in the management of social systems and maintaining social order, individuals behaviour is guided by and equally defines the community identity and knowledge of community provides a critical source of socio-political hierarchy (Masolo, 2002). Social groups rapidly self-organize into hierarchies, where members vary in their level of power, influence, skill, or dominance (Koski, et al, 2015).

Based on the focus groups discussions this aspect was prominently noted, that, the Pokots for instance are status minded and expansionists and that is their nature. They always push off other communities. They made an attempt to push the Turkana and after a month's fight, Lomelo centre was opened up so that that became a base and the fight was successful. One interviewer mentioned that the two tribes have had inter marriages and some of the prominent politicians in Pokot, their mothers or fathers were from Turkana. The other focus group discussions touching on the Tugen, Marakwet, Samburu and Turkana noted that while conflicts occurred as a result of land pressures and land use coupled with revenge and cattle rustling, they all soon escalated to preserving respect and pride within the tribe. The 'we-cannot-loose-and-we-are-men attitude' become a conduit via which escalation of conflicts took place.

**V. CONCLUSIONS AND RECOMMENDATIONS**

Based on the study objective, it is evidently clear that the Kerio Valley delta inhabitants felt that their community was highly respected, the family was also highly respected, they fought to maintain the respect and the other tribe did not respect them and they had to teach them a lesson. Generally, they fought to keep the respect and for one to be respected they must have more than one wife and must participate in raid. It can thus be concluded that maintaining status has a strong and positive relationship with conflict dynamism in the Kerio Valley Delta.

The government both nationally and at the County should engage communities in joint activities like schools where children from both communities go together. This will help forge friendships and conduits of understanding that builds consensus and peace.

The government should conduct a simultaneous disarming of communities to reduce de-escalation of conflicts. This should be done in a fair manner that does not leave one group feeling discriminated or targeted. More involvement of local politicians in

such operations together with chiefs to help build rapport amongst the influencers and the influenced.

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# Assessment Of Knowledge And Practices Regarding Dengue Fever Among Local Community Of Taxila

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**Abstract- Objective:** To assess the knowledge and practices regarding dengue fever among people living in Taxila.

**Study Design:** This was a descriptive quantitative study design based on self-design questionnaire.

**Place and Study Duration:** It was carried out from August 2019 to December 2019 involving people of Taxila.

**Materials and Methods:** Data was collected through self-structured questionnaire from 150 people living in Taxila. The collected data was analyzed through SPSS version 21, for proper analysis the data was presented in the form of percentage and frequencies for qualitative variables, mean and standard deviation was calculated for quantitative variables.

**Results:** The study results showed that almost all participants had good knowledge (70%) regarding dengue fever and 54% participants had adequate practices. They also knew about the signs and symptoms of the disease. The study results showed that media played an important role in providing awareness regarding the disease. The existing studies was done to explore the gap between knowledge and practices of the people regarding the disease.

**Conclusion:** Dengue is a mosquito-borne viral infection that is common in warm, tropical climates. Infection is caused by any one of four closely related dengue viruses and these can lead to a wide spectrum of symptoms, including some which are extremely mild (unnoticeable) to those that may require medical intervention and hospitalization.

**Index Terms-** Knowledge, Dengue fever, outbreak, health care professionals, practices.

## I. INTRODUCTION

Dengue (DEN) virus is a viral infection related to the flavivirus genus and having four antigenically related but genetically their serotypes are different (DEN 1–4). The *Aedes aegypti* mosquito is the most domesticated and the main vector for dengue transmission to humans in endemic tropical and subtropical regions. According to the World Health Organization (WHO) guidelines fever, hemorrhagic tendency, thrombocytopenia, and capillary leakage are the four criteria that allow dengue hemorrhagic fever classification elevated vascular permeability may headway to vascular collapse and death (Kularatnum, G.A.M., Jasinge, E., et al.2019).

According to WHO, dengue was found as one of the 4<sup>th</sup> main life-threatening infections globally, among the 10 highest priority health issues. One of the other studies showed that there are 390 million dengue infections per year of which 96 million clinically with any severity of WHO disease classification. An estimated 500, 0000 with severe dengue (DHF/DSS) need hospitalization each year about 2.5% will die. In addition to this severe dengue is a leading cause of hospitalization and death of children in Southeast Asian countries (Yousaf, M.A., and Neil, I. 2018).

According to the Pan American Health Organization (PAOH), dengue fever increases in America since the start of the year 2019. According to the published report, over 2 million had exposed to dengue fever in Latin America and 723 deaths occurred by the end of 2019 due to dengue fever. The International health agency reported that four countries of America including Brazil, Colombia, Honduras, and Nicaragua have declared national epidemiological alerts due to mosquito-borne disease (Charles, J. 2019)

A cross-sectional study conducted in Ethiopia among 348 health care professionals regarding dengue fever. The study results showed that doctors and nurses had a moderate level of knowledge regarding dengue fever because of a lack of training towards them. Their attitude was neutral because they were working in different health care facilities and they did not attend a single case of dengue virus. Some even told that they even couldn't manage the patient of dengue fever without their cardinal symptoms. Health care professionals (HCPs) had a low level of knowledge regarding the prevention and management of dengue fever and their practices were very poor. The study results revealed that only 45% of HCPs were familiar with WHO 2010 guidelines regarding the prevention of dengue fever (Yousaf, M., and Ibrahim, A. 2018).

In a study conducted in Selangor, Malaysia in 2019, the study results showed that there is the highest number of dengue cases in Malaysia. 406 participants were selected living in 20 hotspots and 20 non-hotspot areas of Selangor. Dengue fever is the most prevalent disease in south east Asia because of extreme weather changes and population overgrowth. A hotspot area is the area where dengue occur more than 30 days and non-hotspot area is the area where dengue outbreak is noted not more than 30 days. People living in hotspot areas had average knowledge than non-hotspot areas. The results revealed that majority of the people had no idea about the prevention of the dengue fever. Health education about the disease is compulsory to provide better knowledge

regarding the prevention and risk factors of the disease (Akmar, G., Nurul., Shohaimi, S., et al. 2019).

A study conducted in India among parents of children suffering from dengue fever and admitted. Parents knew that mosquito was a vector of disease but they didn't know about the transmission and exact time of breeding. 79% of parents had a better attitude towards dengue fever because their level of education was good. The study results showed that media played an important role in giving awareness of dengue fever and the Government also took necessary steps regarding prevention of the disease (Harish, S., Srinivasa, S., et al. 2018).

Another cross-sectional study was conducted in the Vietnamese population, 330 patients were included in this study. People living there had to experience dengue outbreak in 2017. Study results showed that most of the people had basic knowledge about dengue fever but they had a lack of practices about prevention of the disease. Most of the participants identified symptoms of dengue fever and they also knew about the cause of dengue fever. Some people considered dengue fever a serious illness but some knew that there was no need for hospitalization. Study results also showed that people had knowledge regarding prevention but they had limited resources at home to implement and prevent disease. It also found that education had a great impact on knowledge regarding the disease and occupation also had an impact on attitude. Farmers and workers had poorer attitudes regarding prevention and practices of dengue fever (Nguyen, H.V., Than, P.Q.T., et. 2019).

In Pakistan, the dengue outbreak in the country appears to be crossing the previous record of 2011 when 27,000 people were affected by the mosquito-borne disease. However, this time death caused by dengue is expected to be minimal as compared to 2011 when 370 people lost their lives to the painful disease. During the current year, 42 deaths have been caused by dengue so far and health practitioners attribute the lower mortality rate to better availability of surveillance and curative measures (Junaidi, I. 019).

According to a government document available with Dawn, during the current year over 25,000 dengue cases have been confirmed across the country. As many as 6,537 cases have been

reported from Islamabad, 5,642 from Punjab, 4,403 from Sindh, 4,276 from Khyber Pakhtunkhwa and 2,750 from Balochistan. The remaining cases have been reported from other regions, including AJK and Tribal Districts. Almost two-thirds of the cases have been reported from the Pothohar region. Dengue has claimed the lives of 15 persons in Sindh, 13 in Islamabad, 10 in Punjab, three in Balochistan and one in AJK (Junaidi, I. 2019).

## II. MATERIALS AND METHODS

This was a descriptive cross-sectional study design based on self-design questionnaire carried out from August 2019 to December 2019 involving people of Taxila. Non-probability convenient sampling was carried out. People aged between 18-50 years were included in the study and below 18 and above 50 years were not included in the study. Informed consent was signed and purpose of the study was explained to all participants. All participants become the part of this study on their willingness. Confidentiality was ensured to protect the ethical right of all participants.

## III. RESULTS

Dengue (DEN) virus is a viral infection related to the flavivirus genus and having four antigenically related but genetically their serotypes are different (DEN 1–4). The *Aedes aegypti* mosquito is the most domesticated and the main vector for dengue transmission to humans in endemic tropical and subtropical regions. A descriptive cross-sectional study was conducted and convenient sampling technique was used. 150 respondents from local community of Taxila were included in the study. Good knowledge of signs and symptoms of dengue fever was crucial to recognizing the disease and seeking appropriate health care. Awareness about the disease in the local community was one of the main factors that determine the success of a control program. The knowledge of symptoms was essential to facilitate effective case management of dengue. It was necessary to identify breeding sites and initiating control approaches.

### Socio demographic data of participants

<b>Gender:</b>	<b>Number</b>	<b>Percentage</b>
Male	108	72%
female	42	28%
<b>Religion</b>	<b>Number</b>	<b>Percentage</b>
Muslim	96	64%
Non-Muslim	54	36%
<b>Age of the respondent:</b>	<b>Number</b>	<b>Percentage</b>
15-29	54	36%
30-44	66	44%
45-59	21	14%
60-84	9	6%
<b>Marital status:</b>	<b>Number</b>	<b>Percentage</b>
❖ Married	105	70%
❖ Single	45	30%

<b>Respondent's qualification:</b>	<b>Number</b>	<b>Percentage</b>
❖ Illiterate	9	6%
❖ Primary	18	12%
❖ Secondary	45	30%
❖ Higher education	78	52%
<b>Residence of respondent:</b>	<b>Number</b>	<b>Percentage</b>
❖ Urban	105	70%
❖ Rural	45	30%
<b>Employment:</b>	<b>Number</b>	<b>Percentage</b>
❖ Yes	42	64%
❖ No	108	36%

**SECTION I: KNOWLEDGE OF PEOPLE REGARDING DENGUE FEVER**

**Knowledge Assessment Scale**

**TABLE 1:**  
**Level of The**

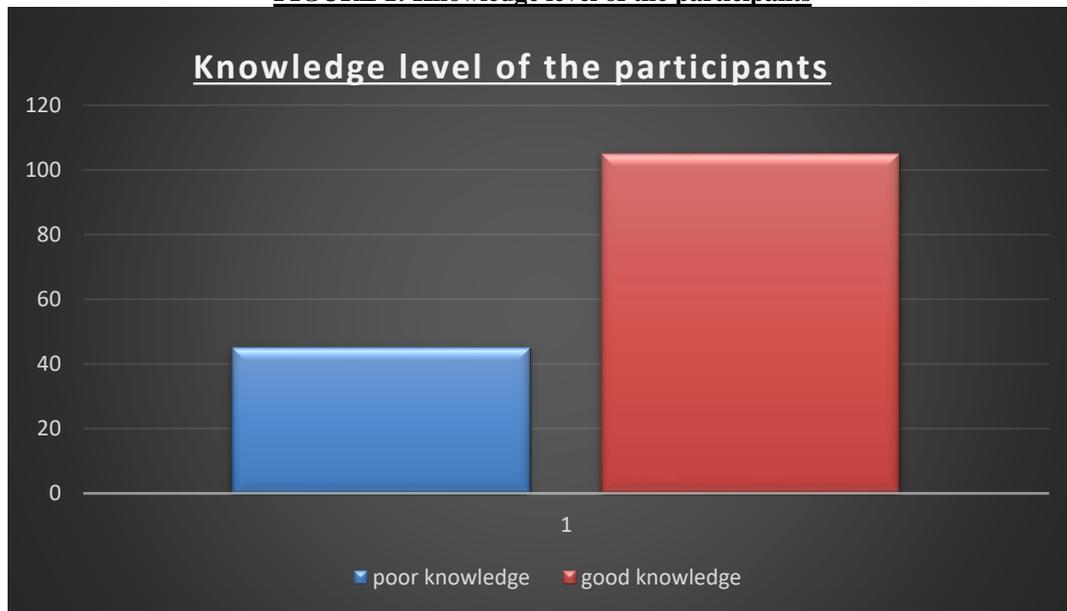
<b>Knowledge level</b>	<b>Interpretation</b>
<b>Good Knowledge</b>	If the respondents give 60-80% correct answers from the structured questionnaire
<b>Poor Knowledge</b>	If the respondents give < 50% correct answers from the structured questionnaire.

<b>Knowledge level</b>	<b>Frequency</b>	<b>Percent</b>
poor knowledge	45	30.0
good knowledge	105	70.0
Total	150	100.0

**Knowledge**  
**Participants**

**FIGURE 1: Knowledge level of the participants**



The study results showed that most of the (70%) participants had good knowledge regarding dengue fever. They knew about the disease and also knew that signs and symptoms of the dengue fever were joint pains, muscle pain, headache and

fever. The study results showed that media played an important role in providing awareness regarding the disease. People knew the time of breeding of the mosquito. They also knew about the life-threatening symptoms of the disease.

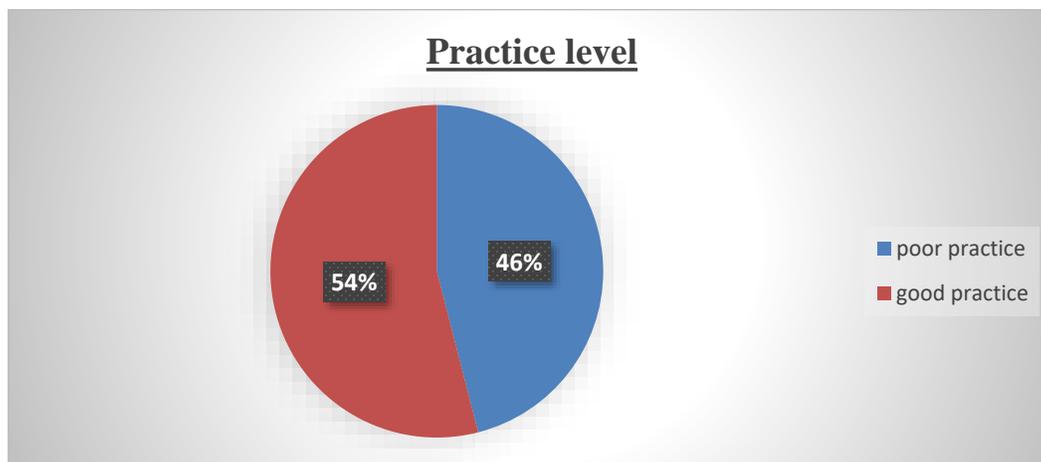
**SECTION II: PRACTICES OF PEOPLE REGARDIN G DENGUE FEVER**

**TABLE 2:**  
**of the**

Practice level	Interpretation	
Good Practices	If the respondents give 60-80% correct answers from the structured questionnaire	
Poor Practices	If the respondents give < 50% correct answers from the structured questionnaire.	
Practice level	Frequency	Percent
poor practice	69	46.0
good practice	81	54.0
Total	150	100.0

**Practice level participants**

**FIGURE 2: Practice level of the participants**



The results showed that 54% respondents had done good practices to prevent from the disease but 46% people had poor practices regarding the disease. They had storage water container in their homes. The results showed that most of the people didn't use mosquito nets during day and night sleep for prevention. The results also showed that most of the people didn't wear long sleeves and long pants during monsoon and post-monsoon. The mean practice level is 1.54 and standard deviation is 0.503.

**IV. DISCUSSION**

The Aedes aegypti mosquito is the most domesticated and the main vector for dengue transmission to humans in endemic tropical and subtropical regions. A descriptive cross-sectional study was conducted and convenient sampling technique was used. 50 respondents from OPD of POF hospital were included in the study. Good knowledge of the sign and symptoms of dengue

fever is crucial to recognizing the disease and seeking appropriate health care.

According to WHO, dengue was found as one of the 4<sup>th</sup> main life-threatening infections globally, among the 10 highest priority health issues. One of the other studies showed that there are 390 million dengue infections per year of which 96 million clinically with any severity of WHO disease classification. An estimated 500, 0000 with severe dengue (DHF/DSS) need hospitalization each year about 2.5% will die. In addition to this severe dengue is a leading cause of hospitalization and death of children in Southeast Asian countries (Yousaf, M.A., and Neil, I. 2018).

In our study, results showed that most of the participants had good knowledge (70%) regarding dengue fever. They knew about the disease and also knew that signs and symptoms of the dengue fever were joint pains, muscle pain, headache and fever. The study results showed that media played an important role in providing awareness regarding the disease. People knew the time

of breeding of the mosquito. They also knew about the life-threatening symptoms of the disease.

A study conducted in India among parents of children suffering from dengue fever and admitted. Parents knew that mosquito was a vector of disease but they didn't know about the transmission and exact time of breeding. 79% of parents had a better attitude towards dengue fever because their level of education was good. The study results showed that media played an important role in giving awareness of dengue fever and the Government also took necessary steps regarding prevention of the disease (Harish, S., Srinivasa, S., et al. 2018).

In our 54% respondents had done good practices to prevent from the disease but 46% people had poor practices regarding the disease. They had storage water container in their homes. The results showed that most of the people didn't use mosquito nets during day and night sleep for prevention. The results also showed that most of the people didn't wear long sleeves and long pants during monsoon and post-monsoon. The mean practice level is 1.54 and standard deviation is 0.503.

The study may give a basic level of knowledge and practices regarding Dengue preventions. A further afford is required for awareness programs and teaching sessions to provide essential knowledge and improve the level of awareness. There is a gap between knowledge and practices of the people, they had good knowledge regarding the disease but their practices were not good to prevent from the disease.

## V. CONCLUSION

The *Aedes aegypti* mosquito is the most domesticated and the main vector for dengue transmission to humans in endemic tropical and subtropical regions. According to WHO, dengue was found as one of the 4<sup>th</sup> main life-threatening infections globally, among the 10 highest priority health issues. Dengue fever is the most prevalent disease in south east Asia because of extreme weather changes and population overgrowth. Symptoms of dengue are high grade fever, headaches, joint and muscles pain, fatigue, rashes on skin, abdominal pain, nausea and vomiting. Prevention of the disease includes wear long sleeves and pants, use good mosquito repellents and remove water from coolers and other small containers once in a week.

## VI. RECOMMENDATIONS

Every citizen must know about the signs and symptoms and the time of breeding of dengue mosquito. Proper survey team should be arranged to visit the houses for proper screened houses,

water storage, use of nets etc. The knowledge about dengue fever should be improved with regular classes, seminars and different practical activities before every coming season. Through all these preventive measures, we can reduce the risk of dengue infection. Additional concern should be given to tropical and sub-tropical areas. Further studies are essential in the evaluation of the situation of infection control in different areas of breeding of mosquito. More intensive and regular prevention programs should be displayed on media. Regular inspection and follow-up from the ministry of health guarantees good infection control practices. Dengue Clinical Case Management Course should be arranged for health care workers.

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## **Spatio-Temporal Analysis of Land Use Changes in South-Eastern States, Nigeria**

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**Abstract:** Urban growth processes, usually accompanied by increased population also sees cities growing rapidly in terms of physical dimension leading to rapid expansion and changes in land characteristics of the area concerned. This study examined land-use changes of states in the south-east, Nigeria. Satellite imageries of the study area for 1986, 2006 and 2018 were sourced from US Geological Survey and NASRDA (March, 2019). Landsat Thematic Mapper imagery constitutes the base data layer from which the land use and land cover (built-up and non-built up) maps were derived. A total of 270 data points were obtained from the ground truth field survey from which 195 ground truth points were used for accurate assessment through the use of Global Positioning System (GPS). The result revealed that there is spatio-temporal variation in land use characteristics among the various states in the south-east, Nigeria in all the years examined. Abia state grew from a built-up area of 223.3 Sq.km in 1986 to 285.18Sq.km in 2006 and 405.72 Sq.km in 2018. For Anambra, it was 377.78Sq.km, 599.15Sq.km and 1795Sq.km in 1986, 2006 and 2018 respectively. Ebonyi also had its share of land use changes with a built-up area of 812.37Sq.km, 1074.50Sq.km and 1451.91Sq.km in 1986, 2006 and 2018 respectively. The built-up area for Enugu for 1986, 2006 and 2018 are 1866.31Sq.km, 1929.28 Sq.km, and 3353.49Sq.km respectively while for Imo State it was 155.07Sq.km (1986), 309.06sq.km (2006), and 642.40Sq.km (2018).Changes in land-use pattern of states in South-East Nigeria tends to follow a combination of infilling and spontaneous growth, edge-expansion and outlying growth type. For settlements in the region to continue to play their role, there is need for deliberate urban growth management approach through a well thought out land-use planning.Strict adherence and compliance to planning regulations and political will on the part of government in the area is a desideratum to achieving sustainable urban growth in the region.

**Key words:** Urban growth management, urban expansion, Livability, built-up, land use/cover change

## 1. Introduction

All over the world, urban growth has been considered as one of the essential indicators of economic growth and development of any country they are found. Although, the world is experiencing rapid urban growth, the rate is felt more in developing countries making urban growth one of the most important issues. According to the prediction of the United Nations, the population of Africa will double within the next 40 years: from about 1 billion in 2010, Africa is expected to reach 2 billion inhabitants around 2045 (UN-Habitat. (2010). Most of these rapid urbanization will take place on agricultural land, vegetation and other natural land cover. Seto, Sánchezrodríguez, and Fragkias (2010), argued that the rate of urban physical expansion often referred to as urban sprawl, is much faster than urban population growth in many cities that put pressure on land resources. The increasing scarcity of limited land resources due to anthropogenic activities – particularly by urban growth – has not been given enough attention, which poses a great challenge to achieve the goals of sustainable development (Haber, 2007).

Urban growth processes, usually accompanied by increased population also sees cities growing rapidly in terms of physical dimension leading to rapid expansion and changes in the urban space pattern and land cover characteristics of the of the area concerned. (Mohapatra, Padmini & Monika, 2014). Although urbanization is often accompanied by positive outcomes, it also has some negative implications to include loss of agricultural land, surface and groundwater depletion, changes in geomorphic features, flooding, and landslides. (Mohapatra, et. al, 2014)

Uncoordinated urban growth has huge implications on the demand for infrastructure development and improved amenities calls for greater need to explore areas of concern by identifying the specific drivers of growth in each state and with a view to prioritizing the development scenario.

According to Jianzhu, Ikechukwu and Maduako (2018) in developing countries' large cities, the lack of timely, accurate and credible data on the location, spatial extent, rate and driving factors of urban growth has always been a crucial obstacle for implementing suitable and effective planning policies by city management. For them, although dynamic spatial-temporal change process of urban development cannot be prevented, modeling, simulation and prediction of cities' future growth remains powerful planning tool to understand the interactions between the natural and anthropogenic environment, and the problems arising from rapid urban growth.

The south-east geopolitical zone in Nigeria has witnessed rapid urban expansion due mainly to its location and position. The discovery of coal in the region near Enugu in the early 20th century around the Udi Plateau; led to the establishment of coal mining industry and subsidiary firms that acted as force towards the region's growth. The region was also famous in producing palm kernel that accounted for half of the world's total output making the region a net exporter in agricultural produce.

The presence of good atmosphere for trade also exerts centrifugal force pulling both man and industries into the region with attendant implication on land use changes in the area. Understanding the nature and pattern of land-use changes in the south east region of Nigeria is a desideratum to ensuring a sustainable urban growth in the area. This study therefore seeks to examine the nature and trend of land use dynamics in the south east region of Nigeria.

## 2. Study Area

The South-Eastern Nigeria is generally regarded as “Igbo land” and occupies a land mass of 76,145.65 km<sup>2</sup> comprising of Abia, Anambra, Ebonyi, Enugu, Imo and major parts of Delta States (Uchem, 2001).Historically, Igbo land has taken up a large part of South East Nigeria, mostly on the eastern side of the Niger River. It extends westward across the Niger to regions of Aniocha, Ndokwa, Ukwuani and Ika in present day Delta State and also minute parts of Edo State in Nigeria. Its northernmost point enters the Savannah climate around Nsukka (Uchendu, 1965). The States of South East Nigeria include; Abia, Anambra, Enugu, Ebonyi and Imo. Their State Capitals include; Umuahia, Awka, Enugu, Abakaliki and Owerri respectively. (Figure 1).



**LOCATION MAP OF STUDY AREA**

**Figure 1: South-East Nigeria Administrative**

### 3. Methods and Materials.

The studies utilized the longitudinal survey research design since it intends to explore changes in land-use of states in the south-east Nigeria over time. Both primary and secondary sources of data were used. The primary data took the form of ground truthing via the use of Global Positioning System (GPS) and physical observation carried out in the area. A total of 270 data points were obtained from the field survey from which 195 ground truth points were used as ground truth for accuracy assessment. Ground truth survey was performed in order to obtain accurate location point data for each land use and land cover class included in the classification scheme. Ground-truth surveys are essential components for the accurate determination and assessment of classified satellite imageries (Congalton, 1991).

Secondary data came in the form of satellite imageries sourced from US Geological Survey and NASRDA (March, 2019). Landsat Thematic Mapper imagery constitutes the base data layer from which the land use and land cover (built-up and non-built up) maps were derived. The scope of this study required the acquisition of three Landsat TM sheets for different years 1986, 2006 and 2018, which were corrected for cloud cover and other interferences.

The acquisition dates of the ETM Scenes employed in the change detection process fell within an acceptable anniversary window: November 18th, 1986 and February 6th, 2018. The best time for phenological stability in this region is during the dry season from November to February.

Each Landsat ETM Scene is 36, 247 Sq. km, but when five of each is *mosaic*, it produced an area of 181,235 Sq. Km. The study area has an area of approximately 287,71.12 Sq. Km. In order to subset the study area from each of the five Landsat scenes, a vector file defining the county boundary with the same geo-referenced coordinates as the Landsat images, UTM Zone 32N, WGS 1986, was imported into ArcGIS 10.2. The state boundary vector file was converted to a binary bitmap mask and overlaid on to each of the TM scenes.

Image classification was achieved using the a multilevel, hierarchical land use classification derived from the author's a priori knowledge of the study area and is roughly based upon an Anderson level II classification (Anderson et al, 1976). The land use and land cover categories of focus were urban areas, forest, agricultural land, barren land, and water bodies. The urban areas were further categorised as built-up, while the forest, agricultural land, barren land, and water bodies were considered as non-built up. To enhance comprehension, schematic presentation in the form of maps was used.

#### **4. Empirical Review**

The study of urban growth has elicited the interest of different authors (Calthorpe 1993; Wheeler 2000; Calthorpe & Fulton, 2001; Wheeler, 2002; Duany & Talen 2002; Talen 2008; Birch & Wachter 2008; Weje & Osanebi, 2018; Weje & Dapa, 2015 among others). This may not be unconnected to the role urban centers play to the continuous existence of the society. Tan., Lim., MatJafri and Abdulla (2010), investigated Land use/Land Cover Change (1999-2007) in Penang Island, and observed that highly built-up areas increased (109.03%), minimally built-up areas decreased (4.61%), barren land decreased (77.69%) due to urbanization, forested lands decreased an average of 16.89% grasslands increased (12.67%), and water areas showed a modest increase (0.75%).

In a related study, Chi, Shubo, Nao and Shuqing, (2015) explore the spatial patterns of different urban growth forms in relation to roads and pre-growth urban areas in the Nanjing metropolitan region of China. The result revealed that three basic urban growth forms - infilling, edge-expansion, and spontaneous growth - were distinguished using a topological quantitative criterion. The three urban growth forms identified generally showed exponential attenuation with increasing distance to roads and pre-growth urban areas.

Weje and Dapa (2015) worried by the rapid disappearance of wet land in Port Harcourt carried out a study and found that the increasing population of port Harcourt precipitates a situation where wetlands are reclaimed for residential use. The study revealed that uncoordinated nature of land reclamation (usually done with local materials) leads to the formation of slums in the area.

Weje and Osenebi (2018) also looked land use and landcoverdynamics in Ukwuani Local Government Area, Delta State, Nigeria. The findings indicated that the areas covered by forest which was 77,948 m<sup>2</sup> in year 2000, reduced to 25,226 m<sup>2</sup> in 2018 and the areas covered by other land uses increased from 389,449 m<sup>2</sup>. in 2000 to 442,234 m<sup>2</sup> in 2018. The total forest land lost to other land uses amount to approximately 52,785 m<sup>2</sup> while the total land area gained by other land uses amount to approximately 52,785 m<sup>2</sup>.

Agbora and Weje (2019) worried by the amorphous growth of Bori town examined the level of land-use changes in the area vis- a- vis the master plan prepared for its growth in 1972. The result of their investigation showed that rapid urbanization creates a situation where peripheral lands are subjected to intense pressure a phenomenon that precipitates rapid land-use dynamics, as rural areas are made to be part of the city leading to urban sprawl. The result of the analysis further shows that the present growth pattern of Bori is at variance with the provision of its 1972 prepared plan. Residential land use increased from 1,302.7 hectares in 1972 to 5,302.7 hectares in 2003, and 7,507.3 hectares in 2018 respectively. Commercial land use also grew at 144.8 hectares' in 1972 to 140.4 hectares in 2003 and to 1,117.3 hectares in 2018. Sharp decline in the land for forest and agriculture were also observed. Bori area had a total land devoted for forest covering 65.4 % about 10,159.6 hectares in 1972, this figure dropped to 1137.2 hectares a mere 7.3% in 2018.

Njoku, Ebe, and Pat-Mbano (2010) studied Land use and land cover dynamics in Owerri, the Imo State Capital and environs using Landsat TM 86 and ETM+ 2000. Their result showed that there is significant shift in the aggregate land use and land cover class due to natural and anthropogenic forcing agents. Forest vegetation class had the largest coverage on the land use and land cover maps of 1986 and 2000. As revealing as this study may seem, its analysis focused only on Owerri-the capital of Imo state.

To better appreciate the land use changes in the entire south-east Nigeria there is need to examine the land use dynamics of the area taking all States of the region at a time. This in our view constitutes a gap in literature that the present study intends to fill.

## 5. Results and discussion

Table 1 is the result of analysis on landuse dynamics for various states in the south-east for 1986, 2006 and 2018. A dispassionate analysis reveals there is spatial variation in the landuse changes among the various states under investigation. For example, in 1986, the Abia State, had a built up area of 223.2 sq. km. and a sparsely concentration of settlements around Umu-Nneochi, Aba, and Isikwato axis. Built-up area in Anambra State in 1986 was not different as the landuse pattern tends to be quite uniform. There was no dominant urban area, but several built up scattered around within the area, indicative that opportunities and social amenities were distributed in a near uniform manner. Within the same period under reference (1986), there was outlying growth in the Northern parts of Anambra State concentrating in the areas such as Ayamelum and Anambra-West covering a built up area of 377.78 sq. km. the non-builtup areas for Anambra within the same period was 4344.58 Sq.km.

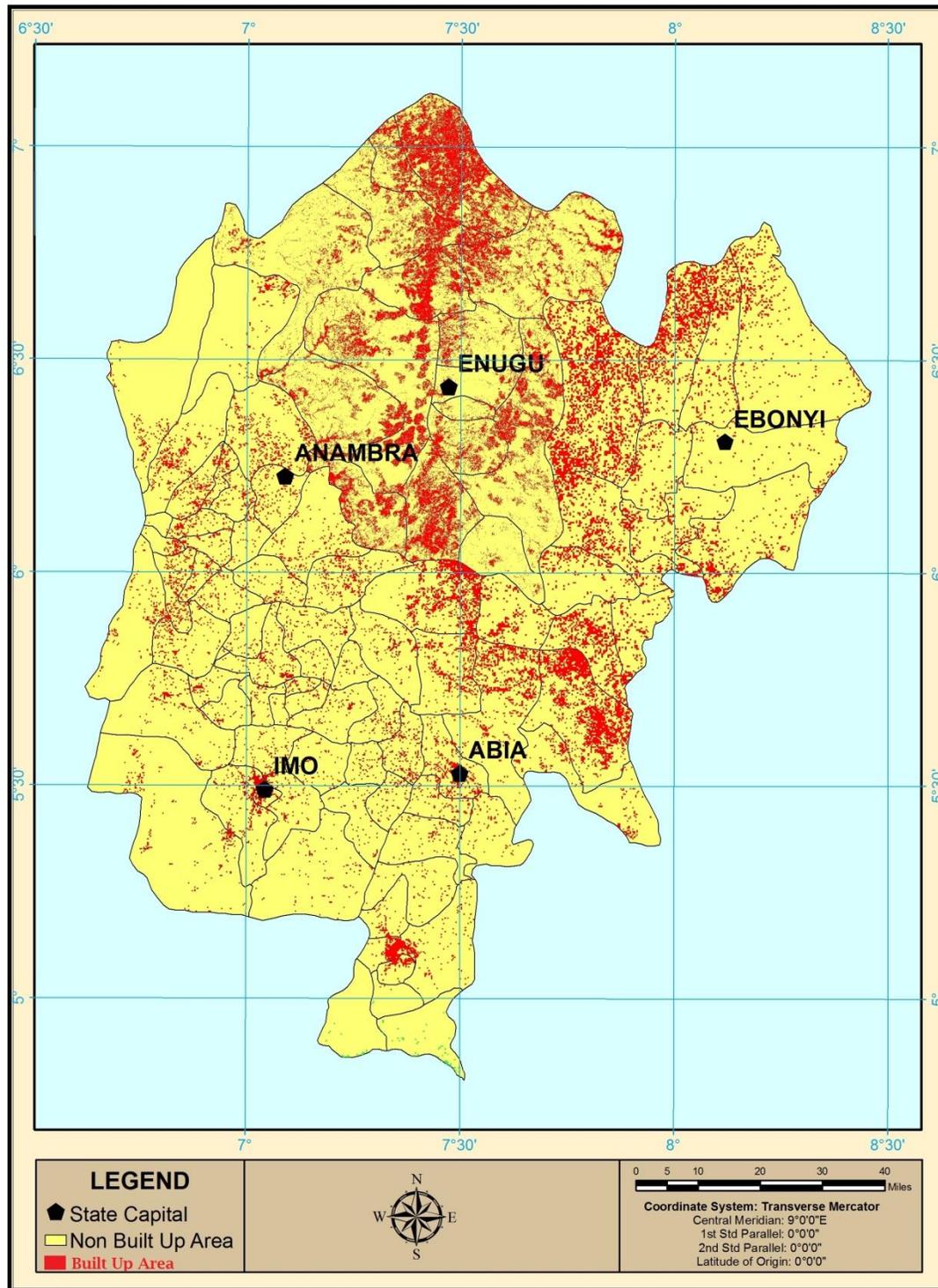
Ebonyi State also witnessed a near uniform pattern of urban growth in 1986. Although there was no dominant urban area, but several sub-centers these areas are obviously locations where jobs and social amenities are distributed in a near uniform manner having a built up area covered 812.37 sq. km. in 1986.

For Enugu the built up pattern was observed to have no dominant urban center in 1986. The urban spread covered a sparsely built-up area of 1,866.31sq.km and a non-built-up area of 5799.69sq.km. Most built-up area was concentrated at the North and Western parts of the Enugu, with evidence of infilling and spontaneous growth in the Northern and Western parts (Figure 2). The densely built-up areas were found more in areas such as Nsuka, Oji River, Eze-Agu, and adjoining areas including parts of Enugu-North and Enugu-East. The result also indicates that Imo state had an overall built up area of 155.07sq. km and a non-built-up are of 5019.72in 1986 exhibiting a sparse but random concentration. Infilling growth was visible around Owerri-Municipal, Owerri-North and Owerri-West at this period. Figure 2 is the schema showing urban growth among states in the south-east, Nigeria in 1986.

**Table 1: Spatial Outlook of Built-up and Non Built-up Areas of States in South-East Nigeria**

States	BUILT UP AREA			Non built up area		
	1986 (Sq. Km)	2006 (Sq. Km)	2018 (Sq. Km)	1986 (Sq. Km)	2006 (Sq. Km)	2018(Sq. Km)
Abia State	223.2	285.18	405.72	4510.36	4448.38	4327.84
Anambra State	377.78	599.15	1795.96	4344.58	4123.21	2926.4
Enugu State	1866.31	1929.28	3353.49	5799.69	5736.73	4312.52
Ebonyi State	812.37	1074.50	1453.91	5508.04	5245.91	4866.5
Imo State	155.07	309.06	642.40	5019.72	5019.72	4686.38

Source: Field work, (2019).



**Figure 2: Land-use Characteristics of States in South-East, Nigeria (1986)**

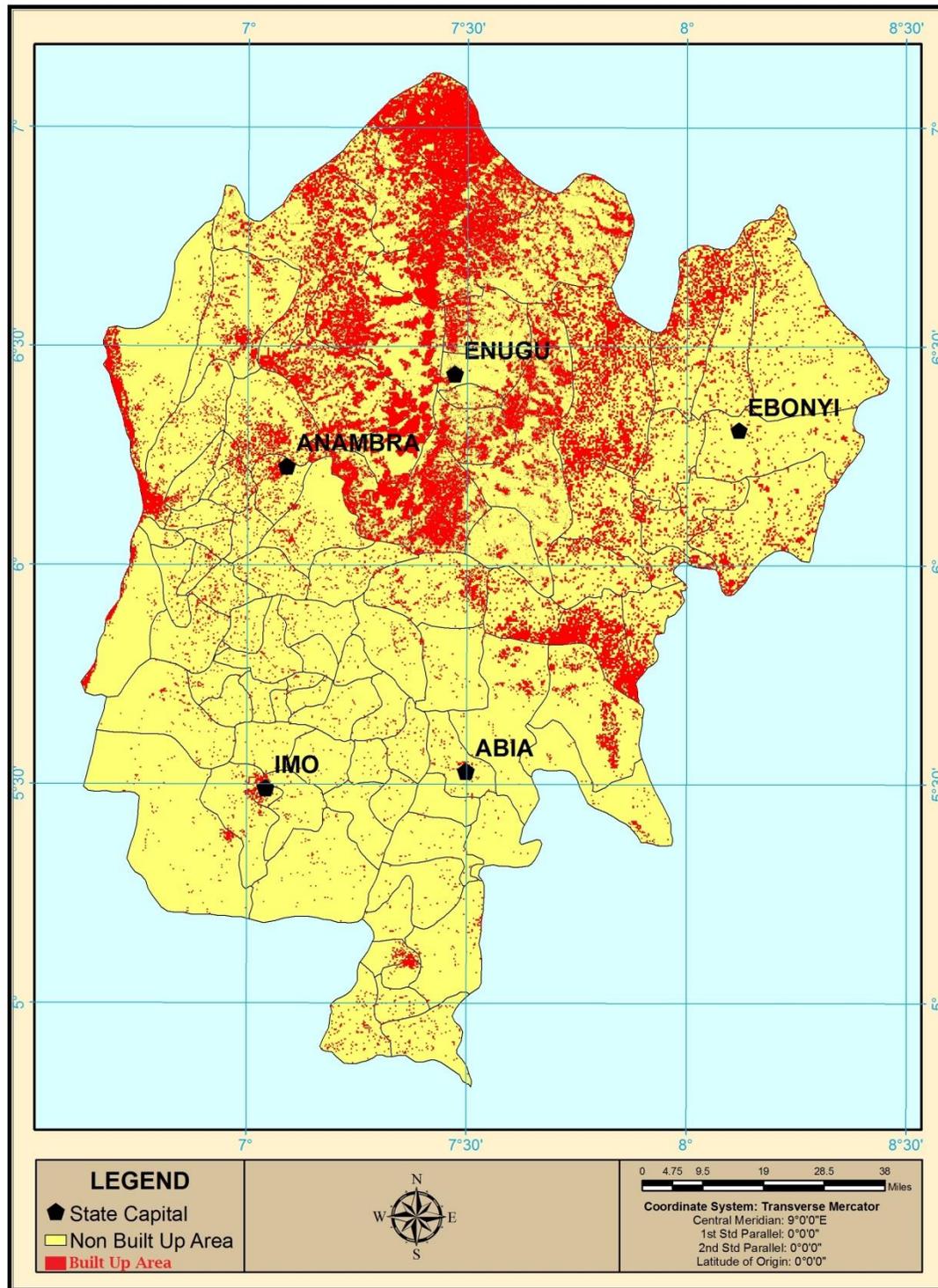
**Source: Researcher's Analysis (2019)**

As fascinating as the urban morphology of built-up areas in south-eastern states of Nigeria in 1986 may seem, the 2006 analysis of land use change in the area showed spatial variation among the various states in the region.

A close analysis however showed that in 2006, built up area for Abia State has extended to other settlements such as Ohafia, covering a total built up area of 285.18 sq. km- a far departure from 223.2Sq.Km in 1986 (Table 1). Intensification of settlements led to urban expansion extending up to Aba-South and Aba-North, Umu-nneochi, Ohafia and Umuahia-North. within this same period ( 2006) a total non-built up area reduced to 4,448.38 Sq.Km as against 4,510.36 Sq.Km in 1986. Generally speaking in 2006, landuse pattern in Abia State took a linear dimension as most built-up development occurred along major roads. The driving force for such growth was the presence of social amenities, job opportunities, and access road network. Leading radial movement of people from the periphery towards the highly dense built up spaces. Anambra State also witnessed urban increase in landuse conversion in 1986. With built up area of 377.78sq.km in 1986, by 2006 the built-up area had increased to 599.15 sq. km with obvious growth noticed at the southern parts of Ogbaru and Ihiala ends of the State. Within this same era, the non-built-up area in Anambra state was 5736.73sq.km in 2006 as against 5799.69 sq.km in 1986

The case of Ebonyi State appears not to be different. There was also a rise in the built-up area from 812.37 Sq.km in 1986 to 1074.50 Sq.km in 2006. The non-built space for Ebonyi in 2006 stood at 5245.91sq.km as against 5508.04sq.km in 1986. Even though there was an outlying and infilling growth around Afikpo-South at the initial stages of 1986, growth in Eboni state appeared to be quite dense. Though most establishments and Government presence was felt in the State Capital, Abakaliki, other locations including Afikpo South, Ohakwu, Ishelu, Ezza North, Afikpo North, Afikpo South and Ivo witnessed spontaneous and infilling growth. The reason for this outcome may not be far from the agrarian and indigenous nature of the Ebonyi people being one of the major producers of rice and other cash crops in Nigeria.

For Enugu, the dense built up in 2006 increased slowly in intensity and coverage around their borders indicative of settlement edge expansion. The dominant land use type in Enugu was outlying growth. Overall, built up area grew from 1866.31 Sq.km in 1986 to 1929.28 sq. km in 2006. Within the same year (2006) Imo state saw a rise in built-up area as significant edge expansion and outlying growth occurred at the borders of major urban areas resulting in annexation of the adjoining rural hinterlands. Urban built-up area for Imo State which was 155.07 Sq.km in 1986 increased to 309.06 Sq. km in 2006. (Figure 3)



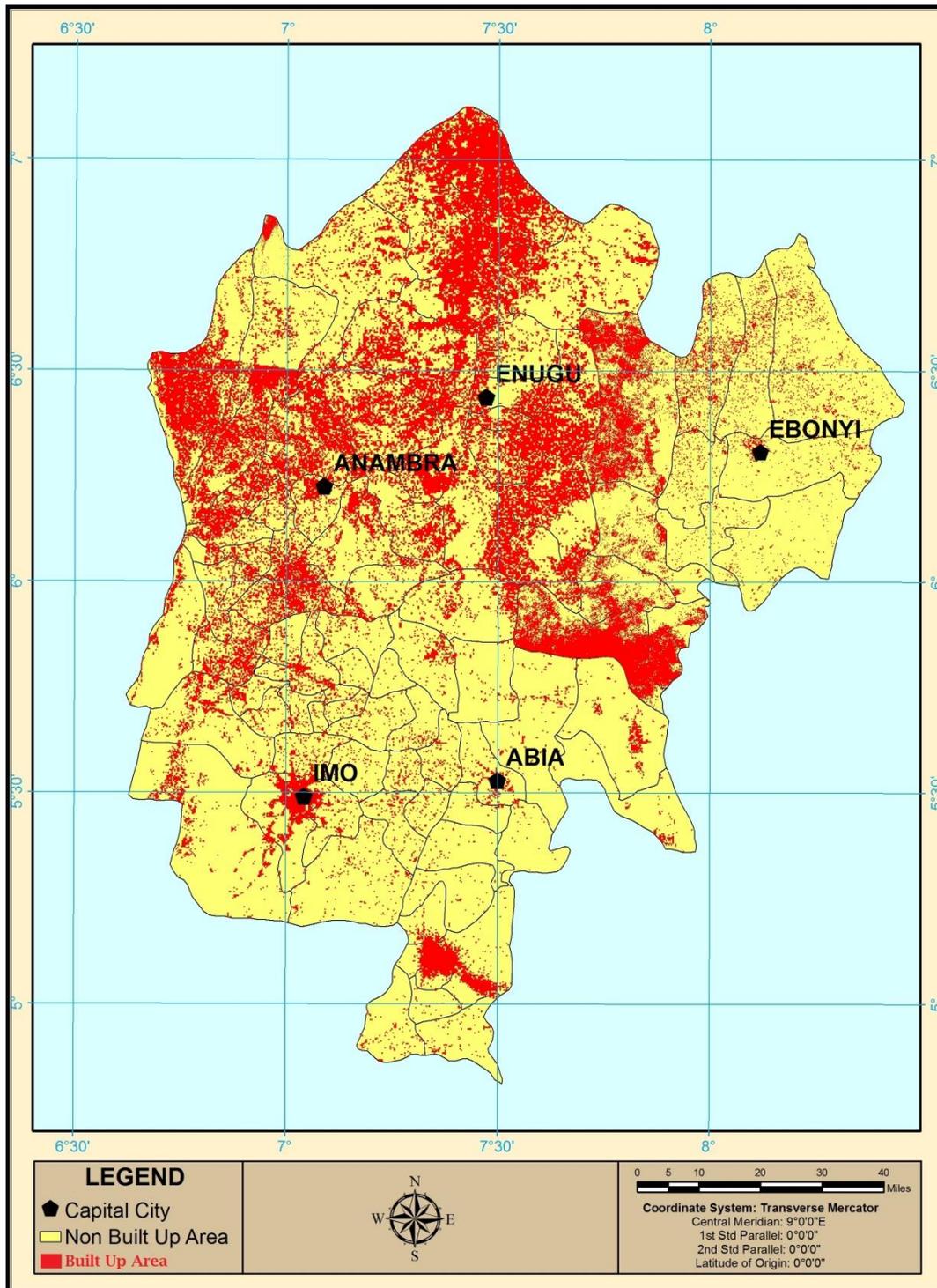
**Figure 3: Land-use Characteristics of States in the South-East, Nigeria (2006)**

**Source: Researcher's Analysis (2019)**

With the passage of time, urban expansion in the various states in the south-east intensified. The result of analysis indicates that in 2018 Anambra state had major infilling and spontaneous and dense urban growth

extending to areas such as Onitsha-North, Idemili-North, Onitsha-South, Idemili-South, Orumba-North, Annocha, Orumba-South, Aguata, Ekwusigo, Nnewi-South and Dunukofia. The total built-up area in Anambra State in 2018 stood at 1795.96.Sq.km as against 599.15 Sq.km in 2006. The corresponding value for non-built-up areas between 2006 and 2018 were 4123.21 Sq.km and 2926.4Sq.km for 2006 and 2018 respectively.

Ebonyi State also witnessed very high land-use dynamics. From a built-up area of 1074.50 Sq.km in 2006, the built-up area rose to 1453.91 sq. km in 2018 leading to loss of cultivatable land of 379.41 Sq.km between 2006 and 2018. Also in 2018 high density built-up and spontaneous development was observed in Enugu state, with built-up area extending to adjoining areas mainly around the North and Western parts of Enugu(Figure 4). Sparse built-up and edge expansion growth was observed at Isi-Uzo, Uzo-Uwani, and parts of Enugu-East. Built up space within this period covered an area of 3353.49 sq. km indicating that Enugu State had the largest built-up space when compared to all the states in South East, Nigeria within the period under review (2018). For Imo state, in 2018, there was also an infilling and spontaneous growth leading to high density built up in Owerri-Municipal, Owerri-North and Owerri-West, Oguta and Orlu-West areas (Figure 4). Further intensification of built-up area in Imo state led to the spread of growth to other adjoining areas such as Mbaitolu and Ikeduru. Urban built-up area for 2018 covered an area of 642.40 sq. km. exhibiting an outlying growth leading to an increasing built up pattern within the Northern part of Imo State.



**Figure 4: Land-use Characteristics of States in South-East, Nigeria (2018)**

Source: Researcher's Analysis (2019)

## 6. Conclusion

This work looked at spatio-temporal analysis of land-use changes of states in the south-eastern Nigeria for the periods 1986, 2006 and 2018. Satellite imageries of the study areas were obtained from the United States Geological Survey (USGS) and National Air Space Research & Development Agency (NASRDA). Physical observation and ground truthing surveys were also carried out with the use of GPS. From the result, it was observed that though states in the south-east have increased in spatial extend, growth pattern however varied between and among the different states in the region.

One of the characteristic features of land-use dynamics in the south-east, Nigeria is the fact that growth took the form of infilling and outlying growth. Although, rapid changes in land use among states in the south-east Nigeria is expected given the changes that have taken place in the socio-political and economic spheres of the states in the region, our concern however hinges on the fact that, spontaneous land-use conversion in the region precipitates a situation where human settlement proceeds in an amorphous and uncoordinated manner with severe implications on livability. As a way of averting the negative consequence of uncoordinated land conversion, there is need for deliberate urban growth management approach through well thought out land use planning. Strict adherence and compliance to existing planning regulatory instruments and standards by the planning authorities coupled with political will on the part of government of the various states is a desideratum to achieving sustainable urban growth in the region.

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# Analyzing policies and plans of the Brazilian sanitation sector

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**Abstract-** Sanitation is a service that needs to be provided in order to promote good health and the well-being of people. Thirteen years after the establishment of the Sanitation Law in Brazil, the sector still experiences several challenges in providing adequate access to sanitation services for the population. According to national standards, only about 55% of the population has access adequate sanitation services. There is a growing need to understand the linkages between the legal framework and the development of the institutional structure, and how the current model of the sanitation sector could be improved. This study describes the legal framework of the Brazilian sanitation sector and discusses the role of the public sector with focus on the potential impacts of increasing the participation of the private sector.

**Index Terms-** Brazil, legal framework, policies, plans, sanitation.

## I. INTRODUCTION

The access to sanitation services is widely recognized as a basic human right. In Brazil, the management of water and sanitation is directly related to the Federal Law n° 11.445/2007 – also known as “Sanitation Law” - which establishes the National Basic Sanitation Policy. Although the term sanitation is usually used to describe “a system designed and used to separate human excreta from human contact at all steps of the sanitation service chain” [20], in Brazil the term “basic sanitation” is defined by the Sanitation Law as a set of services, infrastructure and operational facilities for drinking water supply, sanitary sewage, solid waste and drainage management. Without adequate sanitation - safe disposal of human waste – people can be exposed to infectious diseases such as diarrhea, dysentery, typhoid fever and other intestinal parasites. Discharge of untreated wastewater into water bodies contribute to compromise the water quality of receiving bodies, representing a risk to current and future use of water resources. Currently, unsafe hygiene practices are still widespread and continue to negatively impact the health and well-being of billions of people. An adequate access to sanitation has the potential to improve the life quality of the population, reduce social inequalities and improve environmental protection.

In 2013, the National Basic Sanitation Plan was launched with the aim to achieve universal access to sanitation services by 2033. The proportion of population with access to sanitation services in Brazil, however, is substantially lower than the targets established by the national plan, representing a gap between the planning

process and the real capacity of the sanitation sector. The public sector is the main provider of sanitation services in the country, with 26 State sanitation companies providing services to about 88.9% of the urban population in Brazil. However, there has been an urgent need of a greater participation of the private sector in the provision of such services. A detailed analysis of the institutional development, policies and plans were made in this study.

## II. STUDY AREA

Brazil has an area of over 8 million km<sup>2</sup>, occupying a large part of the territory along the eastern coast of South America. In 2019, the population of Brazil was estimated over 210 million people [9], representing about 2.74% of the worldwide population. The country is characterized by five geographic regions: South, Southeast, Midwest, North and Northeast; consisting of 26 states and a federal district. In 2010, the least urbanized region was the Northeast (72.9%), followed by the North (77.0%). The most urbanized region was the Southeast (90.3%), where the areas of high degree of urbanization are mainly located in the states of São Paulo, Rio de Janeiro and Minas Gerais. The geographic distribution of the Brazilian population varies greatly, where most of the population is located less than 1,000 km from the coastline. According to national standards, about 55% of the population has access adequate sanitation services, 18% have their sewage collected but not treated, and 27% do not have access to any type of sanitation facilities or services [2].



Figure 1. Brazil's location in the South American continent.

### III. POLICIES, PLANS AND REGULATIONS

Overall, it is possible to identify the following agents involved in the sanitation sector: the government (Union, member states, municipalities), private companies and consumers. These agents can perform one or more of the following roles in the sector: planning, ownership, regulation and inspection, operation or financing [7].

(i) Planning: as defined by law (n°11.445/2007), municipal basic sanitation plans (PMSB) must include: analysis and scoping of current problems; short, medium and long-term goals; programs, projects and actions required to achieve the goals; and actions for emergency situations.

(ii) Ownership: responsible for providing the sanitation service, which can be operated directly by public administration or indirectly through a public consortium or a concession, public or private. The owner is also responsible for elaborating the PMSB, providing regulation and inspection, ensuring the quality of the service, and establishing mechanisms of social control.

(iii) Regulation and inspection: the holder of the ownership can regulate the service or delegate this role to other entities.

(iv) Operation: can be (1) provided through direct public administration or through decentralized entities (autarchies, public organizations). In this case, the role of ownership is mixed the role of operation, and therefore, it is not legally necessary to design a regulatory structure. (2) the owner can transfer the operation to a public or private entity through a concession contract. However, the concession will only be legal by previous approval of a PMSB and establishment of a regulatory agency.

(v) Financing: Union, states and municipalities are obliged by law to promote sanitation programs. This role is also open to the participation of private companies, which can act as financial agents.

In 1967 the National Housing Bank (BNH), the Sanitation financial system (SFS) and the State water and wastewater funds (FAEs) were established by the government. In this context, BNH implemented the National Sanitation Plan (Planasa) with the aim to support strategic investment in infrastructure. Officially instituted in 1971, Planasa was a milestone in the development of the sanitation sector, with the main objectives to universalize the access to water and sanitation services and promote the financial sustainability of the sector - by offering financing through state resources [1]. According to Planasa, access to financial resources was conditioned to the establishment of State Sanitation Companies (CESBs). If a state wanted to access financial resources, it would have to create a CESB, which would act as concessionaire of the municipalities. In order to align with this condition, about 75% of the Brazilian municipalities adhered to Planasa [7]. Therefore, Planasa supported the establishment of CESBs and withdrew municipal autonomy. The requirement of a single provider per state consequently allowed the CESBs to implement large scale projects that would most likely not be viable separately, especially due to their costs. Overall, this new organizational structure contributed to significantly increase the proportion of population with access to water and sanitation in the country.

In 1986, the BNH is terminated by a new government, essentially interrupting all the investments in the sanitation sector. The operational inefficiency and high costs of the business model caused the beginning of decline of the CESBs. Moreover, the increase of the demand in locations of difficult access (such as slums) required high investments, which made it difficult for companies to profit. For several years, Planasa was the main initiative of a public sanitation policy in the country. With the termination of the BNH and consequent interruption of the investments in the sector, Planasa became obsolete and the sanitation sector experienced a period of negligence in the government agenda that lasted for about two decades.

Since the 1970s, the CESBs were the main providers of sanitation services in the country. However, in 1995 the Concession Law n°8.987 marked beginning of the participation of the private segment in the sector. In 1988, the establishment of the Federal Constitution defined new laws for the sanitation sector. Nevertheless, there were many gaps in the Constitution, especially regarding the ownership of the sanitation services. Conflicts of interest between public and private agents most likely delayed the approval of laws for the sector. In 2004 the Public-Private Partnership Law n°11.079 was approved. Despite the progress, there was a clear absence of institutional and regulatory framework, which was later addressed by the Sanitation Law and the regulatory Decree n°7.217/2010. Until 2007, the absence of regulatory framework contributed to a series of issues, such as the establishment of official financial mechanisms, which consequently impacted the development of the sector [6].

In 2007, the National Basic Sanitation Law was established, that defined guidelines and a basic regulatory framework for the sector, representing an important advance in the legal structure. Since 2007, the delivery of sanitation services has been shifted to decentralized approaches, where a total of 5,570 municipalities became responsible for developing and implementing its municipal basic sanitation plan (PMSB) and implement specific

guidelines for the sector through Municipal Basic Sanitation Policy [4]. In many cases, however, municipalities are restrained (from fulfilling such role) by lack of financial and technical resources. In 2017, approximately 38.2% of the municipalities claimed to have a basic sanitation policy. Regional inequality is present in this framework, as 63.7% of municipalities in the South claimed to have such policy and only 18.6% of municipalities in the Northeast did [8].

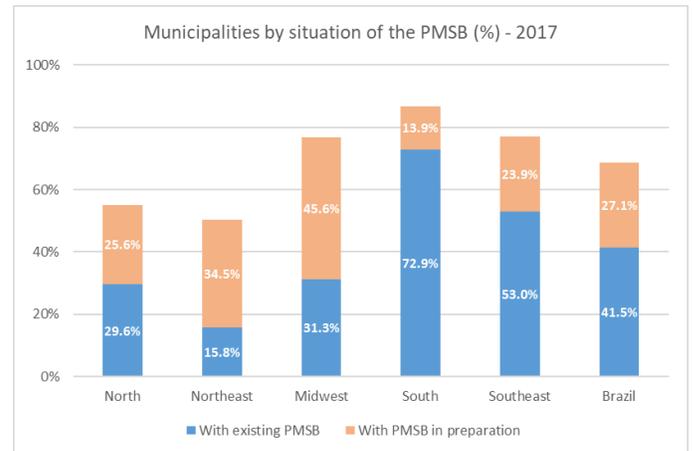


Figure 2. Municipalities by situation of the PMSB in 2017. Source: Adapted from [8].

Although the management of sanitation services is a sole responsibility of the municipalities, as discussed previously, other roles can be delegated to other entities. In this context, there are two main arrangements in terms of sanitation operation in Brazil: municipalities that delegate the provision of sanitation services to an autonomous municipal entity, state company or private concessionaire; or municipalities that remain without an institutionalized service provider. Approximately 2,982 municipalities have delegated the operation of services and 2,588 municipalities still have direct responsibility to provide such services. Although in both arrangements there are cases where the service is not provided to the population, the absence of wastewater collection and treatment is more common in the second arrangement. In the first arrangement, most municipalities have delegated the provision of sanitation services to state companies, which currently cover approximately 88.9% of the urban population. The second arrangement, however, is characteristic of small municipalities. In the east – characterized by high population density – most municipalities have delegated the operation of sanitation services to other entities. In the west, the service holders are usually municipal governments [2].

The Federal Decree n°7.217/2010 also established the existence of regulatory organizations. Regulatory agencies are government organizations with the role of inspection, regulation and control of services of public interest, such as basic sanitation. In 2017, there were 49 agencies regulating the access to sanitation services – 22 at the state level, 23 at the municipal level and 3 of municipal consortia, serving in total 2,906 municipalities. Nevertheless, there is an absence of regulation in several cities and no clarity regarding the quality of existing regulation [6].

The National Plan for Basic Sanitation (Plansab) was launched in 2013 with the purpose to establish guidelines, goals and strategic actions to achieve universal access to sanitation in 20 years. In 2033, the goal was to ensure that 92% of the urban population has access to wastewater collection and treatment [5]. The plan proposed short, medium and long-term goals divided by macro-region and presented a prospect of investments required to meet the goals. Among the set of indicators presented by the plan, the indicator E1 (“Percentage of urban and rural households with access to sewage network or septic tank”) was estimated to be 76% by 2018. However, only about 53% of the population had access

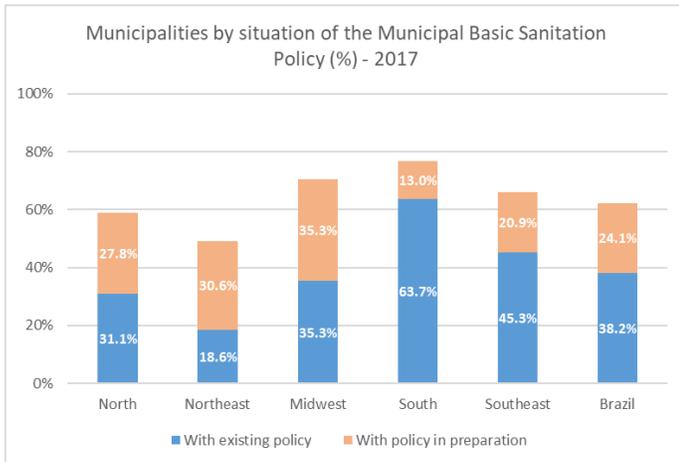


Figure 2. Municipalities by situation of the basic sanitation policy in 2017. Source: Adapted from [8].

Municipal Basic Sanitation Plans (PMSB) are important to analyze and identify problems, set objectives and actions in order to achieve universal access to sanitation. As defined by the Sanitation Law, the PMSB must englobe the four services defined by Brazilian standards as basic sanitation – drinking water supply, sanitary sewage, solid waste and drainage management. Originally, the Federal Decree n°7.217/2010 linked the access of municipalities to financial resources upon the approval of a PMSB until December 2013. Due to the challenges faced by the municipalities in elaborating a PMSB, the deadline established by the decree has been periodically extended to December 2015, December 2017, December 2019 and finally to December 2022 [3]. In 2017, about 41.5% of total municipalities had elaborated a PMSB. As a wide range of municipalities do not meet the required conditions established by the decree, it is as if they are not being reached by current policies. This clearly indicates the incompatibility of the legal framework and institutional structure with the reality of the sector.

to such services in 2018. The goals defined in the Plansab became obsolete, and the failure to achieve such goals likely indicates a gap between planning and the real capacity of the sector to execute idealized activities. Originally, Plansab was based on an optimistic macroeconomic scenario, with large availability of federal resources. It did not predict the need for new financial mechanisms or realistic expenditures for municipal planning.

In 2016, the Investment Partnership Program (PPI) was launched in order to regulate the process of privatizations and concessions in the sector. As sanitation projects required high investments with returns that occur in the long run, financing is essential for the development of the sector and reassurance of the participation of the private sector. Through this program, a greater chance to increase the proportion of population with access to sanitation services might be possible, even in the current scenario of fiscal crisis.

#### IV. CONCLUSIONS

Brazil has a high deficit of access to basic sanitation services. As seen in this study, the public sector commitment to extend the provision of sanitation service in order to achieve universalization is essential. Despite the importance of investments in the sector, the last years have been characterized by low levels of investments in sanitation. In 2007, with the establishment of the Sanitation Law, the provision of services was shifted to decentralized approaches. Once the municipalities became responsible for their own sanitation policies and plans, in many cases there were restraints to fulfill their roles, especially due to the lack of financial and technical resources. In 2017, for example, only about 41.5% of total municipalities had elaborated a Municipal Basic Sanitation Plan. This scenario indicates an incompatibility of the legal framework and institutional structure of the sanitation sector in Brazil.

Approximately 88.9% of the urban population is serviced by State Sanitation Companies. Although CESBs have a dominant role in the sector, they face several challenges and operate under a weak regulatory supervision, which consequently constrains operational efficiency. With contracts that are automatically renewed, there are usually no revisions of the companies targets or tariff structure. Since 1971, CESBs have operated during many different governments, affected by auspicious economic measures and economic crisis. Nevertheless, the proportion of population with access to sanitation services has not substantially changed, indicating the CESBs model is most likely not the ideal institutional structure for this sector. In this context, engaging the private sector resources could potentially be a solution. The apparent increase of commitment to bring private investments into the sector through the PPI is likely a positive step towards improving the provision of sanitation services in Brazil. Attracting such investments to the sector, however, requires a transparent regulatory framework. The high initial investments and long-term capital returns – characteristics of the sanitation sector - are also challenges that need to be discussed in order to increase the participation of the private sector.

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# NodeMCU and Blynk aided Advanced Water Quality Monitoring Set-up

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**Abstract-** The aim of this paper was to come-up with the advanced technique of Water Quality Monitoring. This intended approach helped to replace the former way of manual testing by updating the sensors information over an application's platform. Here, we measured the various chemical parameters of water like pH and total dissolved solids as well as physical parameters of water like turbidity and temperature to monitor the supplied water quality.

The former method included visiting the site, recording the various readings on routine basis, updating the data-sheet manually and then arriving at some conclusion on basis of data recorded by the technician. The data collected and examined through this way took a large amount of time and thus the changing technology demanded a new technique to overcome all such limitations and make this task a user-friendly one. Therefore, our proposed method worked to erase out all such lacunas with help of new emerging technology of machine-user relationship wherein the data updated over any setup could be communicated to a human being at his fingertips.

This technique helped an individual to keep track of minute variations that happened in parameters of supplied water with time. The latest parameter's data was hosted on Blynk application with help of ESP8266 an in-built Wifi-module in NodeMCU. The advanced setup including NodeMCU, Blynk and various meters proved to be the time and effort-saving method which could definitely take place of the traditional way of analyzing the water quality.

**Index Terms-** Blynk Android Application, Efficient Water Quality monitoring, NodeMcu, ESP8266, pH meter, Turbidity sensor, Temperature and TDS (Total Dissolved Solids) meter,

## I. INTRODUCTION

Water is an extremely sacred resource for the existence of mankind on earth. It carries nutrients to all cells in our body & oxygen to our brain. About 71% of earth is covered with water, but only 2.5% of it is drinking water. With increase in pollution, population and climate change, it is expected that by 2025 we will experience eternal water shortages. But in the 21st century, research has proved the fact that people are reaching a point where water will be more expensive as compared to mineral oil. [3]

In today's world, billions of people are still living without safe water. India is facing a water crisis and millions of lives and livelihoods are under threat, this is the worst water crisis our country has ever been through. Currently, 500 million Indians are facing extreme water strain and about two lakh people die every year due to insufficient access to safe water. The crisis is only going to get worse. India ranks 120 amongst 122 countries in the quality of water. 14 crore households are still depleted from this resource. We are having extreme rainfall periods and then enormous dry and drought periods. Till 2021's summer, mostly 21 cities will be facing drought situations. This is a situation a number of larger cities of India will face.

The main purpose of this paper is to reduce wastage of the most valuable resource, termed as "WATER". This is one of the major aims of the **Government of India**, to provide safe drinking water to every household till the year **2024**. [10] The water must not be wasted as till now near about **14 crore households in India** have water shortage. To access clean and potable water to people. To raise our Country's ranking in Water Quality Indexing as well as Safe drinking water availability.

Monitoring water quality in the 21st century is a developing challenge because of the large number of chemicals used in everyday lives that can make their way into waters. Water quality is the measure of the suitability of water for a particular purpose based on specific physical, chemical and biological characteristics. [1] Monitoring provides the required objectives to make sound decisions on managing water quality today and in the future. Real-time water quality monitoring helps us to provide the alert about current, ongoing, and originating problems, taking care of our potable water as per the drinking water standards, and to protect other beneficial uses of water. [13] Assessments based on monitoring data help lawmakers and water managers to analyze water policies, determine if water quality is getting better or worse, and creating new policies to better protect human health and the environment.

Several research works have been conducted in recent times to develop intelligent and efficient systems to identify and monitor water parameters. For real time monitoring of water quality and delivery, setup based on sensors is proposed. The recommended setup focused on the low cost, lightweight implementation. This setup is appropriate for large amount categorizations enabling an approach to water purchaser, water distributors and water supremacists.

Checking the quality of water, can help us answer questions about whether the water is allowable for drinking or not. It also helps the scientists to determine whether the water in a particular system is improving or deteriorating and why. We can use the results of water quality analysis to compare the quality of water from one water body to another in a region, State, or across the whole country. Determining water quality requires the measurement of some specific characteristics which include parameters such as temperature, dissolved mineral contents, pH and turbidity. [7][8] These characteristics are often compared with standards set of values to determine if the water is suitable for a particular use.

In the modern world the problem of the efficient water supply is extremely important because the water resources are widely exploited and water is used in different fields of human activities. Water is an essential need for human survival and therefore there must be mechanism put in place to forcefully test the quality of water that made available for drinking in town and city. In this paper, we present a setup for Water Quality Monitoring System based on Internet Of Things that continuously measures the water parameter i.e. pH, turbidity, temperature and total dissolved solids.[2][5] Four sensors are connected to NodeMCU to measure the water parameters. Extracted data from the sensor is sent to the android application i.e. BLYNK and according to the pre-defined set of standard values, if there is a mismatch in water parameters system will generate an alert message to the remote user. The data updated on the application can be accessed or get back at your fingertips. [4][6]

## II. Methodology

Requirement of frequent site visits, quality technicians for resolving issues related to collected water samples, were a great deal to be dealt with. Our new approach towards water quality monitoring reduced down these required traits to a greater expansion than by the former method.

Our technique provides the detail regarding water parameters straight at the user's fingertips.

The introduced set-up is able to extract the data from water samples by sensors through the NodeMCU and analyze them using the coding. The recommended block diagram of water quality monitoring in Fig 1. consists of 4 different sensors connected with NodeMCU to measure different physical parameters like turbidity & temperature as well as chemical parameters like pH & total dissolved solids. pH sensor is used to measure the amount of alkalinity and acidity in water samples. To measure the turbidity of water turbidity sensor module is used which provides accurate reading between 0-1000 NTU. A TDS meter is used to indicate the total dissolved solids of a sample, i.e. the concentration of dissolved solid particles.

Nine different water samples have been collected from nearby tap, filter, and other sources. The extracted data from these sensors are accessed by the controller NodeMCU and transfer them to the Blynk application.

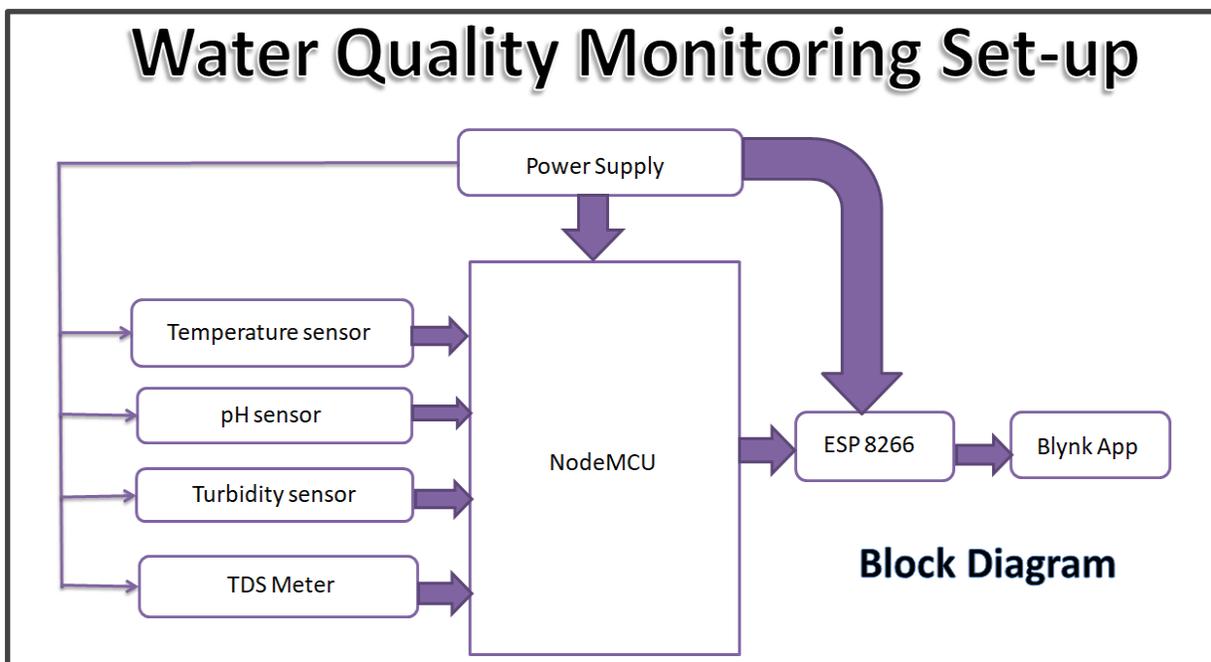


Fig1: Setup for water quality monitoring

### 1.pH:

The pH value is a good index of whether water is hard or soft. The pH of pure water is 7. In general, water with a pH lower than 7 is considered as an acidic solution, and with a pH greater than 7 is considered as an alkaline solution. The range for pH in surface water systems lies between 6.5-8.5, and the pH range for groundwater systems is between 6 and 8.5. The ideal pH level of drinking water should be 6 to 8.5, the human body maintains pH balanced on a constant basis and will not be affected by water consumption. For example, our stomachs have a naturally low pH level of 2 which is an advantageous acidity that helps us with food digestion.

### 2.Turbidity:

Turbidity is a measure of the degree to which the water loses its clarity due to the presence of suspended particulates. The more total suspended solids in the water, the dull it seems and the higher the turbidity. Turbidity is considered as one of the best parameter to measure water quality. The WHO (World Health Organization), found that the turbidity of drinking water should not be more than 5 NTU, and should ideally be below 1 NTU.

### 3.Temperature:

It is important to measure the temperature of water. By doing so, we can see the attributes of the water such as the chemical, biological and physical. Water temperature is an important factor in determining whether a body of water is acceptable for human consumption and use. Temperature is a critical water quality and environmental characteristic because it governs the kinds and regulates the maximum dissolved oxygen concentration of the water. At the same time it also influences the rate of chemical and biological reactions.

### 4.TDS(Total Dissolved Solids)

Water is a good solvent which dissolves every type of impurities in itself easily. Dissolved solids denote any minerals, salts, metals, cations or anions dissolved in water. Total dissolved solids (TDS) consist of inorganic salts and some small amounts of organic matter that are dissolved in water. The total dissolved solids concentration is the sum of the cations which is positively charged and anions which is negatively charged ions in the water. Hence the total dissolved solids test provides a qualitative measure of the amount of dissolved ions.

### 5. NODEMCU

NodeMCU is an open source firmware that plays an important role in designing IoT product. NodeMCU is a device for which open source prototyping board designs are available. It comprise of firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware, which is based on the ESP-12 module. It is an Interactive, Programmable, Low cost, Simple, Smart, WI-FI enabled device.

#### A. Use of Simulation software-Blynk

Blynk made complex IoT technology simple. It can actuate hardware remotely, it can display sensor data, it can store data, visualize it and it could be explored more according to the application.

#### There are three major components in the platform:

- **Blynk App** - It enables the user to create amazing interfaces for their projects using various widgets provided by them.
- **Blynk Server** - It is responsible for handshaking between the smartphone and hardware. Users can use Blynk Cloud or run private Blynk server locally. It's open-source and could handle multiple devices and can even be launched on development boards like Raspberry Pi and Arduino.
- **Blynk Libraries** –It is used over the hardware platforms that enables communication with the server and process all the incoming and outgoing commands.

#### ● Create a Blynk Account

After downloading the Blynk App, a user has to create a New Blynk account. This account is different from the accounts used for the Blynk Forums, he has already created. The recommendation provided by the Blynk forum is to use real email address for simplification.

#### a) Create a New Project

After a user successfully logged into their account, they can start by creating a new project.

### **b) Choosing Hardware**

Select the hardware model which is required by the user.

### **c) Auth Token**

Auth Token is a unique identifier which is needed to connect the hardware to a smartphone. Every new project created by the user will have its own Auth Token. The user receives the Auth Token automatically on their email after project creation. A user can also copy it manually. Click on the devices section and select the required device.

### **d) Add a Widget**

In the very first step up project canvas is empty. User has to tap anywhere on the canvas to open the widget box. All the required widgets are located here. Pick a required button.

**Drag-n-Drop** - Locate the Widget by tapping and holding it from the menu.

**Widget Settings** - Newer widgets can be explored with their respective settings. Users have to tap on the widget to get to them.

The pin is the most important parameter to set in. The list of pins reflects physical pins defined by hardware.

### **e) Add an Eventor**

Eventor widget allows users to create simple behavior rules or events. With Eventor users don't need to write the code. The only need is to send the value from the sensor to the server. Eventor comes handy when users need to change conditions on the fly without re-uploading new sketches on the hardware. Users can create as many events as they need. Eventor could be triggered from the applicant side. Users just need to assign the widget to the same pin as their Event within Eventor. Eventor doesn't constantly send events.

### **f) Run The Project**

When users are done with the Settings they have to press the PLAY button. This will switch user from EDIT mode to PLAY mode where they can interact with the hardware. While in PLAY mode, users won't be able to drag or set up new widgets. So for this user has to press STOP and get back to EDIT mode. [11][12]

All these steps are illustrated in the following flow-chart:

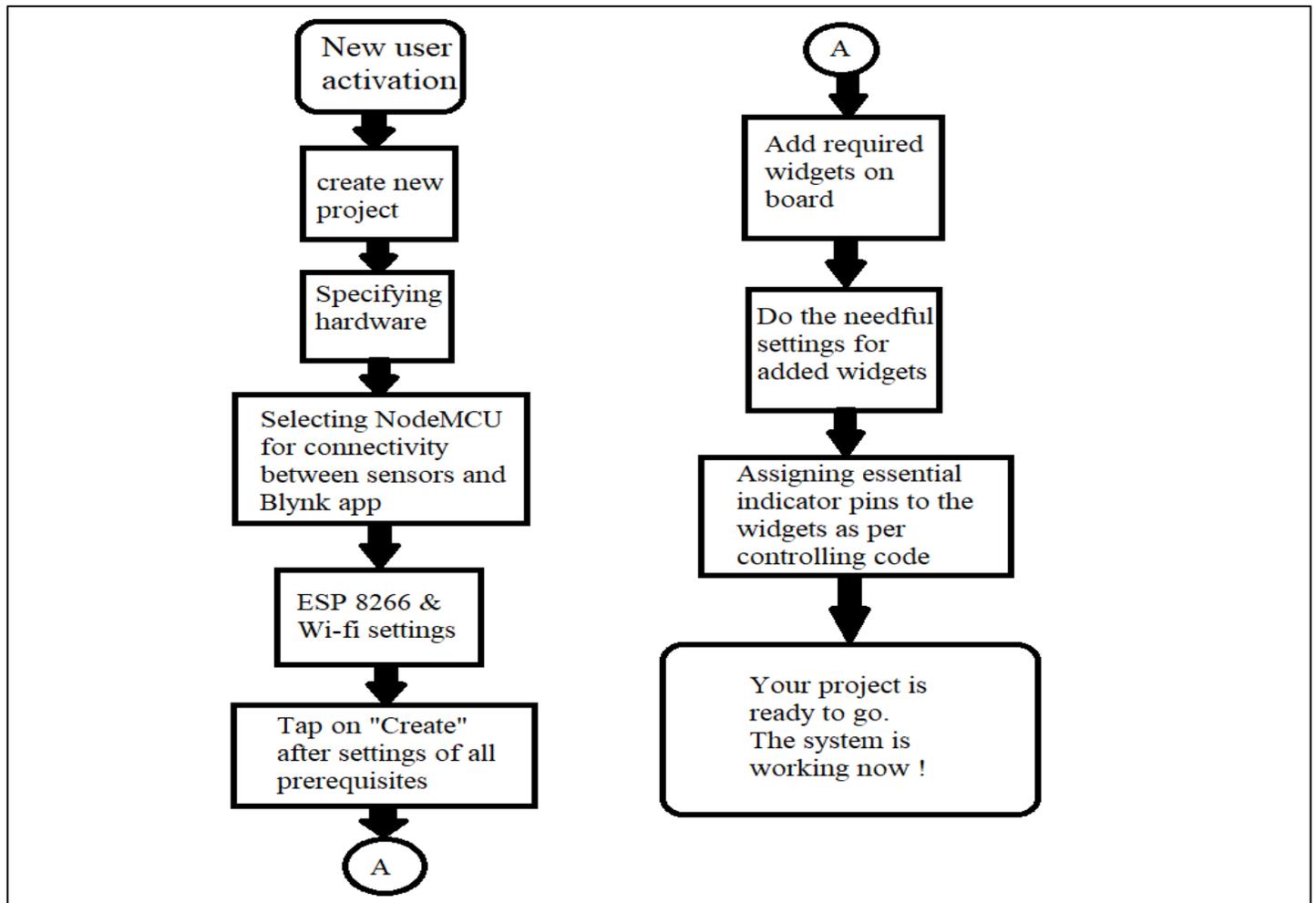


Fig 2: Flow diagram for Blynk Project creation

### III. Results/Discussions/Findings:

Water samples from different water sources were tested to build a reference on the parameters for each type of sample. The chosen sample of water belongs to tap water, surface water, pool water, etc.

The nine water samples were tested all together at indoor ambient temperature. Readings were taken simultaneously. For security reasons the systems were not installed in the specific areas of interest, instead water samples were collected and tested in a safe controlled environment. As we tested nine different water Samples, according to that we got some results.

This very first figure (fig 4.), gives us the update about current pH count and Turbidity level.

The second figure (fig 5.) is of an alert message on user's android application wherein as soon as the water goes below 5.5, this message gets displayed.

This third figure (fig 6.) shows us the warning message regarding turbidity level. As per the permissible standards, whenever turbidity crosses 7 NTU it generates this pop-up on user's application

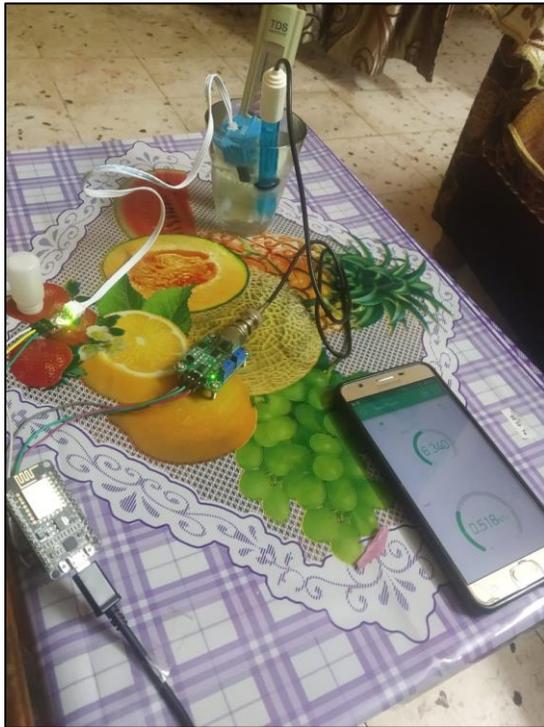


Figure 3: Original setup of our project

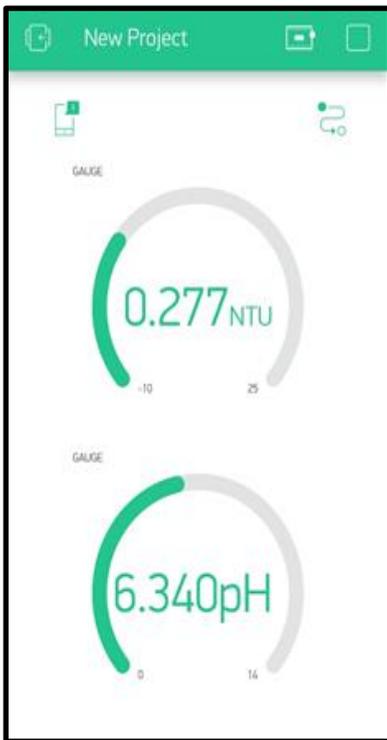


Figure 4: The update about current pH count and Turbidity level.



Figure 5: An alert message on user's android application wherein as soon as the water goes below 5.5, this message gets displayed.

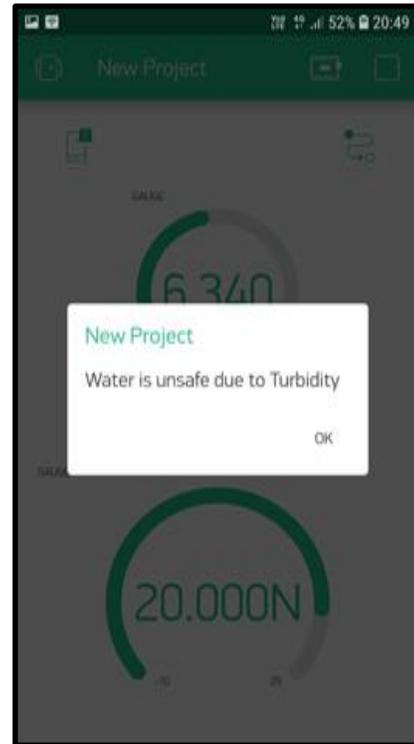


Figure 6: The warning message regarding turbidity level. As per the permissible standards, whenever turbidity crosses 7 NTU it generates this pop-up on user's application.

**TABLE 2. SUMMARIZED RESULTS**

<b>Sr no</b>	<b>Water samples</b>	<b>pH</b>	<b>Turbidity (in NTU)</b>	<b>TDS(in ppm)</b>	<b>Water Temperature(in Celsius)</b>
1	Drinking water	7.819(6.5-8.5)	0.459	141	22.8
2	Surface water	7.665(6.5-8.5)	0.751	489	22.0
3	Ganga jal	6.925	0.148	232	22.9
4	Rain Water	6.211	17.7	15	24.3
5	Boiled water	7.726	0.277	59	21.9
6	Washing water	4.398	0.749	234	22.9
7	Pool water	7.5	0.55	1700	24
8	Bathing Soap water	7.172	4	226	22.9
9	Hair Shampoo water	6.978	6	228	22.8

#### IV. CONCLUSION

The main purpose of this work is to observe the quality of water samples by designing an intelligent water quality monitoring setup implemented in IoT platform that can detect water's physical and chemical parameters. The interfacing is done between the system and the sensor network on a single chip solution wirelessly. For the monitoring process, the system is achieved with reliability and feasibility by verifying the four parameters of water. The time interval of monitoring might be changed depending upon the necessity of water resources. The time is reduced, and the cost is low in this environmental management.

The water samples were collected from nearby areas in Nagpur city, during the winters. A general study over these parameters was done once we compared our sensor values with the standard values defined by WHO for Indian outskirts. Further advancements could be done in areas of using the history of these hosted values to form a chart in order to apply data science algorithms to deal with the varying trends in near future as per the previous records. The various parametric measurements were being verified with the standard parametric values stated by WHO, as follows:

**Table.1-Drinking Water parameter Standards by WHO [9]**

Sr. No.	Parameters	Units	Desirable-Maximum limit
1.	pH	-	6.5 - 8.5
2.	Turbidity	NTU	5 - 10
3.	Total Dissolved Solids (TDS)	mg/L	500 - 2000

\*

#### V.ACKNOWLEDGMENT

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# Critical Narrative Analysis in Linguistics: Analysing a Homodiegetic Rape Narrative

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**Abstract:** Why separate the micro world from the macro world when the micro world is a derivative of the macro world? This paper explored the framework of Critical Narrative analysis, acronym CNA and therefore presented and applied a model for said framework in linguistics in the analysis of an extract from a select homodiegetic rape narrative. This study therefore presented a model developed from Fairclough's 3-dimensional model for critical discourse analysis. Utilizing the proposed model, and different theoretical paradigms to analyze the extract, it was established that the model is functional and can be employed for a more in-depth and exhaustive deconstruction of a narrative. Having conducted the analysis using the mixed method research design, the mode of the features of spoken discourse are the fillers with a frequency of 4 and the qualitative analysis shows how language has helped to attract attention to the issue of patriarchy, rape and subjugation which is inherent in our culture and language habits. It also shows how language has given structure to the narrative by creating timelines, imageries, and order to the events and how the narrator used units of language to achieve unity in her narrative.

**Keywords:** Critical Narrative Analysis, Language, Homodiegetic, Narratives, Rape, Ideology, and Culture

## Introduction

Language is a universal, vital and dynamic phenomenon of human existence. It is a tool to observe problems and give real life solutions. Language helps one to report and understand what is happening in the society. It determines how a person views the world; an individual interprets different actions and events based on the language features or personalities of that individual's speech community, which constitutes their linguistic foundations. Sapir (1929) posits that the structure of a language affects a speaker's world and determines a native speaker's perception and categorization of experience. Thus, this elucidates the notion that language is indeed germane to human reality and subjective to societal volatility. Therefore, several scholars (Bloch & Trager, 1942; Okata, 2016; & Osisanwo, 2003) have attempted to define language however, the working definition for this article is the definition given by Robins (1968, 1976) that language is a symbol system based on pure or arbitrary conventions that are infinitely extendable and modifiable, according to the changing needs and conditions of the speaker because it emphasizes on change; change in meaning, situation, purpose, and different uses of communication.

Human beings do not live in an objective world, they live in a world that is subjected to language and the habits it exhibits (Sapir, 1929); thus, humans are subjected and at the mercy of the particular language which has become the medium of expression in our society. Therefore, one of the ways by which language is used to express oneself is through a narrative. Foucault (1966, 1970) posits that the world is structured by discourse. A narrative is a type of discourse usually termed narrative discourse. Therefore, a narrative discourse is a discourse that is a tale of occurrences, often in the past, that uses speech that belong to the verbal grammatical category, motion, and action to portray a series of experiences that are controlled by one another, and customarily center on one or more performers of actions (Manfred, 2017). According to Gerard and Lewin, (1988), there are two types of narratives which include a homodiegetic narrative (a first-person narrative) and a heterodiegetic narrative (a third person narrative). These two types of narratives have at least three textual elements which are: content matter, subjective expressions or expressivity markers and pragmatic signals. Pragmatic signals refer to expressions that indicate that the narrator is aware of an audience and the level of their orientation as regards the available audience.

The term Narrative analysis was first explored by Jerome Brunner (1990) as a way of discerning people's acumen of their lives. It is a scrutiny of how people decode the reality of their world through their life stories. On the other hand, the framework of this study Critical Discourse Analysis is an annex of critical social dissection, which lays emphasis on discourse and on relations between discourse and other social facets (Fairclough, 2012). It brings the critical custom in social deconstruction into language studies and

focuses on the relationship between discourse and social elements; power relations, ideologies, sexuality, social identities, and other forms of social inequality (Dijk, 1995). Scholars working in the tradition of critical discourse analysis posit that social or non-linguistic practice and linguistic practice complement another and center on scrutinizing how societal power relations are inaugurated and augmented through the manner of language use by interlocutors (Van Dijk, 1996).

Therefore, if Critical discourse analysis explores the accord between discourse and social conventions and Narrative analysis deconstructs how people interpret the reality of their world through their life stories, therefore, an interplay between both frameworks is plausible (Souto-Manning, 2014) yielding Critical Narrative Analysis (CNA). It is a framework that explores the relationship that exists between the Micro and Macro world. The framework of narrative analysis explores narratives to elicit themes, the narratives' referential and evaluative functions, ideology of the narrator because ideology is related to social relations of power, the social reality of the narrator, and ultimately the experiences of the narrator. Furthermore, employing the framework of critical discourse analysis in addition to the narrative analysis, it goes beyond eliciting the aforementioned concepts and further explores the social relations in institutional practices from the macro world that are represented linguistically in the narratives (micro). The framework of critical narrative analysis may be employed in exploring various fundamental linguistic practices in the society and the narratives by exploring the relationship that exists between the social relations in institutional practices that are represented linguistically in the narratives and the contemporary society.

However, the combination of the frameworks of critical discourse analysis and narrative analysis has been frequently used in other academic fields particularly psychology (Gemma, et al., 2016) but scarcely in the field of linguistics. The aim of adopting Critical narrative analysis is that critical discourse analysis is a fundamental problem-oriented, interdisciplinary approach which is absorbed in scrutinizing social phenomena which are naturally complex and therefore depend upon a multidisciplinary and multi-methodical approach (wodak & meyer, 2008), and Narrative analysis aims at understanding people's life stories which are dependent on these naturally complex and social phenomena.

Fairclough (1989, 1995) posited a model for CDA which consists of three inter-related processes of analysis tied to three inter-related dimensions of discourse.

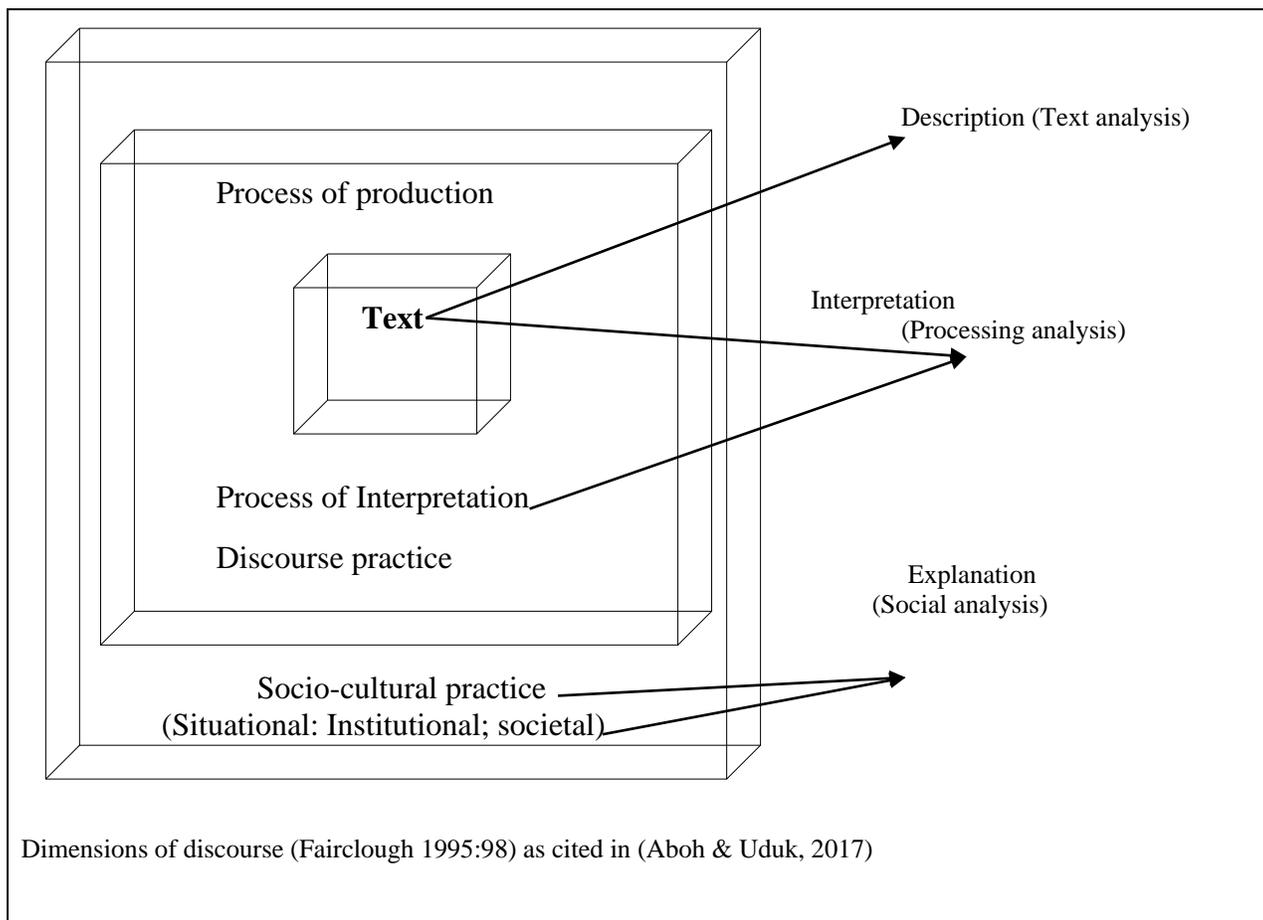
- 1) The object of analysis (including verbal, visual or verbal and visual texts).
- 2) The processes by means of which the object is produced and received (writing/ speaking/designing and reading/listening/viewing) by human subjects.
- 3) The socio-historical conditions which govern these processes.

According to Fairclough each of these dimensions requires a different kind of analysis

- 1) Text analysis (description): This involves an analysis of the formal properties of the texts using linguistic tools.
- 2) Processing analysis (interpretation): This refers to the various discursive processes and its relationship with the text, the process through which the text is produced that can enable its interpretation.
- 3) Social analysis (explanation): This entails the explanation of a text within the context of a socio-cultural reality, or the wider context of society.

(Norman, 1995) As cited in (Romanus & Uduk, 2017).

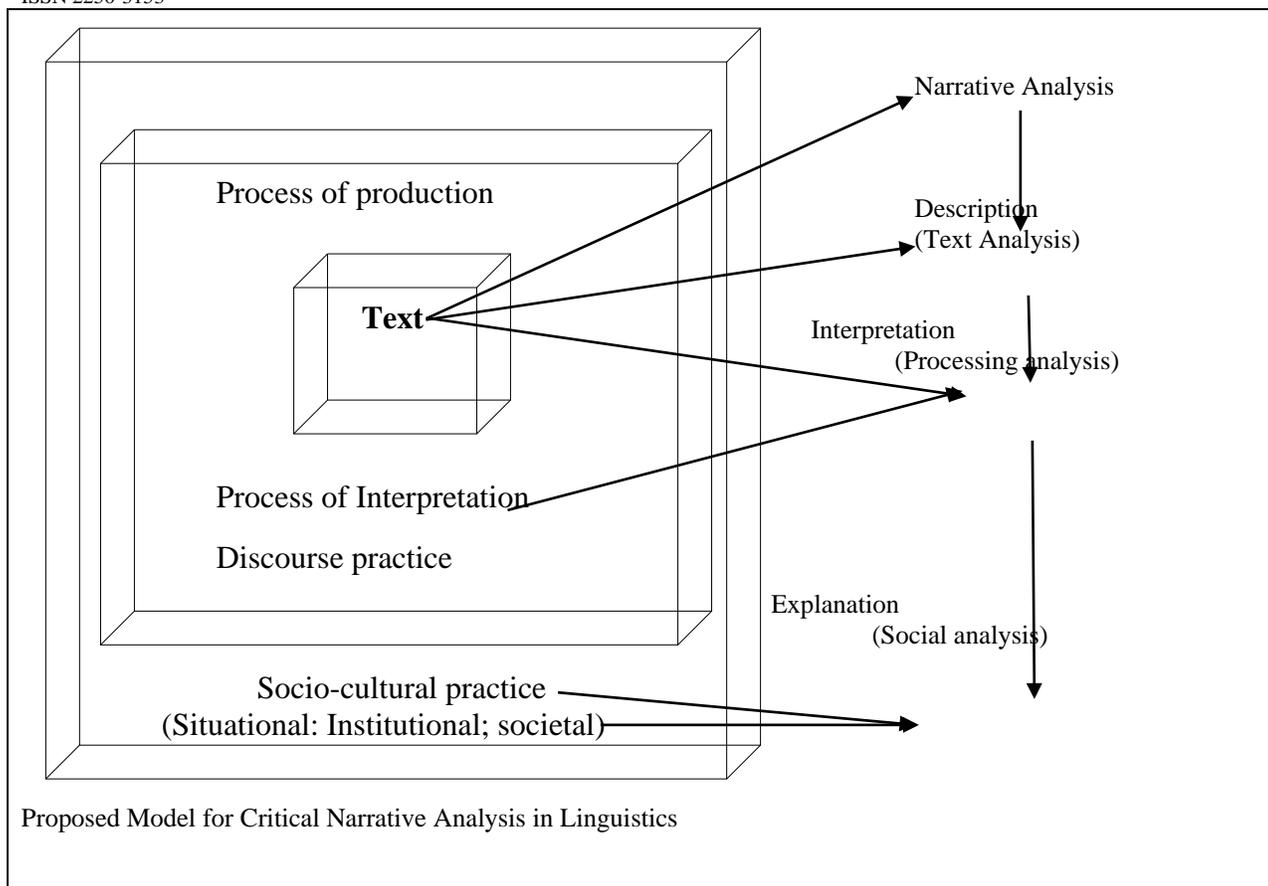
DIAGRAM 1



However, this article aims to propose a model for CNA in linguistics developed from the above model for CDA where the analysis will be carried out in two stages:

- 1) Narrative Analysis: This involves shaping chaotic events into a coherent narrative.
- 2) The three-dimensional model by Fairclough for the socio-cultural approach to CDA which involves:
  - i. Text analysis (description): analysis of the formal properties of the texts using linguistic tools
  - ii. Processing analysis (interpretation): various discursive processes and its relationship with the text, the process through which the text is produced that can enable its interpretation.
  - iii. Social analysis (explanation): explanation of a text within the wider context of society.

DIAGRAM 2



## Application

This model was applied in the analysis of the purposively selected data which is an extract from the rape narrative given in an interview by the Anonymous Ex COZA staff to Chude Jidonwo and uploaded to YouTube on Yaw Naija TV channel in June 2019 and the analysis was divided in to two stages namely:

- 1) Narrative Analysis using the Labovian technique for thematic progression in a narrative and
- 2) The three-dimensional model by Fairclough for the socio-cultural approach to CDA which involved
  - i. Text analysis: A bar chart indicating the linguistic feature of spoken discourse with the highest frequency of occurrence in the excerpt and highlighting the cohesive devices and their use.
  - ii. Processing analysis: Linguistic and Situational context using Dell Hymes SPEAKING acronym to provide an in-depth interpretation of the discursive processes and its relationship with the text. Exploring the process through which the text is produced and how it helps interpret the text.
  - iii. Social analysis: Socio-Cultural Context where Edward Sapir and Benjamin Whorf's theory of cultural relativism otherwise known as Sapir-Whorfian hypothesis will be used as a framework to explore the social context and explain how the theme of the text is possible because of societal norms and archetypes.

## Analysis and Results

### Extract

X: "so that day he had asked me to meet him at the house it was a Thursday he had asked me to meet him at the house on Thursday morning and erm I went there it was supposed to be the usual you know, go there, take instructions oh! To either do this for church or go do that for us (Biodun and his family) personally, and then go do whatever needed to be done erm, I like to say that at this time, I considered him to not just be a mentor, but he was someone who I regarded as a father figure of sort, I mean yea, so, the trust was basically... he started trying to pull me into a hug and then of course the trying to kiss me which I found shocking it was I don't know, maybe one of the most shocking things I was about to experience because I have known this man for such a long time I had known him not just as a mentor but as this spiritual leader I have heard him preach, I have heard him talk about you know God and there I was about to witness what would seem like the complete opposite that like thought,

*that this person stood for... I didn't go there to have sex with him, I didn't ask to have sex with him, I told him to stop on countless occasions ...there was no consent, I didn't give my consent".*

### 1. Narrative Analysis

**Abstract:** The extract tells the story of how the narrator was raped by her Pastor boss who was her mentor on a Thursday morning in his house.

**Orientation:**

Antagonist:Pastor Biodun, a mentor, boss, pastor and Father figure to the victim as at the time of the event.

Protagonist/ Victim: A young woman who at the time of the event was an employee in the antagonist's Church

Location:Not specified, but in the Pastor's house

Period (when): on a Thursday morning, specific date, and time not specified

Other people mentioned: The Antagonist's family.

**Complication:** the narrator went to the antagonist's house for a meeting which was not an unusual occurrence. However, the most unusual thing happened was when He raped her.

**Evaluation:** She was shocked and surprised because she could not reconcile the image of the man who was about to rape her to the image of her boss who was a pastor, her mentor, and her spiritual leader.

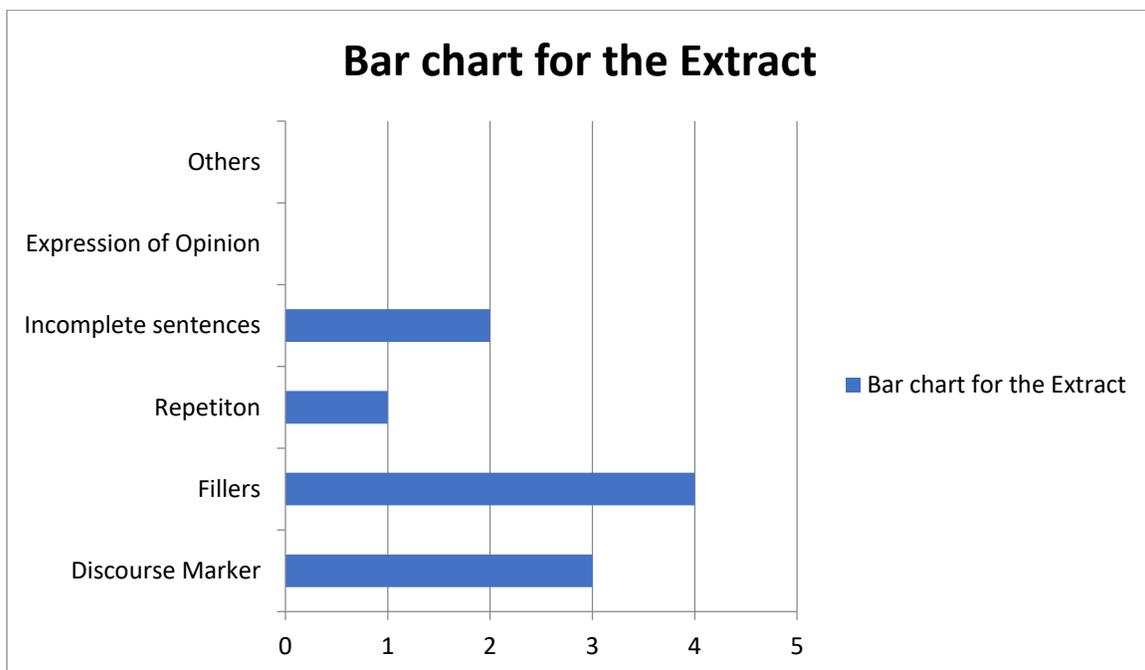
**Consequence:**the event made her see the antagonist as the complete opposite of what the pastor, she, and their religion, stood for.

**Coda:** The narrative is a Homodiegetic narrative; therefore, it was told in the first person point of view, it is a narrative therefore the narrator made use of past tense in the course of the narration. And several cohesive devices were employed to unify the utterances and embellish it in a state of continuity. The themes discovered are the themes of Rape, and Religion

### 2. Critical Discourse Analysis

**Description:** Text analysis; A bar chart indicating the linguistic feature of spoken discourse with the highest frequency of occurrence in the excerpt and highlighting the cohesive devices and their use.

Spoken discourse is accompanied with varying features. Features like facial expressions, body language, non-phonetic sounds, cohesive devices, and so on. However, this article focused on the features posited by Romanus and Uduk, (2017).



The most used linguistic feature are the 'Fillers' with a frequency of 4 they are used as pragmatic signals when the narrator is trying to remember something, strengthen a point, to dramatize a situation and to fill in pauses, also,

Discourse markers were used to draw the hearer's attention to some statements to elicit understanding or lay emphasis. They were also used as pragmatic signals that indicate that the narrator is aware of an audience and the level of their orientation as regards the available audience,

Repetition was employed as a linguistic feature and a cohesive device by the narrator to lay emphasis, and enhance clarity and

Incomplete sentences also indicate that the narrator was trying to string different thoughts and present them at the same time

Text analysis

The narrator used cohesive devices to achieve unity in her narrative the different cohesive devices used are:

1. so (Continuative) that day he (cataphoric reference to Biodun) had asked me to meet him at the house it was a Thursday
2. he (cataphoric reference to Biodun) had asked me to meet him at the house (Repetition) on Thursday morning
3. And (Coordinate conjunction) erm I went there it was supposed to be the usual you know, go there, take instructions oh! To either do this for church or go do that for us (Biodun and his family) personally,
4. and (Coordinate conjunction) then go do whatever needed to be done erm, I like to say that at this time, I considered him to not just be a mentor,
5. but (Coordinate conjunction) he (Anaphoric reference to Biodun) was someone who I regarded as a father figure of sort,
6. I mean yea, so (Continuative), the trust was basically... he (Anaphoric reference to Biodun) started trying to pull me into a hug and (Coordinate conjunction) then of course the trying to kiss me which I found shocking it was I don't know, maybe one of the most shocking things I was about to experience
7. because (subordinate conjunction) I have known this man for such a long time I had known him not just as a mentor but (Coordinate conjunction) as this spiritual leader I have heard him preach,
8. I have heard him talk about you know God and (Coordinate conjunction) there I was about to witness what would seem like the complete opposite that like thought, that this person stood for...
9. I didn't go there (Nominal substitution to 'his house') to have sex with him, I didn't ask to have sex with him, I told him to stop on countless occasions ...there was no consent, I didn't give my consent".

**Interpretation:** processing analysis; exploring the process through which the text is produced and how it helps interpret the text utilizing Hymes' SPEAKING acronym

S – The setting and context of the speech event where the narrative was given is in Nigeria in an interview this indicates the referential function of the narrative which according to Labov, 1972 orients and grounds a story to its context of occurrence by recounting the events in the order in which they occurred originally.

P – The participants Pastor Biodun (The Antagonist) and the Narrator (the protagonist).

E – To disseminate the narrative to the general public; this was the outcome. Which suggests that the narrative also perform the evaluative function which according to Labov (1972), indicates the narrator's reason for recounting the events and telling the narrative

A – This extract falls within the Representative act; it is a Recount of a real life experience.

K – The key of this speech event is a sad and solemn one because of 'Rape' is the subject matter and the Rapist is a pastor.

I – The narrative is an oral Narrative delivered through speaking which explains the repetitions, use of fillers, and discourse markers because they are all features of spoken discourse.

N – The narrator made use of past tense which is a norm for narrative discourse because it tells a past event. And the solemn and sad tone of the narrative is an expected norm when talking about 'Rape'

G – The genre of the above extract is a Spoken Narrative Discourse. This explains the use of cohesive devices to keep the narrative in a continuous state.

**Explanation:** Social analysis; Socio-cultural context where Edward Sapir and Benjamin Whorf's theory of cultural relativism otherwise known as Sapir-Whorfian hypothesis will be used as a framework to explore the social context and explain how the theme of the text is possible because of societal norms and archetypes.

1. The victim's social reality is that she belongs to a patriarchal society where men often view women as objects of pleasure. Most rape cases are often gendered in nature, and she was raped by her boss who is a Pastor, mentor and father figure to her.
2. The word 'pastor', the semantic and cultural import of the title suggests 'safety'.

3. Also, the victim's Ideology is conditioned by her sense of religion therefore, to her, the pastor was 'Holy', 'Righteous' and would do her no harm. However, the opposite was the case.
4. Nigeria is to a large extent unconsciously built up on the language habits of the group of people that live in Nigeria. The language habits that will be explored are;
  - i. Use of Kinship terms: the narrator accorded a kinship term to the pastor. The kinship term 'Father'; "*I like to say that at this time, I considered him to not just be a mentor, but he was someone who I regarded as a father figure of sort, I mean yea, so, the trust was basically, he didn't seem like any red flags to me*" which is the greatest and deepest familial bond one can have. Therefore, assigning this term to the pastor means that she also accorded him the respect, and the level of comfort, safety, and dependence one has with one's father. This is why she was comfortable and did not expect to be raped by him.
  - ii. Use of Titles: Nigeria is a society in which her people love the use of titles. It either depicts respect, or professionalism. In the narrative, the title at play is the title of 'Pastor'. This title in the Nigerian society also denotes safety, holy, Righteous, and good because of the country's highly moralistic nature and the victim's sense of religion; "*which I found shocking it was I don't know, maybe one of the most shocking things I was about to experience because I have known this man for such a long time I had known him not just as a mentor but as this spiritual leader I have heard him preach, I have heard him talk about you know God and there I was about to witness what would seem like the complete opposite that like thought, that this person stood for*".

## Conclusion

Having employed the proposed model and different theoretical paradigms to analyze the above extract, it has been established that the model is functional and can be utilized for a more in-depth and exhaustive deconstruction of a narrative. This analysis has shown how multidimensional and multidisciplinary the framework of Critical Narrative Analysis is therefore, it can be utilized in any academic field Linguistics included. This article therefore portrays how language has helped to attract attention to the issue of patriarchy, rape and subjugation which is inherent in our culture and language habits. It also shows how language has given structure to the narrative by creating timelines, imageries, and order to the events and how the narrator used units of language to achieve unity in her narrative. Language really helps one to understand oneself and others in the society and hear about people's experiences while in turn influencing those experiences.

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# Effect of adhesive performance of liquid urea formaldehyde (UF) resin when used by mixing with solid UF resin for manufacturing of wood based panels

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**Abstract-** The purpose of this paper is to investigate the effect of solid powder urea formaldehyde resin on the quality of the plywood when manufactured by mixing with liquid urea formaldehyde resin. The finding obtained would benefit the manufacture of urea formaldehyde adhesive bonded composite panels. The study is focused on new solution for production of high quality wood based panels by using technique of mixing of powder resin with liquid urea-formaldehyde resin to make better adhesive system. In order to improve the adhesive and bonding properties solid powder urea formaldehyde resin was mixed with liquid Urea formaldehyde resin, 12mm plywood was manufactured and bond quality was studied as per IS:848:2006. Conventional hardener – so called latent catalyst namely ammonium chloride was used to react with existing free formaldehyde of the resin forming a strong acid that promotes resin cure. From the study, data shows that glue shear strength for both dry state, weight state and in mycological state, tensile strength and static bending strength values shows satisfactory results. There is a significant change in results of MoR and MoE of plywood samples manufactured by using powder resin mixed with liquid resin. It was also found that after using 10% concentration of solid UF resin, the pre press tackiness was improved drastically which helps to improve the quality of plywood. The study developed a new solution or technique that can give a solution to manufacture plywood by using pre press technique and manufacture of wood based composites having more mechanical and bonding strength by using urea formaldehyde resin.

**Index Terms-** Bonding, glue shear strength, MoR and MoE of plywood, pressing, resins, rheological properties, wood composite materials.

## I. INTRODUCTION

Urea-formaldehyde (UF) resins are one of the most widely used wood adhesives with wide applications in the manufacture of wood-based composite panels such as plywood, particleboard, and medium-density fiberboard. Some of the advantages of UF resins over other adhesives are: easy handling, low cost, and good performance in panel products. UF resins also have high reactivity and hence by the shorter hot press time achievable as well as full hardening, clear glue line, cold tack, absence of organic solvents, synergetic effect with other adhesives, and non-flammability. However, there are two most

important disadvantages: low moisture resistance and formaldehyde emission from wood-based composite panels in service which is known to cause sick building syndrome. These drawbacks are driving research to understand basic properties of UF resins that can lead to developments aimed at reducing formaldehyde emission from wood-based composite panels bonded with UF resins.

Urea-formaldehyde (UF) resins are the most used resins for interior-grade plywood application. However, the construction of the plywood panel itself affords better protection of the glue line from water attack than in other types of wood panels. The major defect of UF resins is their high sensitivity to water attack, fortification with small amounts of melamine being generally used to yield better results, even for interior-grade panels. Hybrid resins in which polymeric isocyanate (pMDI) is used to reinforce the characteristics of full exterior-grade resins are already known for several applications (Adcock et al. 1999, Pizzi and Walton 1992, Pizzi et al. 1993, Simon et al. 2002, Shadurka et al. 2003, Despres et al. 2005). Combining then hybrid resins with the more suitable plywood panel architecture led to the use of small proportions of pMDI to upgrade the water resistance of UF plywood glue lines in the same manner as is current practice with melamine addition to UF resins

Wood adhesives are polymeric materials that are capable of interacting physically or chemically or both with the surface of wood in such a manner that stresses are transferred between bonded materials. Adhesives are to be applied in the form of liquid to spread over and wet the surface of the wood. Urea Formaldehyde Resin is most important type of adhesive in the wood industry since last 60 years especially for the production of wood based panels. More convenient spray dry UF powder is in the market for the last two decades. Small and medium private based wood panel industry prefers to use powder resin since they are more convenient for small capacity production. During last two decades, certain effort have been undertaken for its improvement like reduction of gel time, free formaldehyde emission, adhesive bond fortifying, prolongation of storage life and more convenient transport and application. Liquid UF resin concentration up to 50 to 55% solid content were prepared within wood industry complex is having storage life of 40 days maximum were more convenient but at the same time spread. UF powder resin can be used by re-dissolved and re-dispersed in water at different concentration just before application.

So efforts have been made in this study to make a glue system for wood based panel industry by combination of powder

resin with liquid UF resin. Petroleum is a finite natural resource subject to the vagaries of market forces. This improves the durability - stability of UF resins as a potential substitute for more petrochemical dependent, less versatile, and more supply - sensitive PF resins which will be a welcome development for both manufacturer and users alike. The present study is one of such attempts.

## II. MATERIALS AND METHODS

### 2.1 Stage Materials

Phenol, formalin, caustic, urea etc. used for resin synthesis was collected from local market which belongs to commercial grade. Wood Veneer used for manufacture of plywood belongs to Dipterocarpu sp.(Gurjan). Other chemicals used during testing were of analytical grade purchased from local market. MR Powder resin (SB MR – 202G) taken from M/s ARCL, Kolkata, India which are powder Melamine Urea Formaldehyde resins for Plywood Industry specially developed for MR Grade.

Properties	MR -SB MR – 202G
Appearance	White free flowing powder
Solubility	Easily soluble in water
Bulk Density	0.69 gm/cc
PH (50 % Solution)	8-9
Flow time (1 part resin + 1 part Water) 25°C, in Seconds)	16-18
Gel time	118 seconds

### 2.2 Methods

#### 2.2.1 Synthesis of UF resin

230-250 parts by weight of formalin (Formaldehyde content 37%) was charged into resin kettle and made alkaline with 50% sodium hydroxide solution to pH 7.5 -8.0. 100 parts by weight of urea was gradually added to the kettle and stirring started. Stirring continued till the end of the reaction. Temperature was raised by passing steam and then set at 92±2°C and kept at this temperature under agitation for 1½ - 2 hours. pH was checked from time to time and was maintained at 7.5 – 8.0. In the second stage, the pH of the solution was lowered to 5.0 – 5.5 by adding 50% solution of acetic acid and reaction was continued under agitation at the same temperature. The progress of the reaction was followed by measurement of viscosity and water tolerance. For steady result instead of viscosity, flow time of the reaction mixture was measured in B4 cup (as per IS: 3944:1982). Water tolerance was a measure of the number of times of weight of water which can be mixed with resin before incipient precipitate is formed. The resin was ready when flow time of 16-18 seconds in B4 flow cup and water tolerance of 3-4 times was observed. The reaction was arrested by raising pH to (7.5 – 8.0) by adding 50% alkali and then the resin was cooled.

#### 2.2.2 Formulation of adhesive mix

Using synthesized UF resin, plywood adhesive mix was formulated by mixing synthetic resin, hardener, buffer and UF/MR/BR powder resin at various concentrations from at concentration level from C0 to C6 to standardize the flow time of

glue under stirring with a speed regulated stirrer (Ref Tab 3). The mixing was then continued for 30 minutes until a homogeneous mixture was obtained. Viscosity of the glue after mixing was taken in B6 Cup (IS:3944-1982 ) and the adhesive mix was taken for glue durability test through water resistance test as per IS :303-1989.

#### 2.2.3 Viscosity assessment

A change in glue viscosity exerts large effects on glue spreader rates. Glue mix with high viscosity is difficult to spread and leads to higher glue spread which is undesirable from quality and economic point of view. For a resin, viscosity is a measure to assess the progress and extent of polymerization of the resin either during manufacture or use and for adhesive it should be satisfactory coverage up to 28-30 gms /sq. ft. In plywood industry the actual viscosity of the adhesive are studied by use of standard flow cup. In this study the flow time of the adhesive mix was studied by B6 flow cup (as per IS:3944-1982) at different concentration level. The results for standardization of flow time are given in Tab 4.

#### 2.2.4 Spreading process

Spread rate will largely depend on the nature of the work being done and the method of cure employed. Rates are normally defined by gms of glue required per 1m<sup>2</sup> of board surface to be glued. Spread rates will range from 28 -30 gms/ft<sup>2</sup> depending on the nature of the work, time constraints of the glue-up, and method of cure. Care should be taken to check the thickness of veneer and relative porosity of the species to be used and the spread to be adjusted accordingly. In many instances, a thin spread coupled with mandatory open assembly time will be necessary to prevent excessive bleed-through. Hot Press pressure also has great bearing on the spread rate. Lower pressures should have less glue in the glue line, as thick glue lines will take longer time to cure.

#### 2.2.5 Pot Life assessment

Once mixed with water, the resin will advance in its cure stage until it is unusable. The amount of time between first mixed until it reaches the unusable point is termed pot life. As with most directions for gluing, this is a dynamic value. It will change primarily due to temperature. Hotter temperatures yield a shorter pot life and vice versa with colder temperatures. At 250C pot life will be 5-6 hours and at30-350C pot life will be 3-4 hours. The results for standardization of flow time is given in Tab 4.

#### 2.2.6 Layup and Stand time assessment

Since layup time depends on the number of plies in a panel, type of core, glue formulation, number of panel etc. and stand time depend on veneer moisture content, veneer temperature, pressure, temperature and spread rate. So proper layup and stand time has to be maintained during manufacture of plywood. The time after spreading the glue, before full pressure is applied is referred to as assembly time. Open assembly is after the glue is applied to the veneer but before it is put together with the mating surface. Closed assembly is after the surfaces have been placed together but before full hot press pressure is applied. Open and closed assembly times are interrelated. The maximum closed assembly time is only reached when virtually no open

assembly time is given and is reduced about 2 minutes for every minute of open assembly time. As temperature increases, allowable assembly times decrease. Maximum assembly time at 25-28°C is 45 minutes and at 30-35°C is 22 minutes. The results for standardization of flow time are given in Tab 5.

### 2.2.7 Stock Preparation

The best results are obtained with the best stock preparation. The closer these conditions are adhered to, the better the results. Equilibrium moisture content (EMC) should be 8-10% max of 12% for cold pressing which may go maximum up to 10% for hot pressing. It is critical to know the destination of the end piece, so that moisture content change will not be extreme. Surfaces should be free of dust, dirt, grease or other contaminants.

### 2.2.8 Pressing and Curing

As with pot life, both hot press pressure and cure time are dynamic depending on the conditions at hand. Pressure required to develop sufficient bond strength is dependent upon the construction and the wood species used with the guiding rule that surfaces must be in intimate contact with the glue.

### 2.2.9 Pre Pressing Technique

The technique of pre-pressing involves a temporary bond formation between the glue coated veneers before hot pressing. The glue coated veneer assembly is compressed near to its final thickness during the short pre-pressing cycle. In a pre-pressed panel, the uncured glue is used to hold the veneers together. The technique of pre-pressing is becoming more and more popular in the manufacture of plywood particularly where hot presses of more than ten daylight openings are used. In this study 1ft x 1ft size 10 nos plywood was manufactured by using Eucalyptus sp. as core veneer and gurjan spp. as face veneer. 10% of BR-201G was mixed with Liquid MUF and UF resin for achieving prepress tackiness of the glue. Details of pre-pressing condition, glue properties and mechanical properties are given in Tab 9 to Tab 11.

## III. RESULTS AND DISCUSSION

### 3.1 General Resin Properties

The specific gravity, solids contents as well as the viscosity values of the synthesized resins showed little differences and these values are within the normal ranges of industrial values (Ref Tab 3).

### 3.2 Adhesive Mix

Adhesive mix for plywood manufacture using three powder resin with liquid resin shows homogeneous mixture after mixing of 30 minutes in glue spreader. The powder resin doesn't show any chemical reactions with liquid UF and MUF resin even after mixing with hardener and buffer which implicates satisfactory results for adhesive mix. The concentration of adhesive mix from extension level C0 to C6 shows satisfactory concentration for glue spreader and adhesive mix viscosity after mixing properly in a glue spreader minimum 30 minutes (Ref Tab 3).

### 3.3 Assessment of Viscosity and physicochemical properties

From Viscosity study (Ref Tab 4), data shows that viscosity of adhesive mix measured in terms of flow time in B6 (as per IS 3944-1982) shows satisfactory result at extension level C3 for smooth operation of Glue Spreader. From the data, it has also been observed that the viscosity of adhesive mix increases with increasing extension level. Solid content of adhesive mix increase as significantly as the concentration of the powder resin increases in the adhesive mix with satisfactory PH and pot life.

### 3.4 Layup and Stand type assessment

Since all gluing operation have to be completed within a giving period of time i.e. from the spreading of adhesive on veneer to the application of pressure in the assembly, so layup and stand time of the adhesive mix should resist within the period. Layup time should not be too short or high to avoid solvent loss and time during panel assembly. From the data (Ref Tab 5) reveals that powder resin mixed with adhesive mix shows significant result towards bond quality during boiling water test when total layup and stand time lays for 60 minutes. But it shows unsatisfactory in terms of glue shear strength and percent of wood failure when both layup and stand time exceeds 60 minutes.

### 3.5 Adhesive bond quality assessment

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Bonding quality was tested according to IS 848:2006 for both UF, MR and BR grade powder resin. The results are summarized in Tab 5 to Tab 8. MR and BR grade resin at 10% (w/w) of liquid resin were used to test for BWR Grade plywood and results are summarized in Tab 13. UF, MR and BR grade powder resin shows excellent results in cyclic test. Glue shear strength value shows more in comparison to MR and UF grade (Ref Tab 7). During the study of glue shear strength for dry state, wet state and mycological state, tensile strength and static bending strength, results shows satisfactory value and there is a significant change in results of MoR and MoE has been obtained for plywood samples manufactured by using powder resin mixed with liquid resin (Ref Tab 8).

### 3.6 Pre pressing and Hot pressing Parameter

TABLE

Lay up and stand time standardization

4

Powder resin grade	Level of conc	Flow time in B6 flow cup (sec.)	Lay out time (min)	Stand time (min)	Quality	
					Cyclic test MR Grade	% of wood failure
MR (202G)	C5	24	20	15	Pass standard	85
			30	15	Pass standard	85
			45	15	Pass standard	75
			60	15	Failed	40
			75	15	Failed	40

TABLE 2  
Adhesive mix with different concentration of Powder resin (MRGRADE)

Component	Parts by weight (Pbw)						
	Level of concentration (%)						
	C0	C1	C2	C3	C4	C5	C6
UF Resin Liquid 48% solid	200	200	200	200	200	200	200
Powder resin MR	0	4.0	6.0	8.0	10.0	12.0	14.0
NH4Cl	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Liquid NH4	1.6	1.6	1.6	1.6	1.6	1.6	1.6

In plywood industries the former process is known as cold pressing and the later process is known as hot pressing and both the process leads to curing of resin. From the study for manufacture of plywood to assess the rheological properties of powder resin, the parameters for hot pressing and cold pressing (Ref Tab 9 to Tab 12), it shows satisfactory results specially in case of bond quality and surface finishing of plywood, result shows plywood delaminates after 3 hours in case of MR Powder resin with liquid UF resin and delaminates after 9 hours in case of BR 201G with liquid MUF resin tested as per IS 848- 2006.

TABLE 5  
Properties Effect of coverage on Glue Shear Strength with respect to coverage spread = 350±10 gms/m<sup>2</sup> DGL

Powder resin grade	Conc Level	Dry State		After cyclic test (MR Grade)	
		Load (N)	Wood Failure (%)	Load (N)	Wood Failure (%)
MR (202G)	C0	1020	65	754	55
	C1	1154	65	787	55
	C2	1248	65	812	55
	C3	1298	70	832	60
	C4	1365	70	888	60
	C5	1420	70	906	60
	C6	1486	70	916	60

TABLE 3  
Properties of adhesive mix with Powder resin MR

Properties	Level of concentration (%)						
	C0	C1	C2	C3	C4	C5	C6
Flow time of adhesive mix in B6 flow cup in seconds	20/B4	10	13	18	23	26	31
Solid content of adhesive mix (%)	48.0	49.2	52.4	53.5	53.7	54.9	56.2
Adhesive pH	6-6.5	6-6.5	6-6.5	6-6.5	6-6.5	6-6.5	6-6.5
Pot life (hrs)	> 6	> 6	> 6	> 6	> 6	> 6	> 6

IV. TABLES

TABLE 6  
Composition of the adhesive mix used to prepare 7 ply plies (12.0 mm thickness)

Adhesive mix		Board parameters for 9 ply plywood	
Component	Parts by weight	Characters	Board Parameters (mm)
Resin UF Liquid	200	Number of plies	9
NH4Cl	1.0	Face longitudinal	0.35
Liquid NH4	1.6	Cross band (cross grain glued)	1.8
Powder resin	3.0	Long core (Longitudinal grain)	1.8
Insecticide (GLP)	0.5	Back (Longitudinal grain)	0.35

TABLE 1  
Properties of synthesized Urea-formaldehyde resin

Gel Time at 100°C (seconds)	Flow Time (B4 cup) (seconds)	Solid content (%)	Water tolerance	pH	pH of Cured film	Free formaldehyde (%)
74	20	48.8	1:4	8.0-8.5	5.6	0.90

TABLE 8  
Static Bending and Tensile Strength of the plywood on the basis of pilot scale using powder resin of synthesized Urea-formaldehyde resin

Sl. No.	Powder resin grade (%)	Static Bending				Tensile Strength (N/mm <sup>2</sup> )	
		MoR, N/mm <sup>2</sup>		MoE, N/mm <sup>2</sup>		Along	Across
		Along	Across	Along	Across		
1	UF+Conv Extender	39.46	46.67	4895	2948	31.25	30.22
2	MR	44.27	67.10	4863	5937	39.45	42.95

TABLE 9  
Board Pressing conditions of adhesive mix with Powder resin (MR GRADE)

Parameters	Cold Pressing	Hot Pressing (UF Resin)
Pressure	8 Kg/cm <sup>2</sup>	10.0 Kg/cm <sup>2</sup>
Temperature	NA	110°C
Time	15-20 minutes	12 minutes/12 mm ply

TABLE 7

Glue Strength of the plywood on the basis of pilot scale using powder resin of synthesized Urea-formaldehyde resin

Sl. No.	Powder resin grade (%)	Average Glue Shear Strength					
		Dry State		Wet State (MR Grade)		Mycological State	
		Load (N)	Wood Failure (%)	Load (N)	Wood Failure (%)	Load (N)	Wood Failure (%)
1	UF+Conv Extender	1375	70	780	60	730	55
2	MR	1525	70	880	60	790	55

TABLE 11

Pre-pressing Conditions

Adhesive Type	Moisture Content of Veneers (%)	Closed Assembly Time (Minutes)	Prepressing Pressure (Kg/cm <sup>2</sup> )	Pre-pressing Time (Minutes)
UF Resin	8-10	20-30	8	15-20
UMF-50 resin	6-8	20-30	8	15-20

TABLE 12

Hot Pressing Conditions

Adhesive Type	Grade of Plywood	Hot Press Temperature (°C)	Hot pressing pressure (Kg/cm <sup>2</sup> )	Hot pressing time (Minutes)
UF Resin	MR	110±5	10	12 minutes for 9 ply, 12mm thk

TABLE 10

Adhesive Formulations for Pre-pressing Pressing conditions of adhesive mix with Powder resin (MR GRADE)

Type of Resin	% of Powder resin on the wt. of liquid resin	% of filler/ Extender	Type of buffer and its % on the wt. of liquid resin	Catalyst and its on the wt. of liquid resin	Flow time (B6 Cup)	Grade of plywood
UF Resin	BR-201G 10%	10%	Liquor ammonia (sp. Gr. 0.91):0.4	NH <sub>4</sub> Cl 0.075 - to 0.1	35-40	MR

## V. CONCLUSION

The different grade of powder resin having solid content 100% doesn't show any chemical reaction with Liquid resin even after mixing with hardener and buffer rather than forming creamy and is lump-free during mixing. Satisfactory rheological properties of the adhesive and physico-mechanical properties of the plywood made with mixing resin technology was achieved. Satisfactory pre-press results have been achieved at higher concentration of powder resin mix. The chances of pre-cure

of dry out was reduced because veneers are held in close contact with each other. The adhesive wets the veneer surface since the layers of veneers have an opportunity to come into intimate contact with each other for greater period of time. Hence the quality of the plywood improved by overcoming warping, pre-curing etc. Plywood delaminates after 3 hours in case of MR Powder resin with liquid UF resin and delaminates after 9 hours in case of BR 201G with liquid MUF resin tested as per IS 848 - 2006 for BWR grade plywood by adding 10% (w/w), however plywood confirms to MR Grade in all the cases.

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# Employee Motivational Aspects Among IT Professionals in Sri Lanka - *Rewards Recognition & Retention*

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**Abstract-** Employee Motivational Aspects among IT Professionals in Sri Lanka (Rewards Recognition & Retention) is much related topic to current Sri Lankan economic context where the country is on a rapid development stage of the IT Sector. For this sector the most important resource is the human resource. Retention of this key asset in the organization has been a contemporary issue for most human resources managers who are employed in these companies in Sri Lanka. There have been very few researchers done in terms of “Motivation” of the IT sector employees, their skill levels and their expectations from the current employers in the industry in terms of Rewards & Recognition. Hence this study was conducted bridge this gap & to identify & recommend few best practices to current & future HR managers who will be in charge of IT Sector in Sri Lanka

**Index Terms-** Employee Motivation, IT Sector, Rewards, Recognition, Retention, Sri Lanka

## I. INTRODUCTION

### **Background to IT Industry Workforce Sri Lanka**

The IT workforce in Sri Lanka grew by nearly 10,000 over the two years from 2004. Nearly 14,500 IT workers are required in the pasted (2007-2008) years which has now increased significantly more in this year.

There was a demand for 7,672 IT workers in 2007. A total of 5,755 graduates are needed in 2007 but only 2,216 IT Major graduates were added to the workforce in the mention year. Programming/Software Engineering is the largest job category with 27% of the overall workforce.

Testing and Quality Assurance engineers have increased from 4% of the total workforce in 2004 to 13% in 2006, the largest increase across all job categories. The overall attrition rate for the IT workforce has doubled from 6.6% in 2004 to 13% in 2006. Today it's even more.

The starting salaries of an IT worker is approximately Rs. 10,000 to 20,000 across all job categories, but with experience his capacity to earn increases at a higher rate if employed in the IT sector.

The overall IT workforce grew by around 20% year-on-year over the 2006-2008 years. That is a growth of nearly 10,000 IT professionals. IT sector can be further categorized into following sub categories.

- 1) IT Companies
- 2) Non IT companies
- 3) Government Sector

IT Jobs were classified into thirteen high-level categories according to their most dominant job function.

The thirteen Job Categories are;

- 1) Business Analysis and Systems Integration
- 2) Systems and Network Administration
- 3) Programming and Software Engineering
- 4) Database Administration and Development
- 5) Digital Media and Animation
- 6) Project and Programme Management
- 7) Testing & Quality Assurance
- 8) Sales and Marketing
- 9) Technical Support

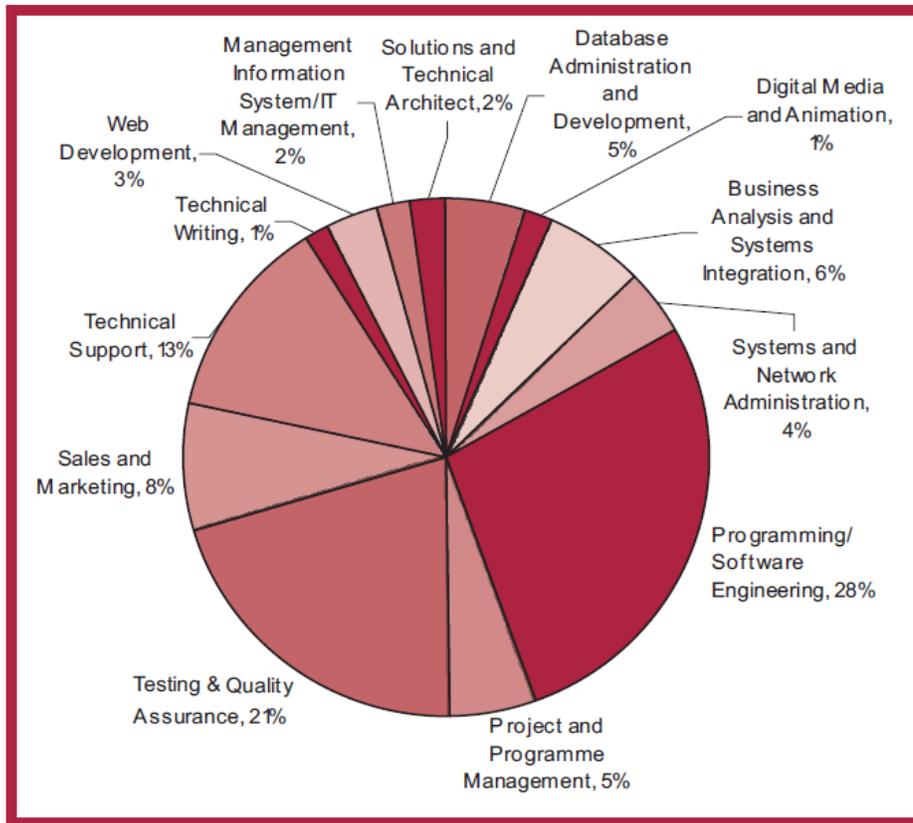
- 10) Technical Writing
- 11) Web Development
- 12) Management Information Systems/IT Management

**Rising demand of IT Work Force**

As per the graph shown below, this shows that Programming/Software Engineering (28%), Testing & Quality Assurance (21%) and Technical Support (13%) are the job categories in high demand.

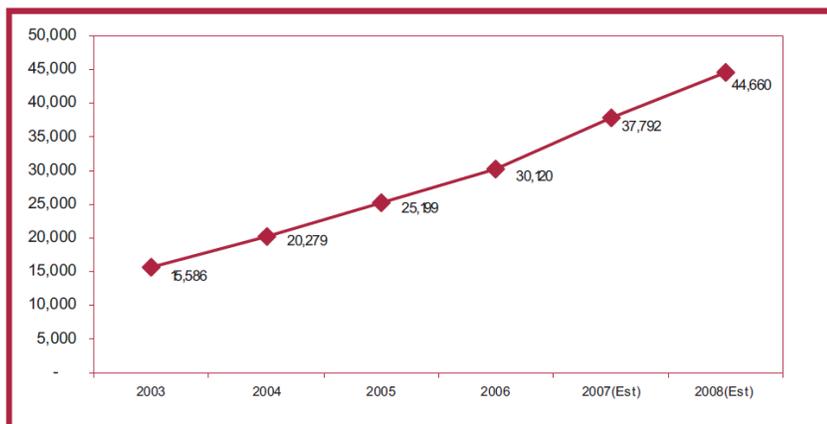
These are also the categories that have the largest communities in the current IT workforce.

**Figure 1 Demand for IT professionals by Job Category**



*1.2.3 Demographics of the IT workforce: young and educated*

**Figure 2: Overall IT workforce growth trend 2003 - 2008**



The IT workforce grew by 9,841 across the IT, non-IT and Government sectors to stand at 30,120 as at the end of 2006.

The workforce in the IT sector increased by 4,222 (122 short of expectation) and the non-IT sector grew by 5,409 (169 short of expectation) over the two years from 2004.

The Government sector (Ministries, Departments and Corporations) lagged behind with a growth of only 210 over the same period (633 short of expectation).

**An educated workforce**

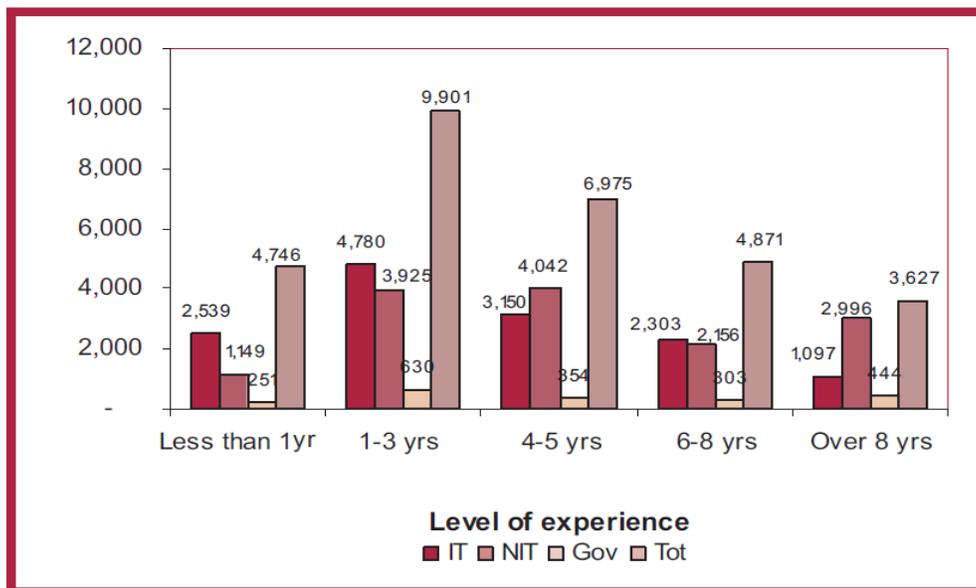
Around 43% of the workforce has a IT degree or above qualification

Over 80% of the workforce has an IT qualification. In the Government sector this has dropped down to 63%. In the IT and non-IT sectors the IT qualified workforce stands at 83% and 82% respectively. In the overall workforce, 43% have a degree or a higher qualification in IT.

Of all the graduates with an IT degree or above, 61% are employed in the IT sector while 35% are in the non-IT sector with the Government employing only 4%. Another 11% of the overall IT workforce has a degree or above qualification but not related to IT. However, they are employed in IT jobs across the three sectors. In other words more than half (54%) of the workforce has a degree or above qualification.

*1.2.5 IT workforce by level of experience*

**Figure 3: Workforce gaining in experience**



Experience is the most look forward qualification in this sector. This was the major consideration in the recruitment process. Experience level of the overall workforce seems to be increasing.

Nearly a three quarter (72%) of the workforce has less than five years of experience. At the same time 84% of the workforce has at least one year's experience. It appears that new entrants are attracted mainly to the IT sector.

Female representation keeping steady Just over a fifth (21%) of the overall IT workforce is female.

## II. IDENTIFY, RESEARCH AND COLLECT IDEA

### **Statement of the Problem & Importance of Study**

In IT industry most of the companies are projects based organizations. These projects are high technical based complex systems. (E.g.- Developing of complex software, ERP systems, web base multi access systems, High complex networks etc.)

The success of these projects depends on the successful performance of the IT employees who handle these projects. Most of these huge projects fail due to following reasons,

1. Employees leaving organizations leaving the projects uncompleted.
2. Key staff is been headhunted by competitor organizations and other companies.
3. Lacks of knowledge and experienced workers available for doing specific unique work.
4. Knowledge workers are migrating to other countries for better prospects.
5. Rapidly evolving technology as a result motivation and commitment to the job becomes a key necessity to become a good professional.

As a result IT firms had to bear huge loses both in time and in financial terms. It has been identified that motivation plays a key role in project staff retention as well as completing the projects successfully.

### **Objectives of Study**

Once taking into consideration the above mention issue and the importance of study the author laid down following research objectives as mention bellow,

1. To do an overview study of the current IT workforce and its nature (various demographics factors, job market demand etc...) through various secondary data available.
2. To identify what factors which would motivates IT staff and what causes IT projects failure

### **Hypothesis to Be Tested**

Author further wanted to test following hypothesis.

- H1 - Nonfinancial incentives/rewards are most appreciated than the financial incentives (rewards).
- H2 - Individual rewards and recognition motivates IT employees more than the general rewards and recognition
- H3 - Challenging and interesting work causes job motivation.

### **Methodology**

Method of Research Used – Author has included both qualitative and quantitative qualities to the questioner since the prime need was to gather both descriptive information and to test the hypothesis which was made in the research objectives.

#### Primary & Secondary data sources

Here the author has used both primary and secondary data collection methods. The secondary data sources were various publications which had been released in Sri Lanka especially from ICTA (Information Communication Technology Agency Sri Lanka). Primary data which was collected through the designed questioner was distributed among the sample frame.

The questioner was design to support both qualitative and quantitative aspects of the collected data. This would increase the value of the collected data. MCQs were used to analyze the quantitative aspects while structured type questions were used to evaluate qualitative areas of motivational areas of IT professionals.

This primary data was used to test the three hypotheses. This required data is gathered under following areas,

1. Demographic data
2. Data relating to rewards factors
3. Data relating to recognition factors
4. Data relating to Motivational factors

### III. WRITE DOWN YOUR STUDIES AND FINDINGS

#### **Presentation of Results**

It was found that IT employees are very serious about career growth opportunities. Rather than promotions they still want personal growth by enhancing their knowledge levels to do their present jobs well. (Through updating their knowledge and training opportunities, investing on knowledge management systems etc...)

When considering Maslow's theory of Needs, starting with basic needs to self-actualization level, (The highest need in the hierarchy). HR managers' effort should be to try and uplift the need level of their employees towards self actualization where they will be satisfied with the current employer.

Since the basic pay levels are high in most IT firms (The starting salary was 15,000-20,000) employees still clamor in achieving needs in the upper level of the hierarchy. Some IT firms have understood this very well where they provided activities like social dancing, yoga sessions to their employees. This is very important in providing the opportunity of maintaining a relax mind to the employees. This investment will return to the employees through increasing their thinking capacities. It's a vital factor in innovative and quick problem solving in the day to day work which is the most important skill of an IT person.

#### **Hypothesis 1**

***H1 - Nonfinancial incentives/rewards are most appreciated than the financial incentives (rewards).***

According to the question "how do you like to be rewarded?" 22% (n=19) of IT employees would like to receive appreciation both verbally and in writing from their employers and supervisors as rewards. Only 10% (n=9) stated salary increments. (Refer data presentation

Question 04)

70% (n=61) of the sample data would prefer having both financial and non-financial benefits as shown in the graph. It's clear that they did not want only financial benefits. (Refer data presentation Question 5b)

Further regarding rewards Job Satisfaction, Trainings for professional development were chosen as the most preferred rewards factors where compensation (Bonus) Plans was not very much attractive variables to IT employees where they even gave a higher ranking to Intellectual Challenge and Creativity factor than financial incentives.

(Refer data presentation Question 01)

- ✓ Considering above facts and figures, our conclusion is therefore that this hypothesis is true. Still financial (monetary) incentives plays vital role in IT organizations as a hygiene factor to keep employees satisfied with the job. It's still a motivating factor which can't be ignored or underestimated.

### **Hypothesis 2**

#### ***H2 - Individual rewards and recognition motivates IT employees more than the general rewards and recognition?***

In the author's question regarding "rewards", Over 80% of the sample wanted to receive rewards both in person and as a group. Only 19% mention that they would like to receive individual rewards. (Refer data presentation Question 02)

This shows that majority of the IT workers likes to be rewarded as a group. This is very important when it come to large projects where the project has been broken in to small groups. Success of these projects can significantly improve by recognizing and rewarding employees as a group.

In the author's question regarding "recognition", 18% (n=16) wishes to receive personal recognition from employers, 82% (n=71) of the sample preferred to receive recognition both person and as a group .This trend is seen in all the companies participated. . (Refer data presentation Question 08)

According to facts given above the second hypothesis can be rejected in order to develop an alternative hypothesis which is,

- ✓ ***H20-General (Both Individual and team) Rewards and Recognition Motivates IT Employees More Than the Individual Rewards and Recognition.***

It's a well-known fact that IT employees are not well recognized for what they do and their achievements. This study shows that 57 % (n=50) of the sample felt that to some extent they receive enough recognition for work they do.7% (n=6) said they do not receive enough recognition and 17% (n= 15) were not happy with the recognition that they receive. (Refer data presentation Question 09)

Study shows that in the current context, employers do make some effort to give due recognition to their employees which is an essential factor in making IT staff satisfied with present job.

When it comes to employee rewards since 35 %( n=31) was not quite happy with the rewards that they receive and they thought it's not adequate. Employers need focus on their rewards schemes further because they might lose their key people due to this dissatisfaction. Only 09% (n=8) felt that they do receive the due rewards. (Refer data presentation Question 03)

2% of the sample did not had an idea about their rewards at all

(Even though some companies had rewards schemes some employees was not aware about it. The rewards scheme need to be properly communicated to the employees. To motivate employees, the scheme needs to address the performance criteria of employees. (Whether it's individual or group rewards)

### **Hypothesis 3**

#### ***H3 - Challenging and interesting work causes job motivation.***

Challenging and interesting work were found to be an equally motivating factor compared to Pay benefits to the participants. Participants did not mention that pay benefits would motivate them to do a better work. This would be another area to study when it comes to IT employee motivation. (Refer data presentation of Question 11).

IT employees gave the highest ranking for interesting challenging work when it comes to present job satisfaction. It can be clearly vied as a job retention factor and a motivator for IT employees. (Refer data presentation of Question 16).This strengthens the third hypothesis where it says "Interesting challenging work causes job motivation".

- ✓ Author's conclusion is therefore that this hypothesis is true. ***“A challenging and interesting Work is an important factor for IT-professionals to be motivated and to perform a good work”.***

IT employees also have some concern about stability of the organization that they work for. The knowledge and the skill component of an IT employee give him a demand in the job market where he/she is easily shift companies for better working environment.

The study shows that employees gave a higher ranking towards following, than financial incentives and bonus schemes (*Refer data presentation of Question 01*).

- Job satisfaction
- Training for professional development
- Creativity aspects

However the need of the financial incentives depends on the current salary and the company benefits scheme. HR managers need to link their nonfinancial incentive scheme to increase creativity aspects of the company employees.

### **Conclusion**

- In a time like this, (where our country is liberated and united once again) IT sector been the fifth largest exporter has far more miles to go in the present and in future. The sector is expanding very fast at the moment. The whole industry is depended on its IT staff and their level of commitment to the job. There for motivating, recognizing and rewarding IT-professionals have become a much more needed issue which has a significant importance.
- There is no set of clearly identifiable factors which keeps employees happy about their work. The task, skill, both internal external factors, variables such like changes in the economic direction, changes in living styles, social factors, individual goals, psychological and physiological needs and many other factors may have a bearing to employee motivation.
- Since most IT projects are expensive and there is no specific product to show until it's been developed (highly risk involve work). These are critical reasons as to why we need to keep IT employees motivated until the project is been completed and has been delivered to the customer.
- Therefore retaining the key people of the company for long time gives IT companies the needed competitive advantage over others. This is where employee motivation, rewards and recognition have the most important role to play. It was clear from this study that many IT companies has identified this aspect and have work for it at the present.
- The study pointed out the fact that rewards and recognition can bring about employee job satisfaction via individual and personal growth, increased creativity, career development opportunities etc.
- Since the IT industry and the environment are not in a stable conditions the participant's ideas and their feedback to this study may be emotional. Their feedback would have been different if this study has been done about 8-10 back where the industry was booming.
- In this study there were two hypothesis which were turn out be true (*hypothesis 1 and hypothesis 3*). *Hypothesis 2* were replaced by an alternative hypothesis according to the data which the author gathered. (*Please refer the Presentation of the Results section “Heading 10”*)

### **Recommendations**

1. It's recommended to the employers to dedicate more time to rethink about the organizations compensation, training, rewards and recognition methods where majority of employees felt they would do a better job if they are better motivated.
2. It's also highly recommended that the employer appreciate the employees work by simple forms of ("A Thank You Note", "Project Completion Party", "Wishes for Job Well Done" etc.). This is where technical managers especially line managers in the IT sector need improve their leadership/people management skills to manage their HR assets better.
- In current scenario most of the line/project managers thinks only about the project that he/she is working where "people" element is neglected.
3. According to analysis results of the Question 13 it was found that only 39% of the IT employees were fully self-motivated to do better job. This indicates HR managers need to work towards addressing these issues because demotivated employees surely reduce productivity of the company.
4. Another important factor which was found out was the developing team of a software component is not given the due recognition to their work. This is where the final credit of all the hard work is been given to the marketing team or the project manager who handled the project. (Usually final presentation of a complete system is been done by above mention parties).

As a result the due recognition is not given to the developing team. This study clearly shows that most of the software developers were not satisfied with the recognition levels that they receive by the employer. As a result they were willing to accept jobs for better working environment. Management need to give serious attention to these issues because developing team acts as the heart of any IT company.

5. Employers' further need to change their organizations to increase creativity aspects of the employees where it will drive IT employees to reach over and above their potential capacities to serve their companies better. Proper work life balance is important in this regard.

### **Further Research**

During this study author felt following area are important to do further research,

1. What motivates Females to select selecting IT as their careers.(The gender ratio/gap in IT industry is very high when compared with other industries)
2. The compensation package which an IT employees expect from an employer in different levels of the career.(eg- from junior programmer to senior software engineer)

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#### VI. CONCLUSION

A conclusion section is not required. Although a conclusion may review the main points of the paper, do not replicate the abstract as the conclusion. A conclusion might elaborate on the importance of the work or suggest applications and extensions.

#### APPENDIX

Appendix A: Analysis of the Data & the Distributed Questioner

#### ACKNOWLEDGMENT

The preferred spelling of the word “acknowledgment” in American English is without an “e” after the “g.” Use the singular heading even if you have many acknowledgments.

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### Appendix A: Analysis of the Data & the Distributed Questioner

#### Sampling and Selection

Out of total population of 44000 (approximate figures) IT employees in Sri Lanka sample including 170 IT employees are selected. To represent this sample out of total population of 144 IT related companies 10 companies were selected. Questioners were then sent to these selected organizations.

Following companies actively participated in the study by filling out the questionnaires.

#### Data Collected

**Table 1: Distribution of Questionnaires**

<b>Distribution of Questionnaires</b>				
<b>Company</b>	<b>Amount of Employees</b>	<b>Questionnaires Sent</b>	<b>Questionnaires Received</b>	<b>Response Rate %</b>
<b>1)ICTA</b>	60	30	15	50%
<b>2)IRON ONE TECHNOLOGIES</b>	50	20	08	40%
<b>3)UCSC</b>	40	20	11	55%
<b>4)EPIC</b>	50	25	10	40%
<b>5)PWC</b>	30	30	14	47%
<b>6)DUO SOFT</b>	60	45	29	64%
<b>Total</b>	290	170	87	52%
<b>Author intended to collect 170 questionnaires, the Total Response Rate will be then 52%</b>				

**Table 2 : Demographical Data**

	1)ICTA	2)IRON ONE TECH	3)UCSC	4)EPIC	5)PWC	6)DUO SOFT
<b>GENDER</b>						
Men	12	07	08	7	11	22
Woman	03	01	03	03	03	07
Total Respondents by Company:	15	08	11	10	14	29
Total Respondents:	<b>87</b>					
<b>AGE</b>						
18-25	03	07	02	05	02	12
26-35	10	01	09	05	09	17
36-45	02				01	
46-55					01	
56>					01	
<b>EDUCATION</b>						
G.C.E A/L or G.C.E O/L				01	02	03
University graduate	09	08	06	08	07	22
Master or doctoral graduate	05		03		03	02
Other	01		02	01	02	02
<b>YEARS OF EMPLOYMENT WITH THE COMPANY</b>						
Below 1 year	04	06		02	03	07
1-2 Years	03	02	04	05	04	11
2 years	03		01	01	03	04
3 years to 5 years	04		04	02	04	05
Above 5 years	01		02			02
<b>CURRENT POSITION</b>						
Manager	07		02		02	
Software Developer	01	06	03	06	02	15

Hardware and System Specialist	01				04	05
Administrative Staff	01		01			
Other	03	01		2	02	2
<b><i>OTHER SPECIFIED</i></b>						
Business Analysts						03
Project Officer	02					
Director IT					01	1
IT Security Managers					01	1
IT Consultants					02	2
Software QA staff/Engineer		01		02		06
Software Architects				02		
Networks & System Administrator			02			
Web Designers			02			

**Hypothesis 1**

***H1 - Nonfinancial incentives/rewards are most appreciated than the financial incentives (rewards).***

The questions relating to this hypothesis	
---	--

**Question 04:-** How would you like to be rewarded when you have done a good work (*what would you like to receive as a reward*)?

**Table 3: Question 04**

STATEMENT	1)ICTA		2)IRON ONE		3)UCSC		4)EPIC		5)PWC		6)DUO SOFT		TOTAL	
	(F)	%	(F)	%	(F)	%	(F)	%	(F)	%	(F)	%	(F)	%
1. Appreciation for work	02	14	01	13	03	27	02	20	04	29	07	24	19	22
2.A Paid Vacation Trip			01	12	01	09	01	10					03	04
3.Bonus Financial Benefits	02	14			02	18			02	14	03	10	09	10
4.Give Feedback for Improvement	01	07							01	07	01	03	03	04
5.Salary Increments			02	25							06	21	08	09
6.Better Performance Appraisals Alien to Work Done	01	07	01	12					01	07			03	04
7.More Authority and Decision Making	01	07											01	01
8.Promotions	01	07					01	10			03	10	05	6
NO ANSWERE	07	47	03	38	06	54	04	40	06	43	09	31	35	41
TOTAL	15	100	08	100	11	100	10	100	14	100	29	100	86	100

“F” – Frequency, “%” – Percentage

Table () – 22% (n=19) of IT employees would like to receive appreciation both verbally and in writing from their employers and supervisors. A wide majority still wanted financial benefits 10% (n=9) and salary increments 09% (n=8) as rewards for their work done. (More weight is given to the non financial factors like recognition)

35% (n=41) of the employees did not answered the question. Reasons may be because it’s a structured type question. Promotions, paid vacations and feedback for their work were also most preferred ones. One or two participants had mention that team party was also preferred rewards factor.

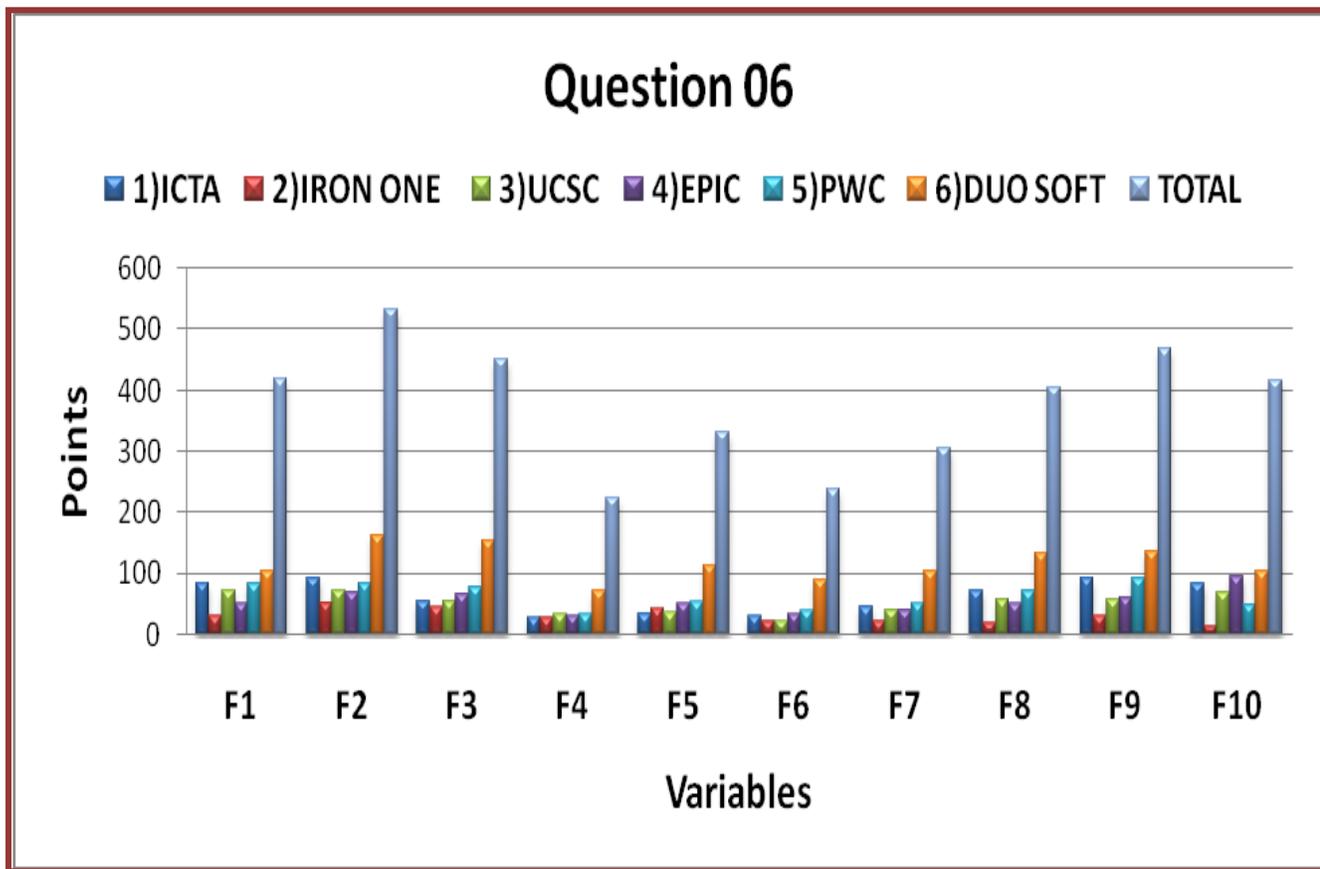
**Question 06:-**

Arrange the following recognitions in order of your preference from 1 to 10, (where 1 represents the best type of recognition and 10 represent the least best type of recognition: )

**Variables**

- F1 -Time off with Pay
- F2-Lunch “on the house”
- F3-Thank You Note
- F4- Full appreciation of work done
- F5 -Certificate for outstanding service or ideas
- F6-Development Opportunities
- F7- Employee Award
- F8- Team-of-the-Month Award
- F9- Years of Service Awards
- F10- Other

**Figure 4: Question 06**



COMPANY	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
1)ICTA	82	91	55	28	35	30	46	72	91	83
2)IRON ONE	30	52	45	27	43	22	23	20	32	14
3)UCSC	73	73	55	33	37	23	41	57	58	69
4)EPIC	50	70	67	31	51	34	41	51	60	96
5)PWC	82	84	77	33	53	40	51	71	91	49
6)DUO SOFT	103	162	152	72	112	89	103	134	135	104
<b>TOTAL</b>	<b>420</b>	<b>532</b>	<b>451</b>	<b>224</b>	<b>331</b>	<b>238</b>	<b>305</b>	<b>405</b>	<b>467</b>	<b>415</b>

(Graph):-

Lowest total points were (F6) Development Opportunities while highest total points were (F2) Lunch “on the house” which is the least preferred variable.

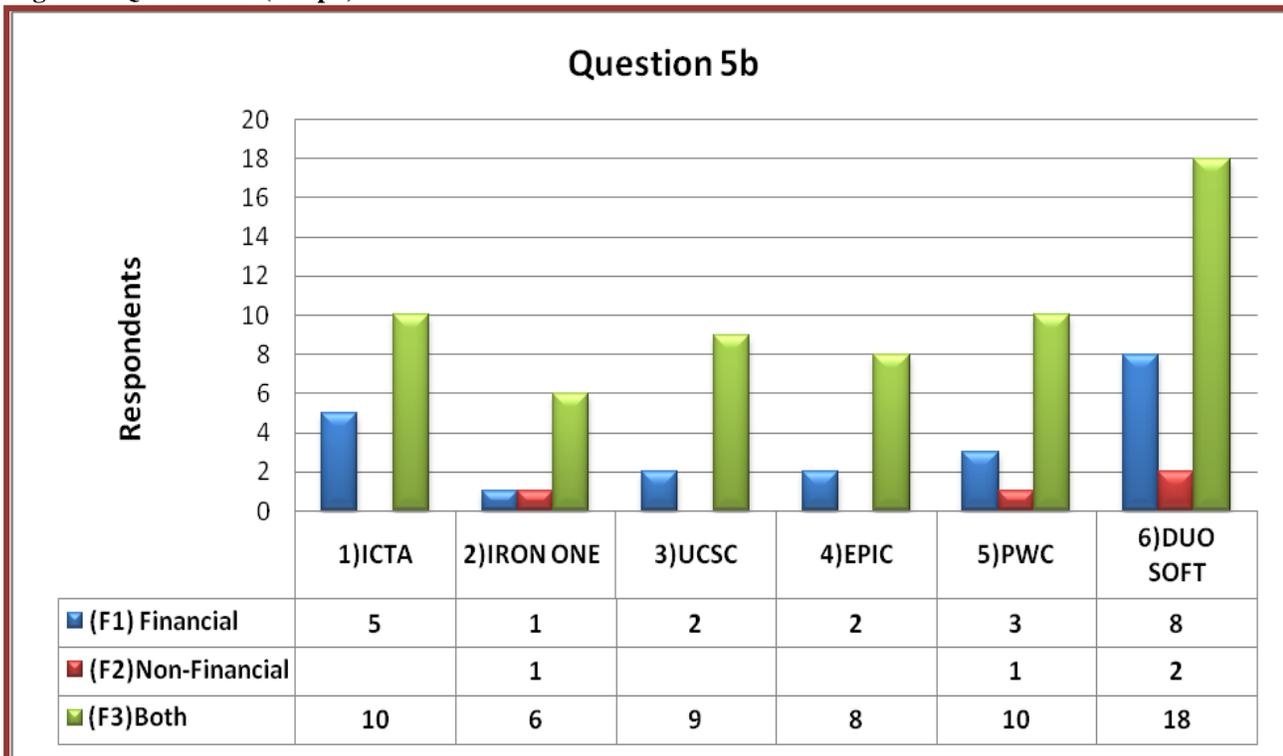
(F5)Certificate for outstanding service or ideas, (F6) Development Opportunities were other forms of recognition which IT employees gave a higher ranking for their preference.

**Question 05b:-**

1. b)What type of incentives motivates you more

Financial  Non-Financial  Both

**Figure 5: Question 5b (Graph)**



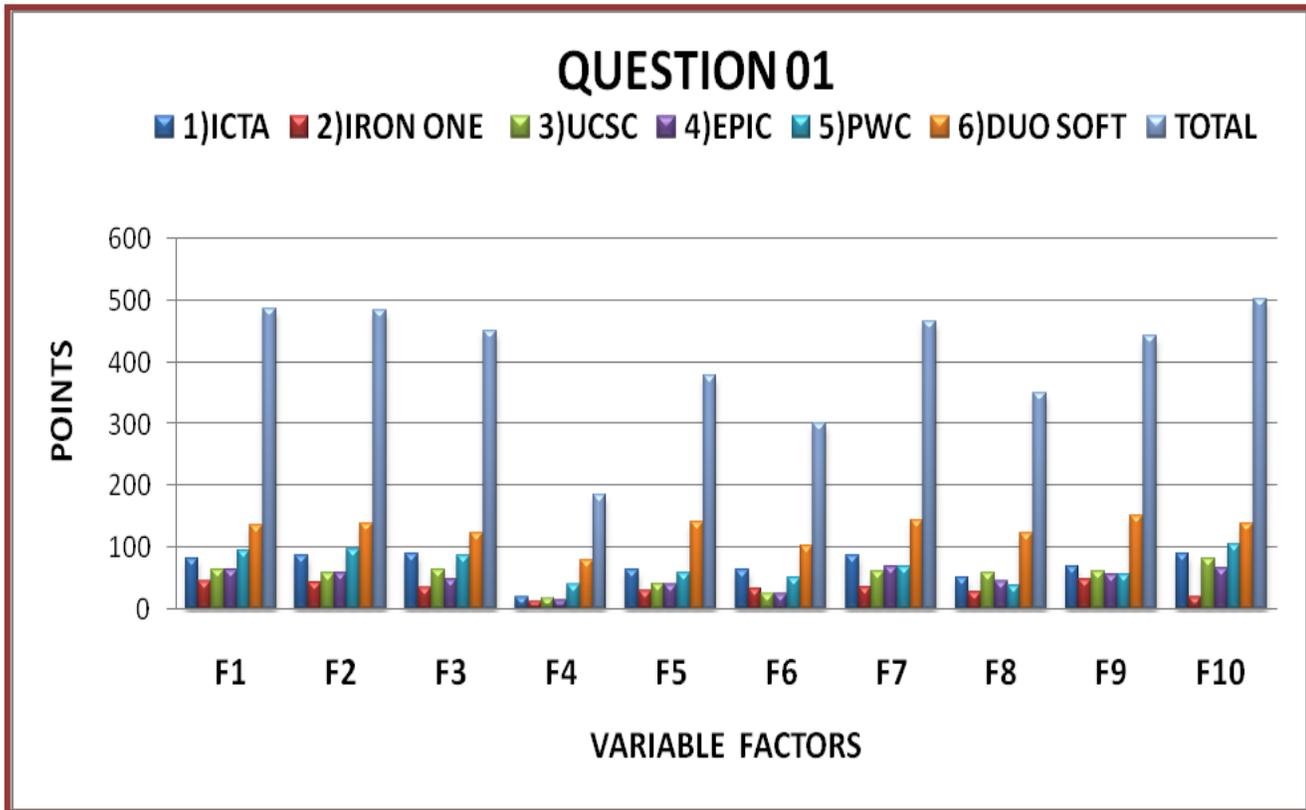
**(Graph):-**

Majority 70 % ( n=61) of the sample data would prefer having both financial and non-financial benefits as shown in the graph.

**Question 01 (Graph):-**

Arrange the following rewards in order of your preference from 1 to 10, where 1 Represent the best reward and 10 the least best reward:

Figure 6 : Question 01 (Graph)



COMPANY	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
1)ICTA	81	87	91	21	64	63	88	52	68	90
2)IRON ONE	45	44	35	13	30	34	36	29	49	19
3)UCSC	64	58	64	18	42	26	62	60	61	82
4)EPIC	64	59	49	14	40	25	69	45	57	67
5)PWC	96	97	87	40	60	52	69	39	56	104
6)DUO SOFT	136	140	124	80	141	102	143	124	152	140
<b>TOTAL</b>	<b>486</b>	<b>485</b>	<b>450</b>	<b>186</b>	<b>377</b>	<b>302</b>	<b>467</b>	<b>349</b>	<b>443</b>	<b>502</b>

- F1- Insurance Scheme
- F2- Pension or compensation (Bonus) Plans
- F3- Beneficial Loans
- F4-Job Satisfaction
- F5- Intellectual Challenge and Creativity
- F6- Trainings for professional development
- F7- Paid Vacations
- F8- Effective Performance Appraisal System
- F9- Participation in Decision Making
- F10- Other Best Rewards you have Receive.....

(Graph):- According to the analyses as shown in the graph F4-Job Satisfaction, F6- Trainings for professional development were chosen as the most preferred rewards factors. (This counts the minimum total points)  
 Graph shows that Insurance Scheme, F2- Pension or compensation (Bonus) Plans was not very much attractive variables to IT employees (highest total points) where they gave a higher ranking to Intellectual Challenge and Creativity comparing.

**Hypothesis 2**

**H2 - Individual rewards and recognition motivates IT employees more than the general rewards and recognition?**

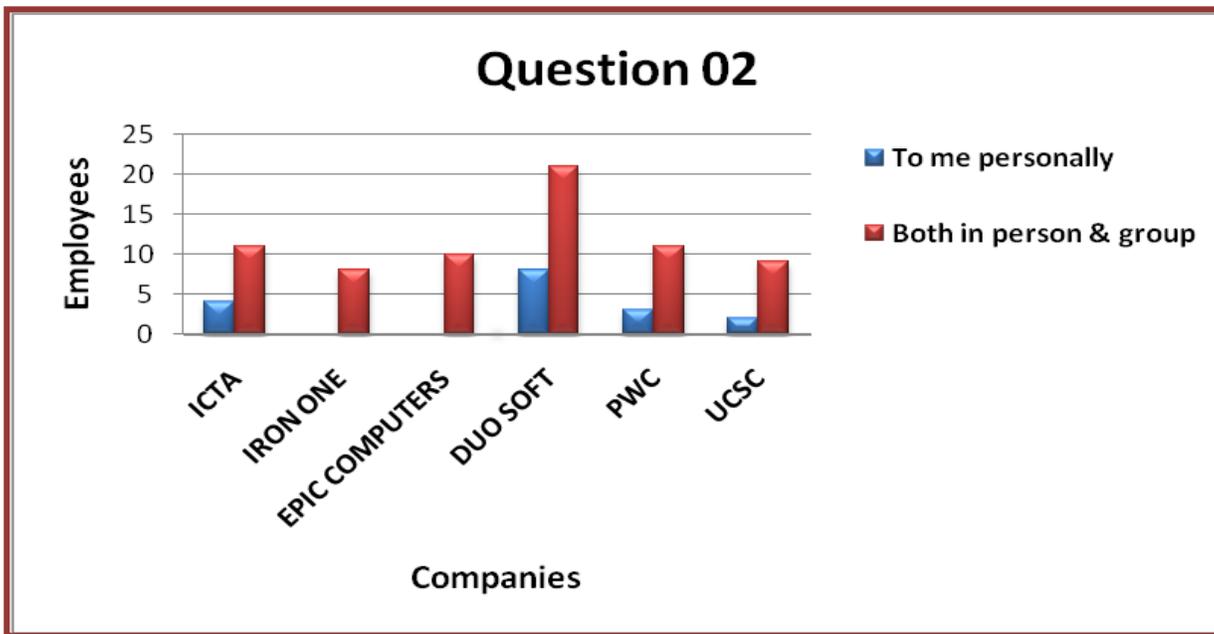
The questions relating to this hypothesis	1	2	3	4	5	5
	7	8	1	9	1	1

**Question 02 (Graph):-**

How do you wish to receive rewards from your employer?

To me personally  both in person and as a group/team

**Figure 7 : Question 02 (Graph)**



company name	To me personally	Both in person & group	Total Of record no
ICTA	4	11	15
IRON ONE		8	8
EPIC COMPUTERS		10	10
DUO SOFT	8	21	29
PWC	3	11	14
UCSC	2	9	11
TOTAL	17	70	87
PERCENTAGE	19%	80%	

**(Graph):-**

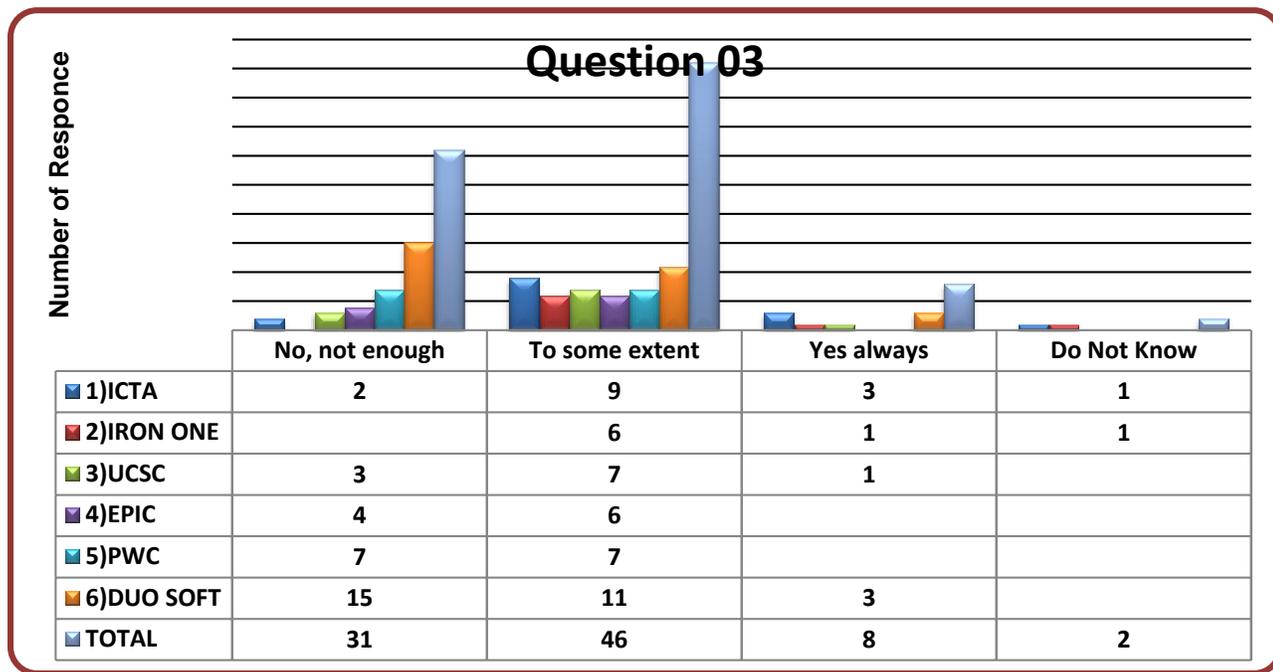
Over 80% of the sample wanted to receive rewards both in person and as a group. Only 19% mention that they would like to go for individual rewards.

**Question 03 (Graph):-**

3.) Do you feel that you have received enough rewards for the work you have done?

- No, not enough
- To some extent
- Yes, always
- Do Not Know

**Figure 8: Question 03 (Graph)**



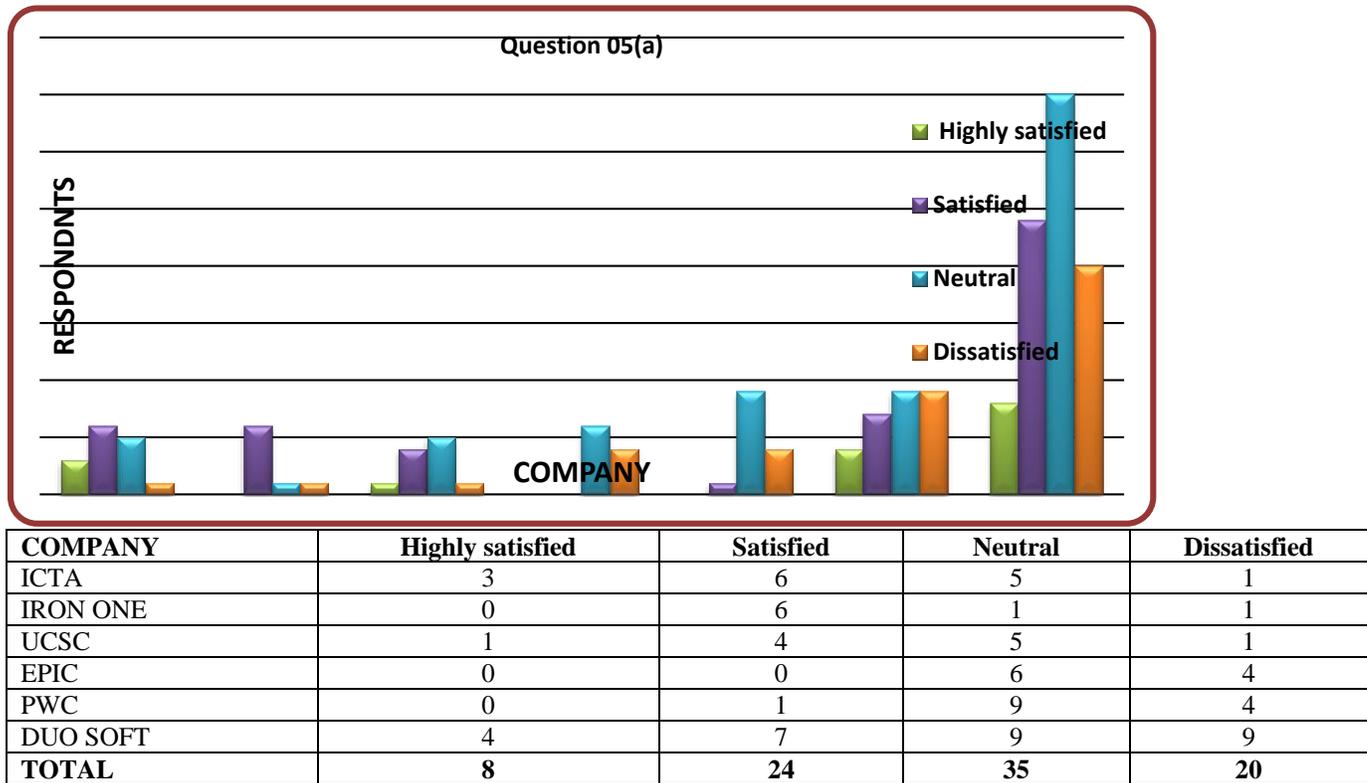
**(Graph):-**

52% (N=46) of the sample felt that they have receive rewards to some extend for their work performed.35 %( n=31) was not quite happy with the rewards that they receive and they thought it’s not adequate. Only 09% (n=8) felt that they do receive the due rewards while 2% did not had an idea about rewards at all.

**Question 05a (Graph):-**

5. a) Satisfaction with the Present incentive Scheme.

**Figure 9 : Question 05a (Graph)**



**(Graph):-**

Only 9 % ( n=8) of the sample were highly satisfied to the incentive scheme.28 % ( n=24) were satisfied while 23 % ( n=20) were dissatisfied with the current incentive scheme. Majority which is 40% ( n=35) were neutral where they did not liked to give a straight answerer.

This reflects that the most Sri Lankan IT companies provide a fairly reasonable incentive scheme to their employees comparing to other industrial sector. Study shows that “incentives” as rewards does provides a fair amount of motivation to present IT employees in Sri Lanka.

**Question 07a:-**

7a) what is the best recognition you have received? \_\_\_\_\_

After going through the respondents replies following factors were identified as the most needed form of recognition by the IT employees in the sample population,

**Appreciation**

Employees mentioned that they would like to be appreciated by their management/supervisors for the work they have done by written or oral recognition. These appreciations can be in following forms,

- I. Employee award, certificates for creativity, hard work etc.
- II. Promotions, assigning more responsibilities.
- III. Just a thanking note

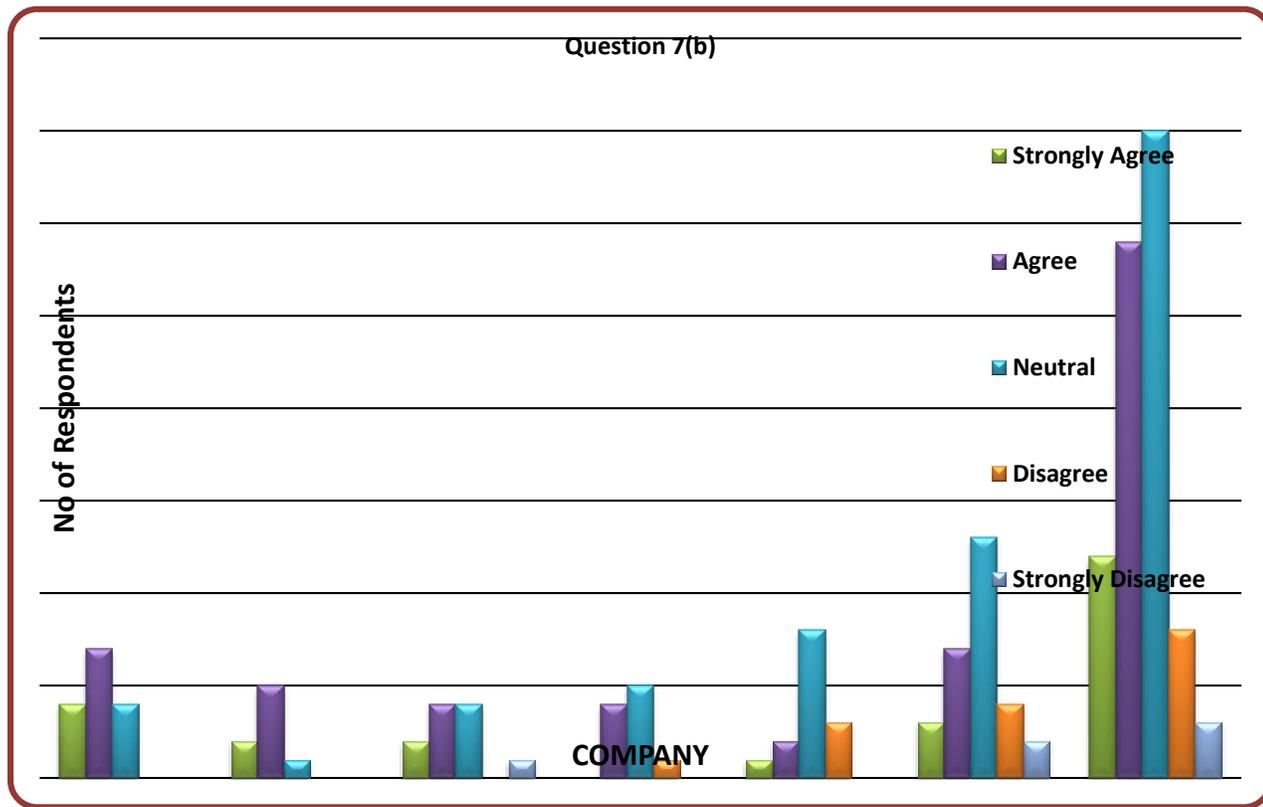
- ✓ Many other employees mentioned that they would like to be appreciated by giving them training and development opportunities.

**Question 07b (Graph):-**

7b) your company is eager (very keen) in recognizing and acknowledging employee’s work.

1. Strongly Agree
2. Agree
3. Neutral
4. Disagree
5. Strongly Disagree

**Figure 10 : Question 07b (Graph)**



COMPANY	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
ICTA	4	7	4		
IRON ONE	2	5	1		
UCSC	2	4	4		1
EPIC		4	5	1	
PWC	1	2	8	3	
DUO SOFT	3	7	13	4	2
<b>TOTAL</b>	<b>12</b>	<b>29</b>	<b>35</b>	<b>8</b>	<b>3</b>

**(Graph):-**

40 % ( n=35) gave a neutral as the answer. Others agreed that their companies are keen in recognizing and acknowledging employee’s work. [14 % ( n=12)- Strongly Agree, 33% ( n=33) Agree]

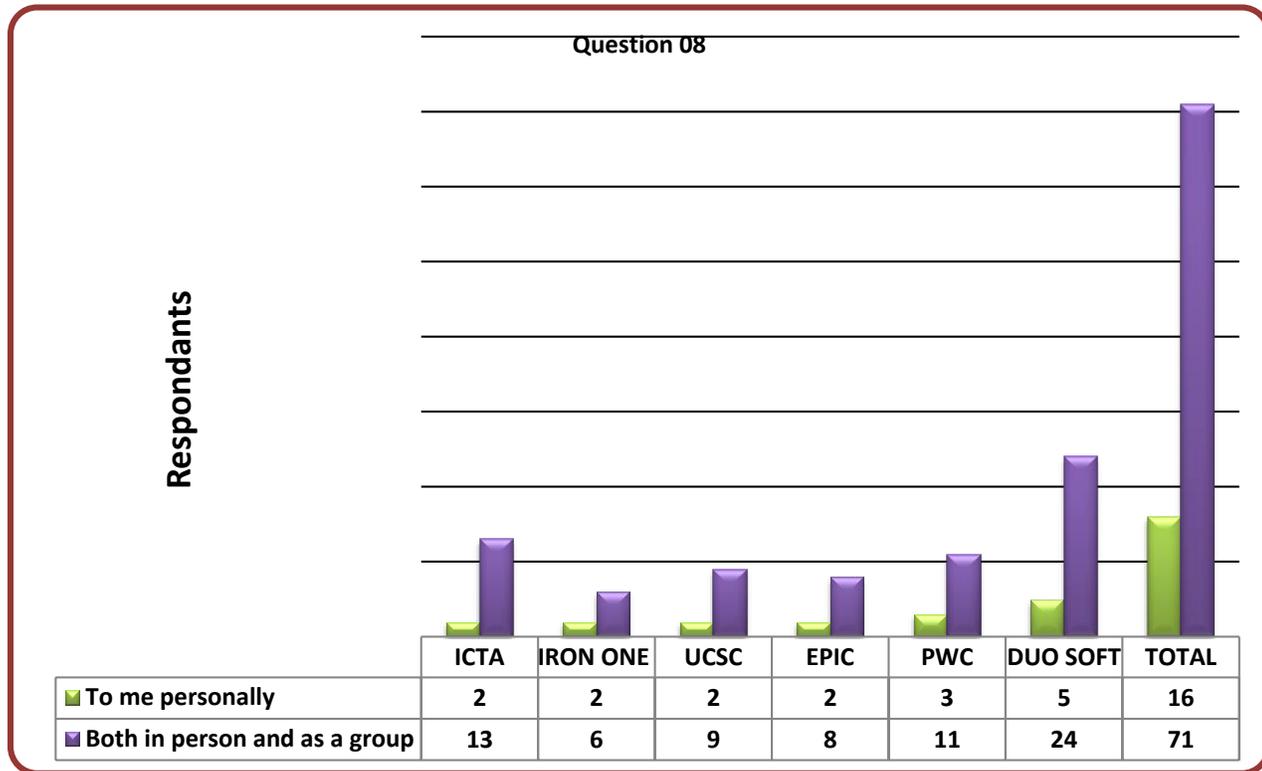
9 % ( n=8) disagreed while 4 % ( n=3) strongly did not agreed that their employers do not make enough attempt in acknowledging employee’s work.

**Question 08 (Graph):-**

8. How do you wish to receive recognitions from your employer?

- To me personally
- Both in person and as a group/team
- Other

**Figure 11 : Question 08 (Graph)**



**(Graph):-**

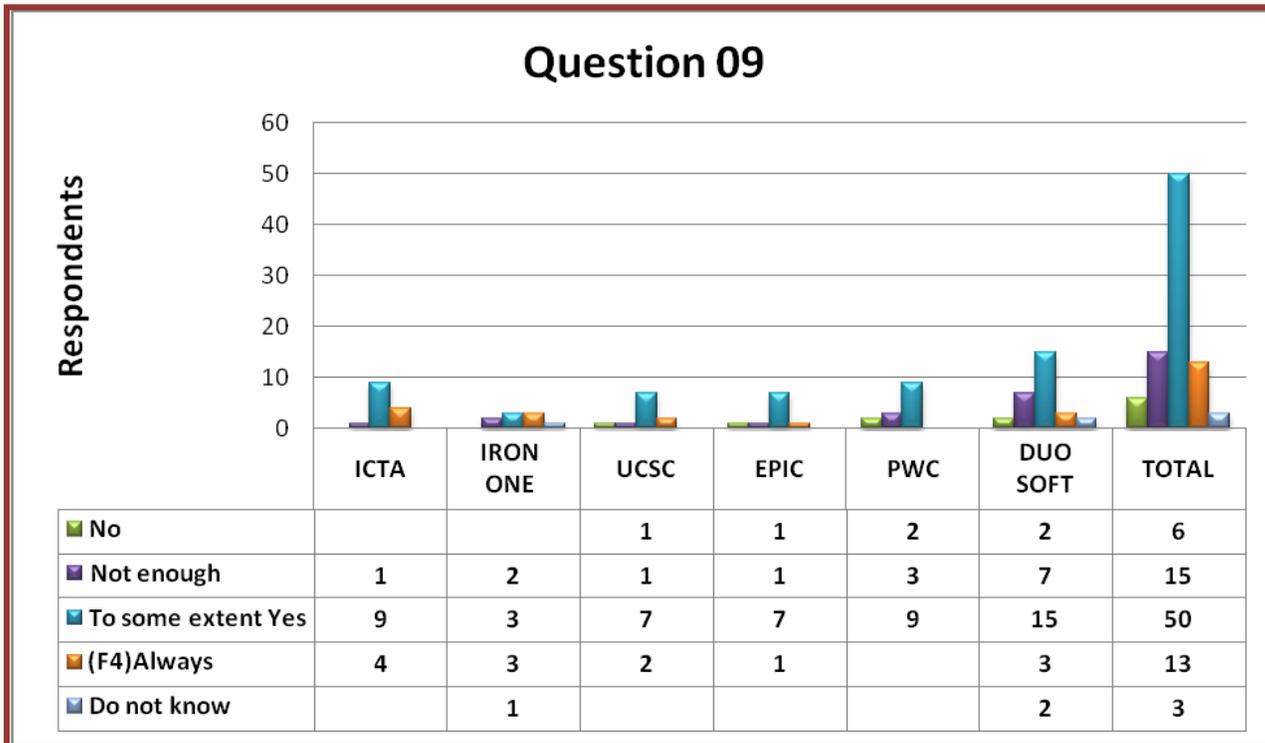
18% (n=16) wishes to receive personal recognition from employers, 82% (n=71) of the sample preferred to receive recognition both person and as a group .This trend is seen in all the companies participated.

**Question 09 (Graph):-**

9. Do you feel that you have received enough recognition for the work you have done?

- No
- Not enough
- To some extent Yes
- Always
- Do not know

Figure 12 : Question 09 (Graph)



(Graph):-

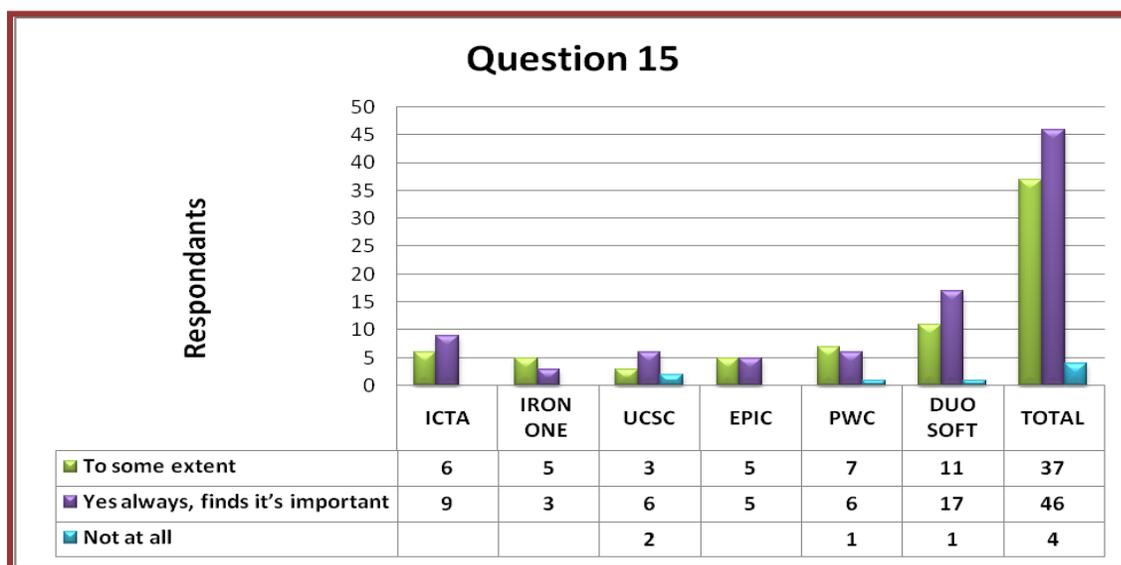
57 % (n=50) of the sample mentioned that they felt to some extent they receive enough recognition for work they do.7% (n=6) of the sample mentioned “NO”, 17% (n= 15) were not happy with the recognition that they receive.3% had no idea about recognition levels.

Question 15 (Graph):-

15.) Do you believe Motivation is the most crucial factor to complete an IT Project successfully?

Not at all ( ) to some extent ( ) Yes always, finds it’s important ( )

Figure 13 : Question 15 (Graph)



(Graph):-

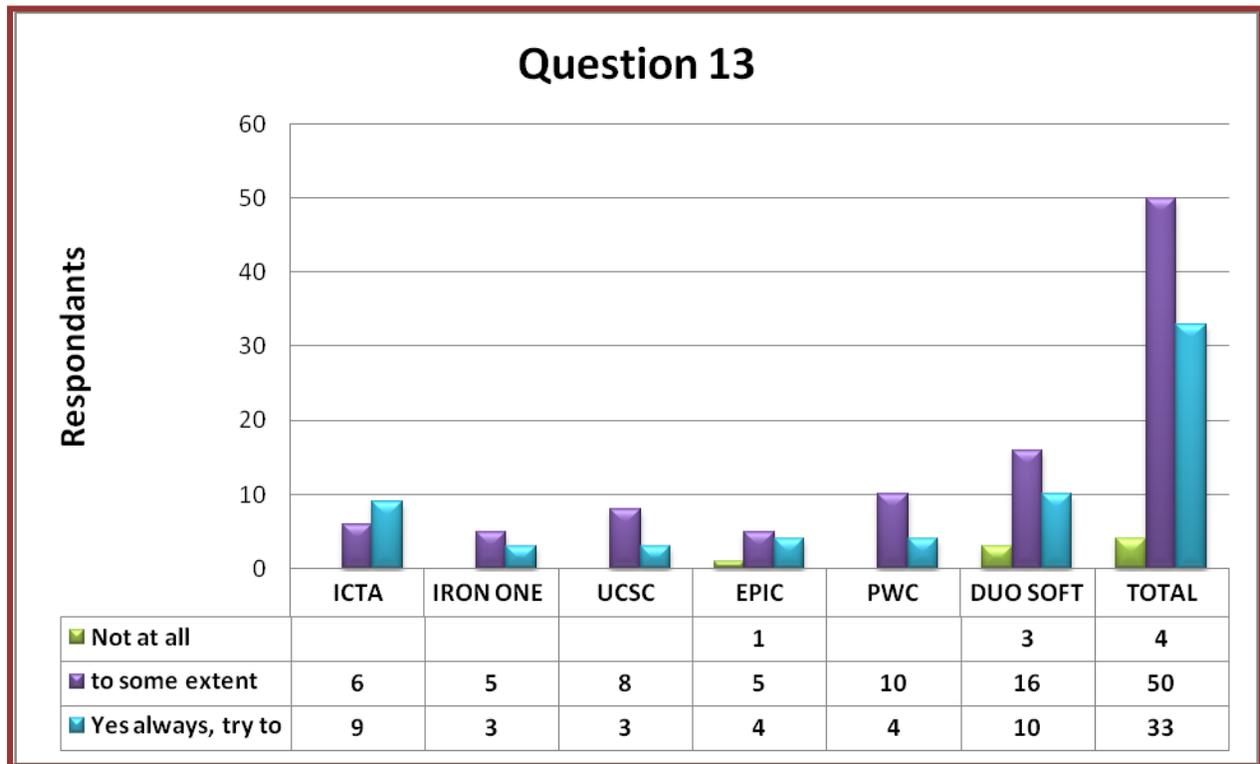
53% (n=46) Agreed that motivation is the most crucial factor, while 42% (n=37) mentioned to some extent they believed motivation affect in completing a project successfully. 2% replied no to this question.

**Question 13 (Graph):-**

13.) Are you motivated to do a good work?

Not at all ( ) to some extent ( ) Yes always, try to ( )

**Figure 14 : Question 13 (Graph)**



**(Graph):-**

4% (n=4) of employees were not motivated at all. 57% (n=50) were motivated to some extent and 39% of the IT employees were motivated to do better work.

**Hypothesis 3**

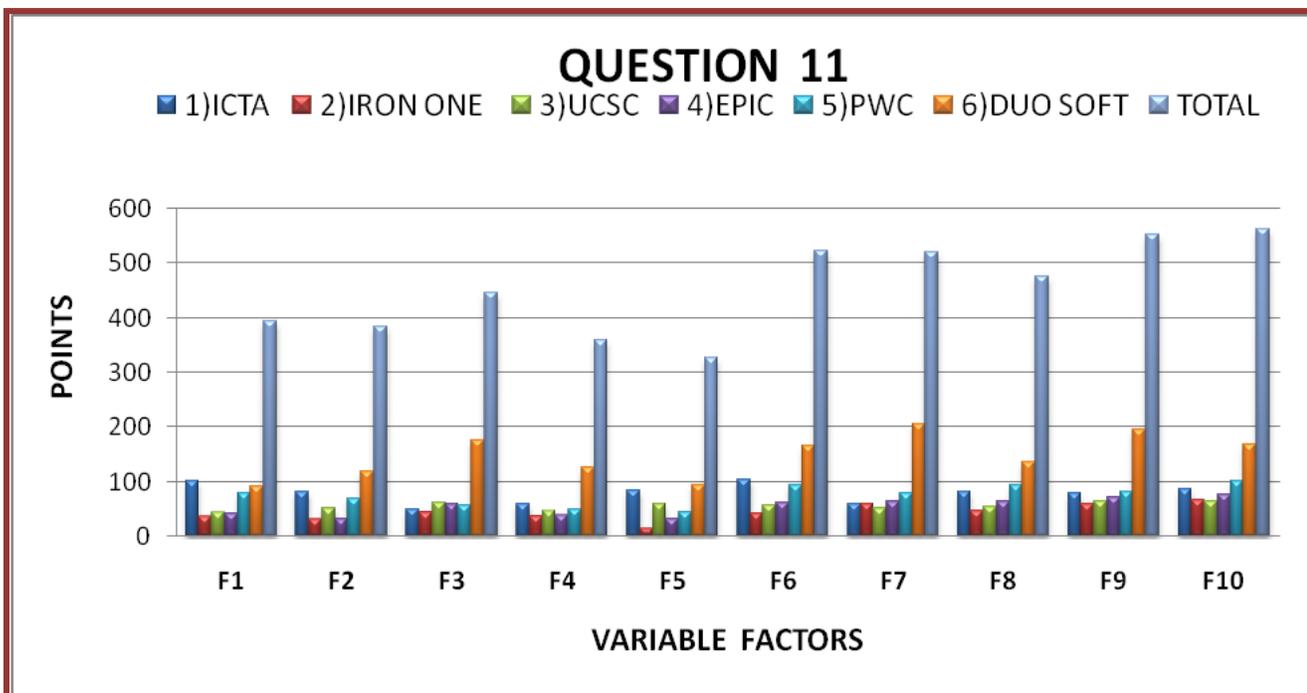
**H3 - Challenging and interesting work causes job motivation.**

The questions relating to this hypothesis	11	1	13	14
	15	16	17	

**Question 11 (Graph):-**

11. Arrange the following motivational factors in order of your preference from 1 to 10, (where 1 represent the best type of motivational factor and 10 represent the least best type of motivational factor)

**Figure 15 : Question 11 (Graph)**



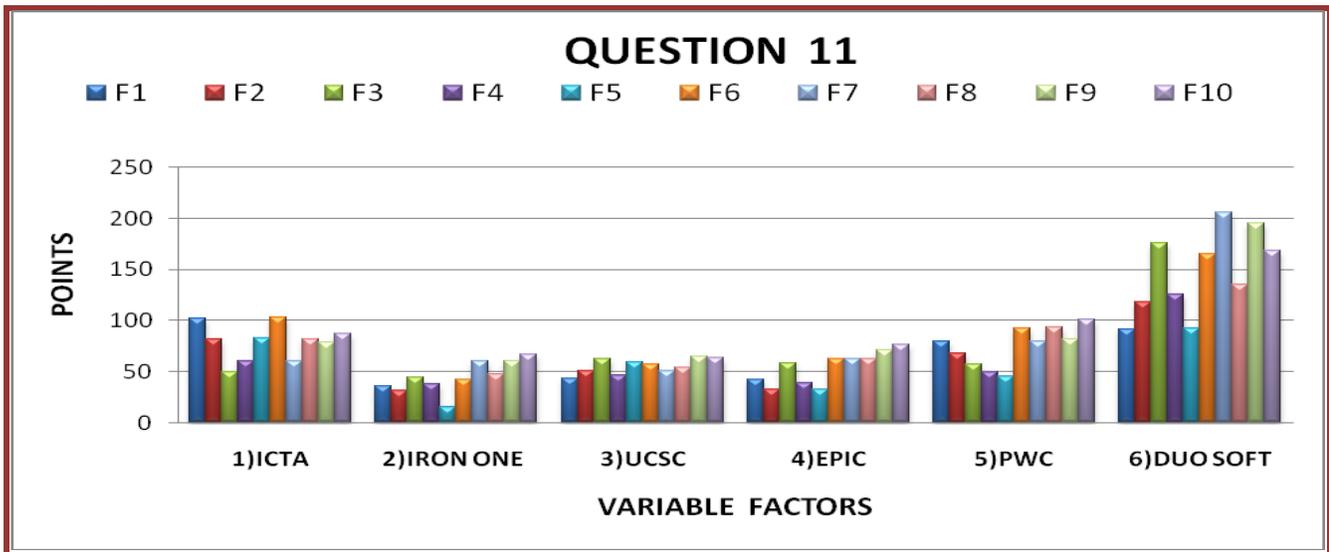
COMPANY	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
1)ICTA	102	82	50	60	83	103	60	82	79	87
2)IRON ONE	36	31	44	38	15	42	60	47	60	67
3)UCSC	43	51	62	46	59	57	51	54	65	64
4)EPIC	42	33	58	39	33	62	63	63	71	76
5)PWC	80	68	57	50	45	93	80	94	82	101
6)DUO SOFT	91	118	176	126	93	165	206	135	195	168
<b>TOTAL</b>	<b>394</b>	<b>383</b>	<b>447</b>	<b>359</b>	<b>328</b>	<b>522</b>	<b>520</b>	<b>475</b>	<b>552</b>	<b>563</b>

- F1-Job Security & Company Image
- F2- Promotion and career development
- F3- Challenging and Interesting work itself
- F4- Full appreciation of work done
- F5- Pay and benefits
- F6- Physical Environment

- F7- Decision making & empowerment
- F8- Flexibility & Relationships with co-workers
- F9- Achievement
- F10- Effective Performance Appraisals

**(Graph):-**

(F4) Full appreciation of work done, (F5) Pay and benefits were the most preferred motivational factors which scored the minimum total points (Highest Rankings).  
 (F7) Decision making & empowerment, (F8) Flexibility & Relationships with co-workers, (F9) Achievement were the least preferred variables which scored the highest total points.  
 (F3) Challenging and Interesting work itself, (F6) Physical Environment was too considered as somewhat preferred variables of motivation.

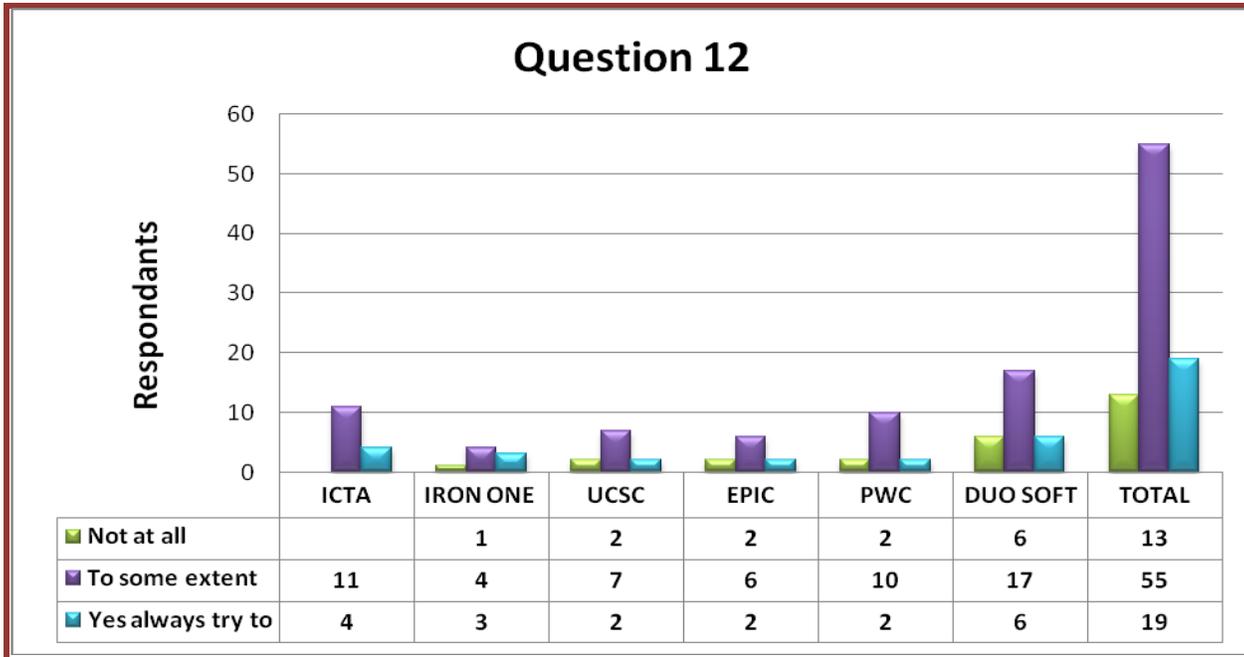


Different motivational factors were chosen as most preferred variable by different companies, Eg-ICTA employees ranked the (F6) Physical Environment as most preferred while Duo soft ranked (F7) Decision making & empowerment as the most preferred factor.

**Question 12 (Graph):-**

12.) How does your employer, try to Motivate you to do a good work?  
 Not at all ( ) to some extent ( ) Yes always, try to ( )

Figure 16 : Question 12 (Graph)



(Graph):-

15 % (n=13) of the sample data mentioned that their employer never try to motivate their good work.63% (n=55) replied that employers make an effort to motivate them to some extend.22% (n=19) stated employers do try to motivate them where possible. Majority of IT companies in Sri Lanka do try to motivate their employees.

**Question 14:-**

14.) Would you do a better job if you were better motivated? \_\_\_\_\_

76% (n=66) out of 87 participants replied Yes.

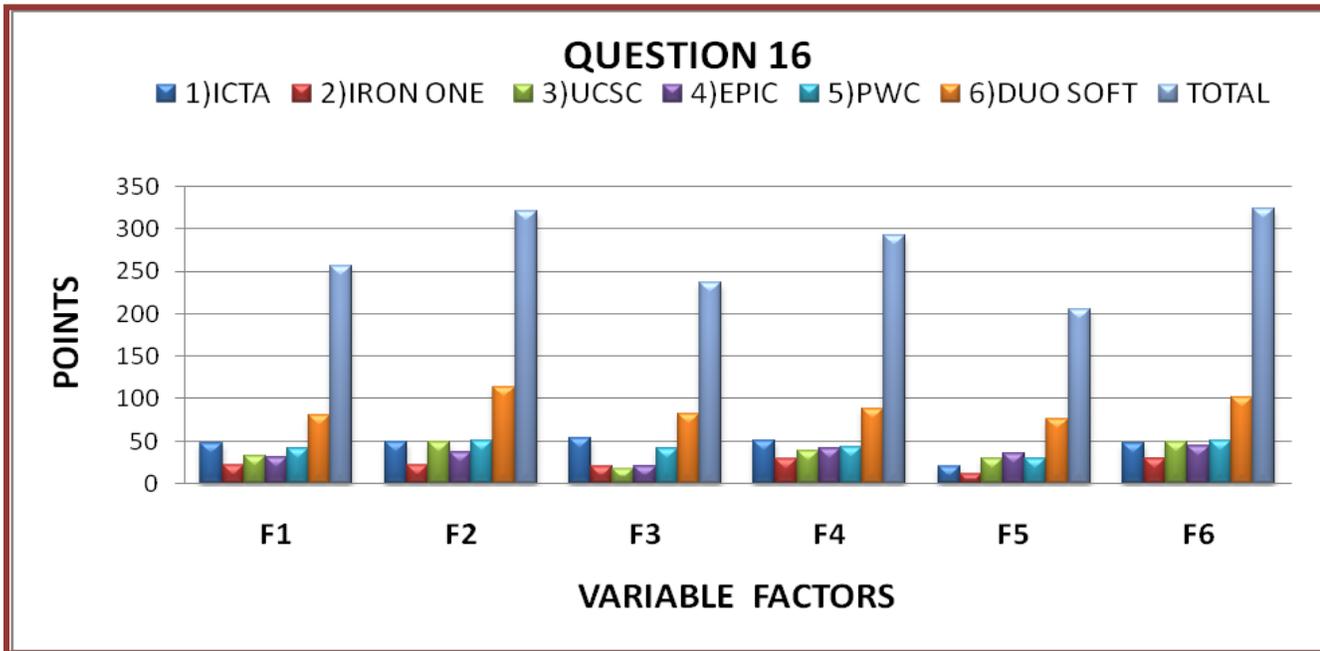
24% (n=20) did not answered this question.

- Majority of IT employees would like to work better and productively if they are better motivated.

**Question 16 (Graph):-**

16. Range the following the most important things for you, **staying with your current job** from 1 to 6, (where 1 is the most important thing and 6 the least important thing :)

Figure 17 : Question 16 (Graph)



COMPANY	F1	F2	F3	F4	F5	F6
1)ICTA	48	49	54	51	20	48
2)IRON ONE	22	22	20	29	12	30
3)UCSC	33	49	18	39	30	49
4)EPIC	31	37	21	41	36	44
5)PWC	41	50	41	43	30	51
6)DUO SOFT	81	114	83	89	77	102
<b>TOTAL</b>	<b>256</b>	<b>321</b>	<b>237</b>	<b>292</b>	<b>205</b>	<b>324</b>

**VARIABLE FACTORS**

- F1- Stability in my working life
- F2- Compensation and monetary rewards
- F3- Further training opportunities and higher education level
- F4- Promotion for higher position
- F5- Interest in the work I am performing
- F6- I see potential growth in the organization I work in

**(Graph):-**

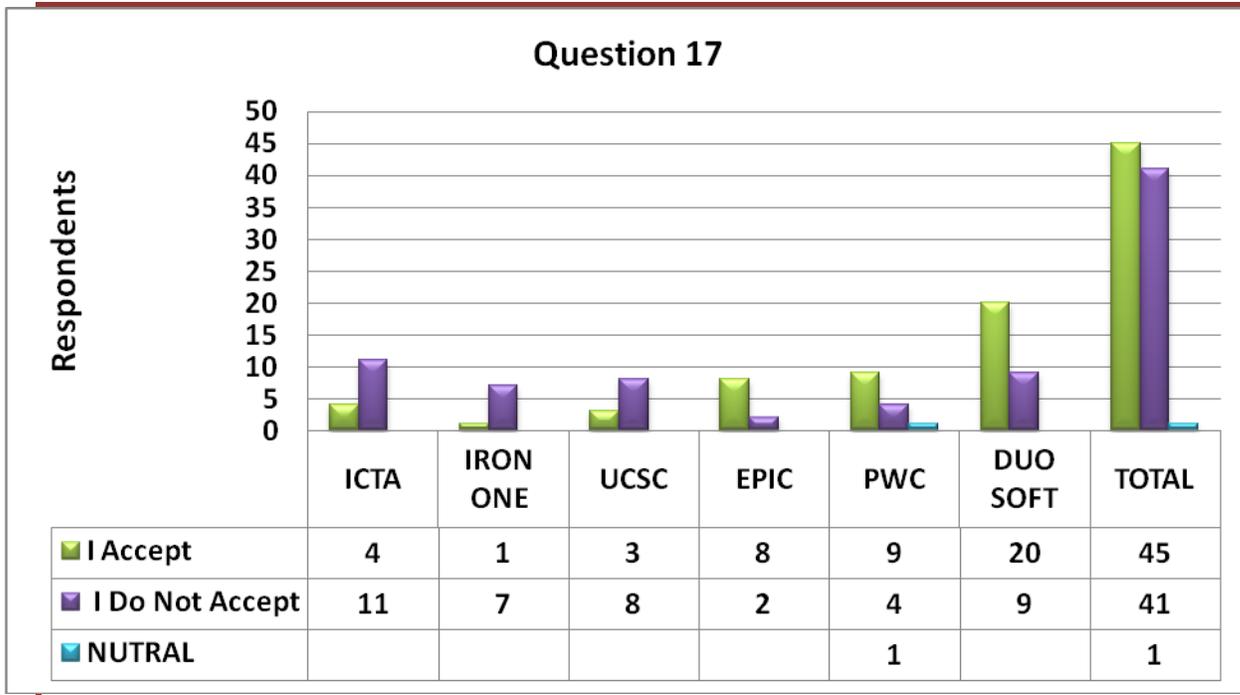
Highest total points which is the least preferred variable was (F2) Compensation and monetary rewards .What IT employees most liked was (F5) Interest in the work I am performing and (F3) Further training opportunities and higher education level. This data is a clear representation which is to say IT employees do not give much of concern to compensation and monetary rewards when it is to compare with career development.

**Question 17 (Graph):-**

17.) If another organization today offers you the same job you have today, would you accept that employment? Please state why you should accept or not accept that employment:

I Accept  I Do Not Accept

**Figure 18 : Question 17 (Graph)**



**(Graph):-**

52 % (n=45) Respondents were willing to accept the job.47 % (n=41) were not willing to accept the job.1% of the sample were neutral to the question.

This is a clear indication where it reflects that most of IT employees would still go for a better job.

# A Simple Computer Model for the Prediction of Chemical Shrinkage and Heat of Hydration of Sugarcane Waste Fiber Ash (SWFA)-Cement Paste

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## ABSTRACT

A computer model coded in Visual Basic and based on the chemical reaction rules of cement hydration reactions was able to predict reasonably the chemical shrinkage and heat of hydration of hydrating cement pastes containing 0 – 20% Sugarcane Waste Fiber Ash (SWFA), and also the 28 day compressive strength values of concrete containing 0 – 20% SWFA by weight of the total binder.

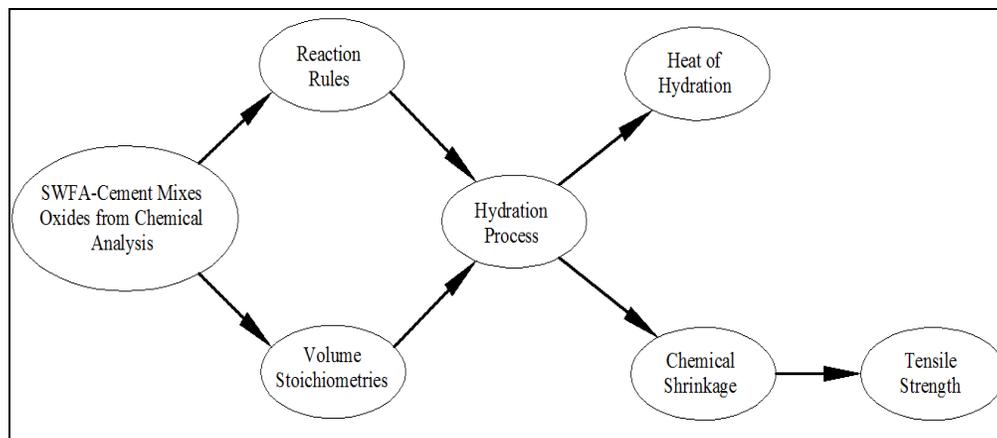
## 1.0 INTRODUCTION AND MODEL CREATION APPROACH

The computer model “SWFAHYD” was developed to analyze hydration of pozzolanic cement containing sugarcane waste fiber ash (SWFA) partially replacing Portland cement by weight percentages of between 0 and 20 percent, with a water binder ration of 0.53.

It was intended to be able to predict the heat of hydration, chemical shrinkage and the strength of resulting concrete mixes made of cement pastes containing SWFA.

The steps in creation of the hydration model, together with experimental interrelations were partially based on work done by Bentz [1].

As summarized in the flow chart Figure 1, the model uses SWFA-Cement oxides from chemical analyses previously carried out in the study to calculate the primary cement phases after which it proceeds to carry out the reactions and predict the final quantities of the cement phases at the chosen age of the cement paste. For the model the chosen paste age is decided upon by the user, between 1 hour and 24 hours after mixing. From these final quantities of the cement phases, heat of hydration and chemical shrinkage are calculated. Based on the chemical shrinkage, the tensile strengths of the resulting concrete mixes are also calculated, as illustrated schematically in Figure 1.



**Figure 1** Flow diagram summarising the modeling program for predicting heat of hydration and chemical shrinkage of SWFA-Cement paste, and tensile strength

The model outputs were then compared with the corresponding laboratory results of tensile splitting, heat of hydration and chemical shrinkage. Details of the model are outlined in later sections of this document.

### Model Cement Phases

12 cement phases were considered in the model, namely;

1. Tricalcium Silicate (C<sub>3</sub>S)
2. Dicalcium Silicate (C<sub>2</sub>S)
3. Tricalcium Aluminate (C<sub>3</sub>A)
4. Tetracalcium Alumino Ferrite (C<sub>4</sub>AF)
5. Gypsum (CSH<sub>2</sub>)
6. Calcium Silicate Hydrate (C<sub>1.7</sub>SH<sub>4</sub>)
7. Ettringite (C<sub>6</sub>AS<sub>3</sub>H<sub>32</sub>)
8. Monosulfate (C<sub>4</sub>ASH<sub>12</sub>)
9. Hydrogarnet (C<sub>3</sub>AH<sub>6</sub>)
10. Calcium Hydroxide (CH)
11. Iron Hydroxide (FH<sub>3</sub>)
12. Water (H)

Table 1 summarizes properties of these initial phases [1]

**Table 1** Selected properties of minerals contained in cement [1]

Name of Mineral	Chemists Notation	Chemical Formula	Molar Mass (g/mole)	Molar Volume (cm <sup>3</sup> /mole)	Heat of Formation (kJ/mole)	Density (Mg/m <sup>3</sup> )
Tricalcium Silicate	C <sub>3</sub> S	3CaO. SiO <sub>2</sub>	228.33	71.00	-2,927.82	3.21
Dicalcium Silicate	C <sub>2</sub> S	2CaO. SiO <sub>2</sub>	172.25	52.00	-2,311.60	3.28
Tricalcium Aluminate	C <sub>3</sub> A	3CaO.Al <sub>2</sub> O <sub>3</sub>	270.20	89.10	-3,587.80	3.03
Tetracalcium Alumino Ferrite	C <sub>4</sub> AF	4CaO.Al <sub>2</sub> O <sub>3</sub> . Fe <sub>2</sub> O <sub>3</sub>	485.96	128.00	-5,090.30	3.73
Gypsum	CSH <sub>2</sub>	CaO. SiO <sub>2</sub> .2H <sub>2</sub> O	152.20	74.20	-2,022.60	2.32
Calcium Silicate Hydrate	C <sub>1.7</sub> SH <sub>4</sub>	1.7 CaO. SiO <sub>2</sub> .4 H <sub>2</sub> O	227.49	108.00	-3,283.00	2.12
Calcium Hydroxide	CH	CaO. H <sub>2</sub> O	74.10	33.10	-986.10	2.24
Ettringite	C <sub>6</sub> AS <sub>3</sub> H <sub>32</sub>	6 CaO. Al <sub>2</sub> O <sub>3</sub> .3 SiO <sub>2</sub> .32H <sub>2</sub> O	1,195.22	735.00	-17,539.00	1.70
Monosulfate	C <sub>4</sub> ASH <sub>12</sub>	4 CaO. Al <sub>2</sub> O <sub>3</sub> . SiO <sub>2</sub> .12H <sub>2</sub> O	602.56	313.00	-8,778.00	1.99
Hydrogarnet	C <sub>3</sub> AH <sub>6</sub>	3 CaO. Al <sub>2</sub> O <sub>3</sub> . 6H <sub>2</sub> O	378.30	150.00	-5,548.00	2.52
Iron Hydroxide	FH <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub> .3H <sub>2</sub> O	213.73	69.80	-823.90	3.00
Water	H	H <sub>2</sub> O	18.02	18.00	-285.83	1.00

Pure SWFA and pure cement samples had been analyzed for chemical composition using XRF.

### Chemical Processes

The main phases at the start of the reaction were created using the Bogue calculation. An adjustment was made on these equations to cater for gypsum by deducting  $0.7xSO_3$  from the total CaO [2].  $SO_3$  is considered in the Bogue calculation because it is a component of gypsum ( $CaO \cdot SO_3 \cdot 2H_2O$ ), one of the main cement phases. Other oxides e.g.  $TiO_2$ ,  $Na_2O$  and  $K_2O$  are not components of the main cement phases thus are not considered in the Bogue calculation.

The oxides used as model inputs were derived from chemical analyses of the cement and the ash separately. Oxides percentages for the SWFA-Cement mixes (ie 4, 8, 12, 16 & 20%) were calculated from the laboratory determined oxides percentages of the pure SWFA and pure cement. Table 2 gives these percentages.

**Table 2** Percentage of oxides in various samples used as inputs to the model

% Cement Replacement	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	CaO	MgO	Na <sub>2</sub> O	K <sub>2</sub> O	TiO <sub>2</sub>	MnO	Fe <sub>2</sub> O <sub>3</sub>	SO <sub>3</sub>	LOI	TOTAL
0%	17.96	4.07	60.87	4.00	0.23	0.48	0.08	0.05	2.93	2.60	5.82	99.09
4%	19.92	4.26	58.55	3.87	0.24	0.55	0.11	0.08	3.01	2.51	5.96	99.06
8%	21.88	4.45	56.24	3.74	0.25	0.62	0.14	0.11	3.08	2.42	6.10	99.03
12%	23.84	4.64	53.92	3.61	0.25	0.69	0.17	0.13	3.16	2.34	6.24	99.01
16%	25.81	4.83	51.61	3.48	0.26	0.76	0.20	0.16	3.24	2.25	6.38	98.98
20%	27.77	5.02	49.29	3.35	0.27	0.83	0.23	0.19	3.31	2.16	6.52	98.95
100%	67.00	8.82	2.98	0.75	0.42	2.25	0.83	0.75	4.85	0.40	9.34	98.39

The modeling of the chemical reactions involved in the hydration process was then carried out. Results of the chemical analyses initially carried out formed the inputs into this process. The model sought to predict the hydration reactions in the first 24 hours after the preparation of the cement mix pastes.

Four main phases in cement were considered at the start of the analysis. This was in line with Bogue's calculation. These are  $C_3S$ ,  $C_2S$ ,  $C_3A$ , and  $C_4AF$ . From the chemical notations, the most critical element is Calcium Oxide (Lime). The quantity of this was assumed to control the amount of hydration that will occur since the w/c ratio of 0.53 more than adequately provided for the water required for the hydration process.

Due to the fairly high w/c ratio used in this study (0.53), it was assumed that there is sufficient water, since full hydration of cement requires a w/c ratio of about 0.25 [3]. The limiting components were therefore the other elements (phases) other than water. This is a simplistic approach because some of the water supplied as w/c ratio is known to be used for wetting the aggregates, among other uses, and therefore the exact amount of water available for the hydration would be less than the 0.53 provided.

### Reaction Rules

The following rules were adopted by model SWFAHYD in carrying out the reactions:

#### Reactants shared by more than one reaction

Reactants in this discussion refer to the phases that react and are consumed to produce other phases referred to as products. At the start of the hydration process, the main reactants are  $C_3S$ ,  $C_2S$ ,  $C_3A$ ,  $C_4AF$  and H, then later in the reactions;  $CSH_2$  and  $C_6AS_3H_{32}$ .

**Table 3** Relative quantities allocated to reactions sharing phases

Reaction	Percentage Allocated
<b>C<sub>3</sub>A Sharing Reactions</b>	
$C_3A + 6H \rightarrow C_3AH_6$	89%

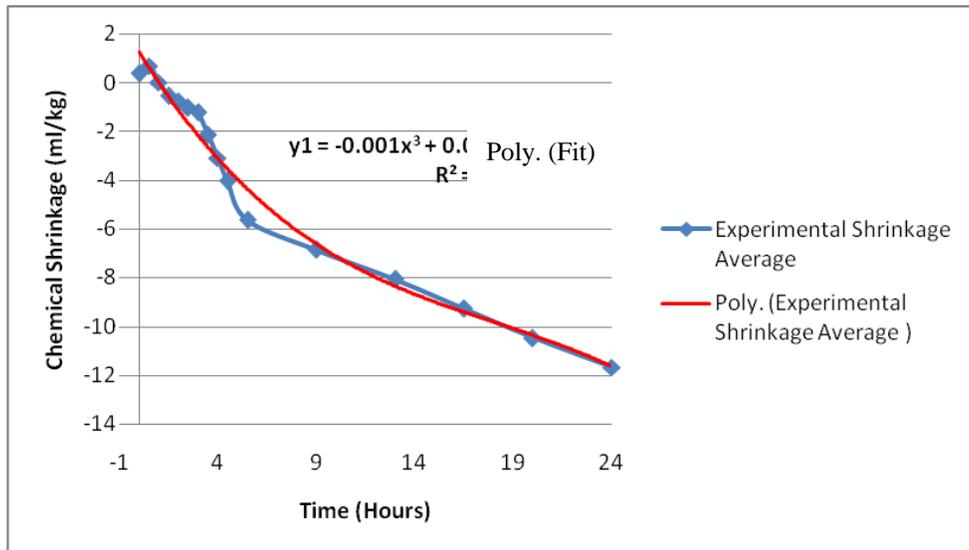
$C_3A + 3CSH_2 + 26H \rightarrow C_6AS_3H_{32}$	10%
$2C_3A + C_6AS_3H_{32} + 4H \rightarrow 3C_4ASH_{12}$	1%
<b>C<sub>4</sub>AF Sharing Reactions</b>	
$C_4AF + 3CSH_2 + 30H \rightarrow C_6AS_3H_{32} + CH + FH_3$	5%
$2C_4AF + C_6AS_3H_{32} + 12H \rightarrow 3C_4ASH_{12} + 2CH + 2FH_3$	5%
$C_4AF + 10H \rightarrow C_3AH_6 + CH + FH_3$	90%
<b>CSH<sub>2</sub> Sharing Reactions</b>	
$C_3A + 3CSH_2 + 26H \rightarrow C_6AS_3H_{32}$	95%
$C_4AF + 3CSH_2 + 30H \rightarrow C_6AS_3H_{32} + CH + FH_3$	5%
<b>C<sub>6</sub>AS<sub>3</sub>H<sub>32</sub> Sharing Reactions</b>	
$2C_3A + C_6AS_3H_{32} + 4H \rightarrow 3C_4ASH_{12}$	90%
$2C_4AF + C_6AS_3H_{32} + 12H \rightarrow 3C_4ASH_{12} + 2CH + 2FH_3$	10%

Reactions were carried out in reverse in the model such that the products took molar quantities of the respective limiting reactants. The user inputs the desired age of the paste at the stage of entering values for the initial oxides. The model then uses this to calculate the phase quantities at the chosen time, by limiting the amount of reaction that occurs. This, the model does by calculating and allowing only a fraction of the initial cementing phases to react. The value of the fraction is given by Equation 1.

$$\text{Available Fraction} = \frac{\text{Selected Age (Hours)}}{24 \text{ (Hours)}} \quad (1)$$

This relationship assumes a linear behavior of hydration with time. This assumption was found not to agree with the laboratory tests carried out on SWFA-Cement paste for chemical shrinkage, which showed a higher reaction rate at early ages which then slowed down.

To capture the acceleration of the hydration reaction at early hours of the reaction, laboratory shrinkage results were averaged and plotted (Figure 2). From the graph a formula was derived (Equation 2) and adjusted to give an output of unity (1.0) at a value input of  $x = 24$ , where  $x$  is the age of the paste in hours (Equation 3).



**Figure 2** Curve fitting of values of chemical shrinkage obtained from experimental results

$$y_1 = -0.001x^3 + 0.057x^2 - 1.306x + 1.259 \quad (2)$$

$$y_2 = -0.0000902x^3 + 0.00514x^2 - 0.1178x + 0.113 \quad (3)$$

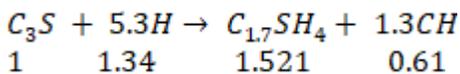
Where  $y_1$  = Average shrinkage directly from curve fitted on the experimental results  
 $y_2$  = Average shrinkage after adjustment such that  $y_2 = 1.0$  when  $x = 24$   
 $x$  = Paste Age (Hours)

Total heat of hydration and chemical shrinkage at the chosen time are then calculated based on the phase quantities consumed and formed.

**Silicate Reactions**

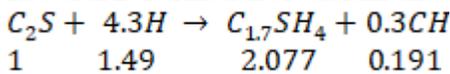
*NB: Values indicated below the reaction equations are volume stoichiometries*

**Reaction 1: Formation of calcium silicate hydrate from the hydration of tricalcium silicate [1]:**



For every mole of tricalcium silicate ( $C_3S$ ) reacted, the model created 1 mole of calcium silicate hydrate ( $C_{1.7}SH_4$ ), 1.3 moles of calcium hydroxide (CH). The reaction used 5.3 moles of water

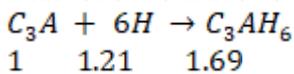
**Reaction 2: Formation of calcium silicate hydrate from the hydration of dicalcium silicate:**



For every mole of dicalcium silicate ( $C_2S$ ) reacted, the model created 1 mole of calcium silicate hydrate ( $C_{1.7}SH_4$ ), 0.3 moles of calcium hydroxide (CH), and 4.3 moles of water were used.

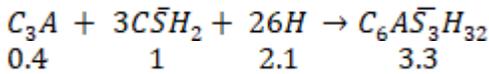
**Aluminate and Ferrite Reactions**

**Reaction 3: Formation of hydrogarnet from hydration of tricalcium aluminate [1]:**



The model creates the same number of hydrogarnet ( $C_3AH_6$ ) moles, as the number of moles of tricalcium aluminate available for this reaction. For every mole of hydrogarnet formed, the model uses 6 moles of water.

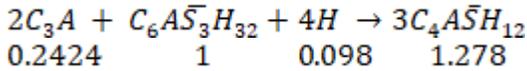
**Reaction 4: Formation of ettringite from hydration of tricalcium aluminate & gypsum:**



For the formation of ettringite ( $C_6AS_3H_{32}$ ), the model checks for the limiting reactant i.e. the smaller of either;  $C_3A$  moles available for this reaction, or 1/3 times the moles of gypsum ( $CSH_2$ ) available for this reaction.

The model then creates ettringite quantities based on this limiting reactant ie moles of ettringite formed in this reaction to be equal to either moles of  $C_3A$  or 0.33 times number of moles of gypsum reacted. Then for every mole of ettringite formed, the model uses 26 moles of water.

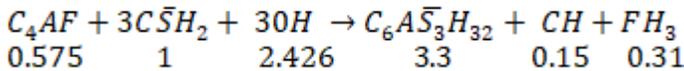
**Reaction 5: Formation of monosulfate from the hydration of tricalcium aluminate, and ettringite:**



For the formation of monosulfate ( $C_4ASH_{12}$ ), the model checks for the limiting reactant i.e. the smaller of either;  $C_3A$  moles available for this reaction, or 1/2 times the moles of ettringite ( $C_6AS_3H_{32}$ ) available for this reaction.

The model then creates monosulfate quantities based on this limiting reactant ie moles of monosulfate formed in this reaction to be equal to either 3 times the moles of ettringite reacted or 1.5 times the moles of tricalcium aluminate. For every mole of monosulfate formed, the model uses 1.33 moles of water

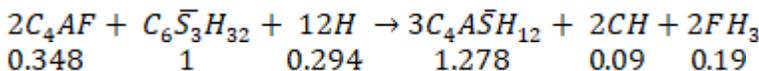
**Reaction 6: Formation of ettringite, calcium hydroxide, and iron hydroxide, from the hydration of tetracalcium aluminoferrite and gypsum:**



For the formation of ettringite ( $C_6AS_3H_{32}$ ), calcium hydroxide (CH), and iron hydroxide ( $FH_3$ ) the model checks for the limiting reactant i.e. the smaller of either;  $C_4AF$  moles available for this reaction, or 1/3 times the moles of gypsum ( $CSH_2$ ) available for this reaction.

The model then creates ettringite, CH and  $FH_3$  based on the limiting reactant ie moles of ettringite, CH and  $FH_3$  formed to be equal to  $C_4AF$  moles reacted or 1/3 of gypsum moles reacted. The model then uses 30 moles of water for every mole of ettringite formed.

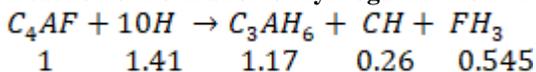
**Reaction 7: Formation of monosulfate from the hydration of tetracalcium aluminoferrite and ettringite:**



For the formation of monosulfate ( $C_4ASH_{12}$ ), calcium hydroxide (CH), and iron hydroxide ( $FH_3$ ) via the hydration of tetracalcium aluminoferrite and ettringite, the model checks for the limiting reactant i.e. the smaller of either; 1/2 times  $C_4AF$  moles available for this reaction, or the moles of ettringite ( $C_6AS_3H_{32}$ ) available for this reaction.

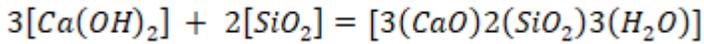
The model then creates monosulfate, CH and  $FH_3$  based on the limiting reactant ie for every mole of  $C_4AF$  reacted, 1.5 moles of monosulfate, 1 mole of CH and 1 mole of  $FH_3$  are formed, and for every mole of ettringite reacted, 3 moles of monosulfate, 2 moles of CH and 2 moles of  $FH_3$ . The model then uses 4 moles of water for every mole of ettringite formed.

**Reaction 8: Formation of hydrogarnet from the hydration of tetracalcium aluminoferrite:**



For every mole of tetracalcium aluminoferrite reacted, the model creates one mole of hydrogarnet, calcium hydroxide and iron hydroxide, and uses 10 moles of water.

**Reaction 9: Formation of calcium silicate hydrate from the reaction of calcium hydroxide and silica:**



Three moles of calcium hydroxide react with two moles of silica to form one mole of calcium silicate hydrate.

**Chemical Shrinkage**

The model uses molar volume values to calculate the chemical shrinkage. Initially total volume of the reactants is calculated as the volume of the formed main phases plus that of the oxides remaining after formation of the main phases. The molar volumes of the remaining oxides (after formation of the main phases) is calculated from the molar masses and densities of the oxides and are as given in Table 4 [1].

**Table 4** Molar volumes of main oxides

CCN	Actual Formula	Name	Molar Mass (g)	Density (g/cm3)	Molar Vol
C	CaO	Calcium oxide or lime	56.08	3.35	16.74
S	SiO <sub>2</sub>	Silicon dioxide or silica	60.09	2.648	22.69
A	Al <sub>2</sub> O <sub>3</sub>	Aluminium oxide or alumina	101.96	4.025	25.33
F	Fe <sub>2</sub> O <sub>3</sub>	Iron oxide	159.68	5.242	30.46

The total volume of the created phases and remaining (unreacted) oxides is calculated at the start and end of the hydration reaction calculations. This is then used to calculate the chemical shrinkage as the change in total volume per unit mass of the cement, given by Equation 4:

$$Shrinkage = \frac{V_o - V_{final}}{100} \quad (\text{per gram}) \quad (4)$$

Where  $V_o$  = total initial volume  
 $V_{final}$  = total final volume

The denominator value in the shrinkage equation is used since the model assumes 100g of cement. The shrinkage is calculated in cm<sup>3</sup>/g of cement.

**Heat of Hydration**

The model calculates the heat of hydration by using Equation 5 [4].

$$H_{cem} = 500p_{C_3S} + 260p_{C_2S} + 866p_{C_3A} + 420p_{C_4AF} + 64p_{SiO_2} + 1186p_{FreeCaO} + 850p_{MgO} \quad (5)$$

Where:

$H_{cem}$  = total heat of hydration of the cement (Joule/g),  
 $p_i$  = weight ratio of i-th compound in terms of the total cement content

Only the first four terms of the Equation 5, free CaO (assumed as 1% of the total cementing material weight [2]) and MgO are considered in the model. The used quantities of the initial four phases are calculated, the weights derived from the number of moles (since the reactions were in number of moles), their percentage of the initial weight calculated and put into Equation (5) to give the heat of hydration released.

**Water**

The model also calculates the water quantities used in each hydration reaction based on the amount of the limiting reactant used. The model then sums up the water quantities used in all the reactions and outputs this in moles.

**Concrete Strength Predictions**

The model uses the calculated chemical shrinkage and an assumed value of bulk modulus of concrete of 9.6 GPa (24 hour bulk modulus of concrete class 25) to calculate the strength of the concrete mixes using equation 4.8 derived from energy principles [5].

$$\Delta W_B = -\frac{K}{2} \cdot (\Delta\theta)^2 \cdot V_o = \sigma_t \cdot V_o \quad (6)$$

OR

$$\sigma_t = \frac{-K}{2} (\Delta\theta)^2 \quad (7)$$

Where

- $\Delta W_B$  = bond energy
- $K$  = Bulk modulus (*assumed = 9.6 GPa in the computer model*)
- $\Delta\theta$  = relative volume change (*derived from the model*)
- $V_o$  = Initial volume (*derived from the model*)
- $\sigma_t$  = uniform directed bond strength (tensile strength) of the material

The bulk modulus value of 9.6GPa, and degree of hydration in the first 24 hours assumed to be 30% of total possible hydration [6] are fixed in the model so as to restrict the variables only to time variation within the first 24 hours and oxide percentages. The model outputs for tensile strength at 24 hours were compared to laboratory tensile splitting results for 24 hour old cylinder samples.

### Model User Interface

The model provides the user with an input window for entering the values of the main oxides and the age of the paste in hours. The model then runs the analyses and gives outputs at the user's prompting. The model also allows the user to go back to the input window, change a parameter, say the age of the paste, and reanalyze for revised outputs.

### Model Summary

The model processes are summarized in the flow chart shown in Figure 3.

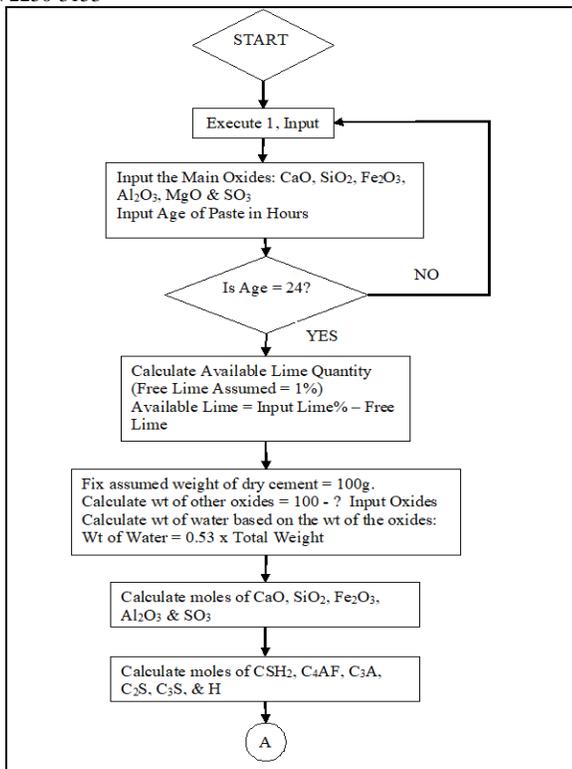
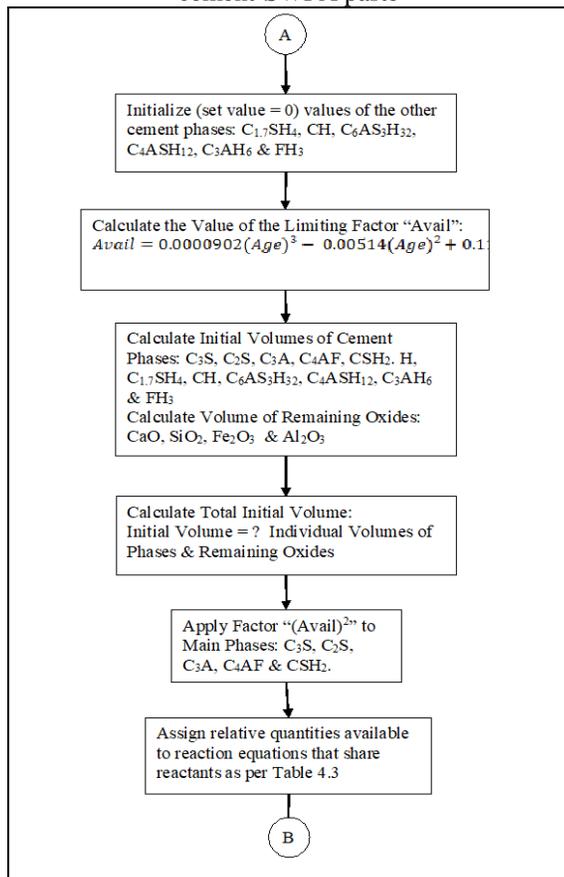
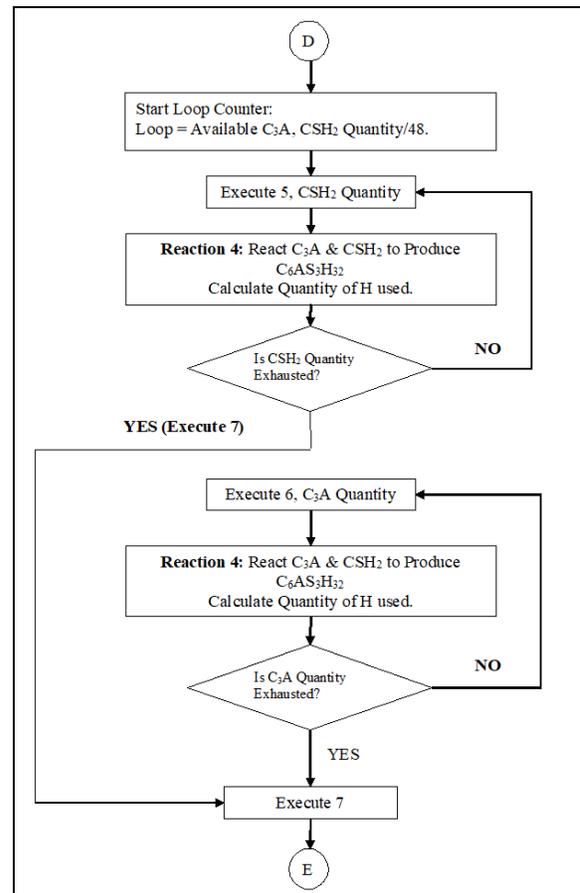
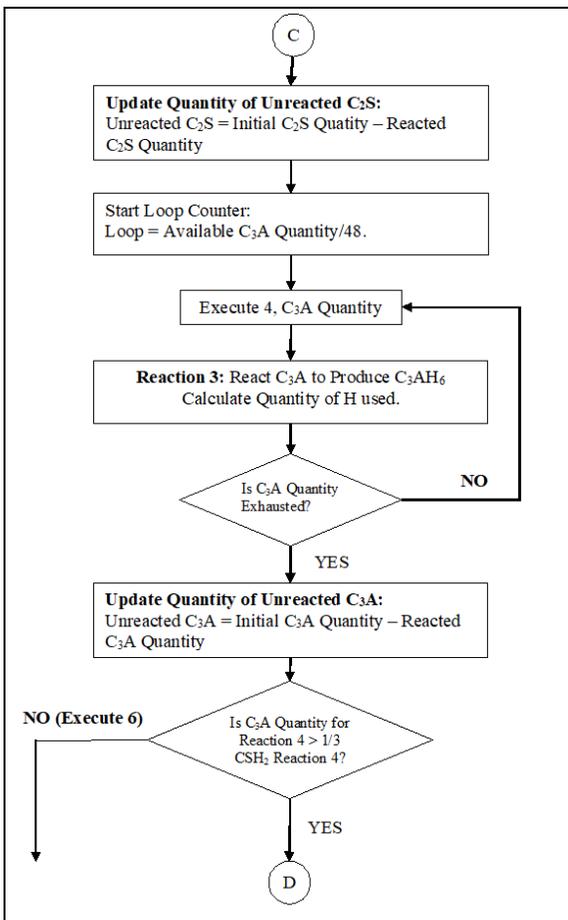
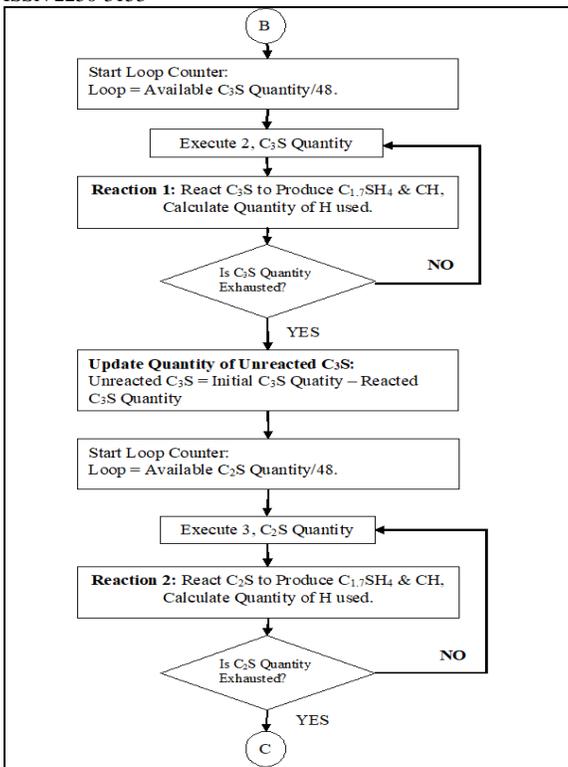
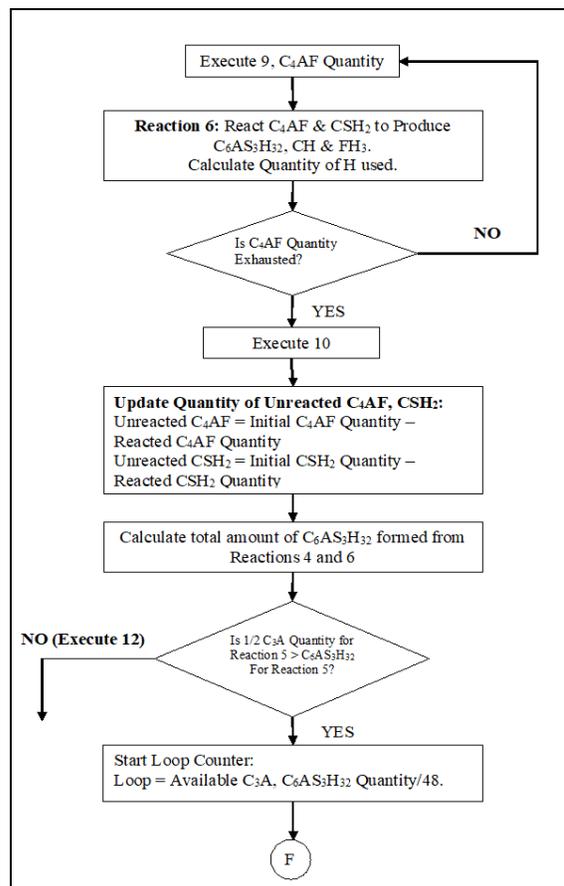
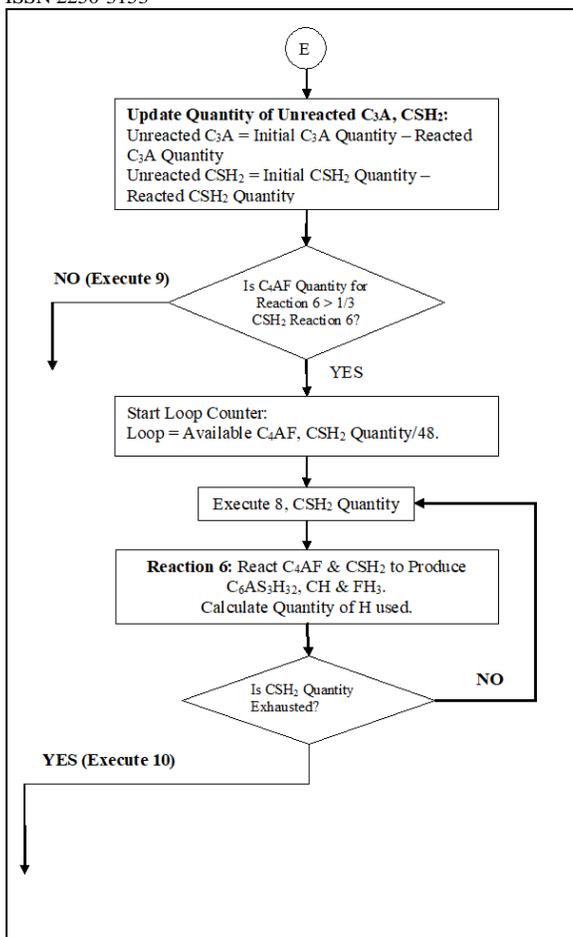
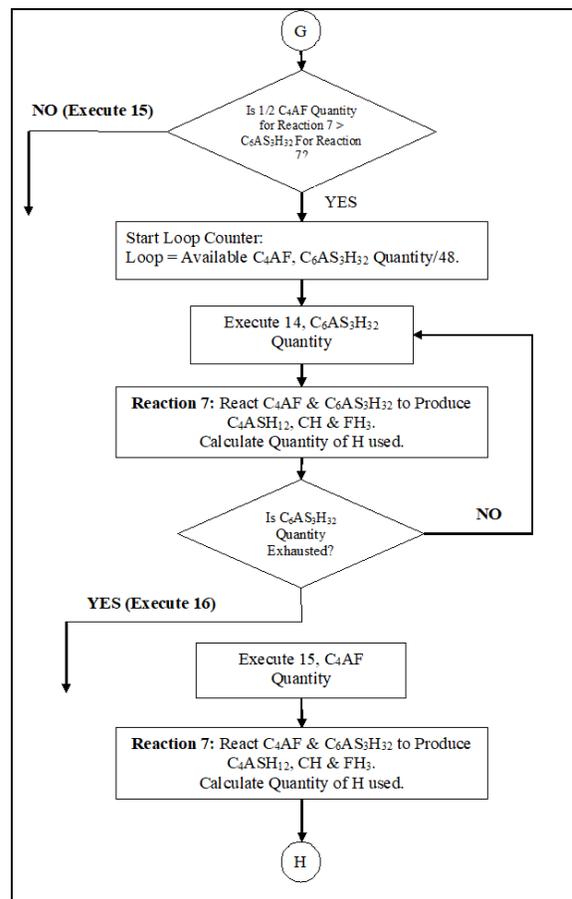
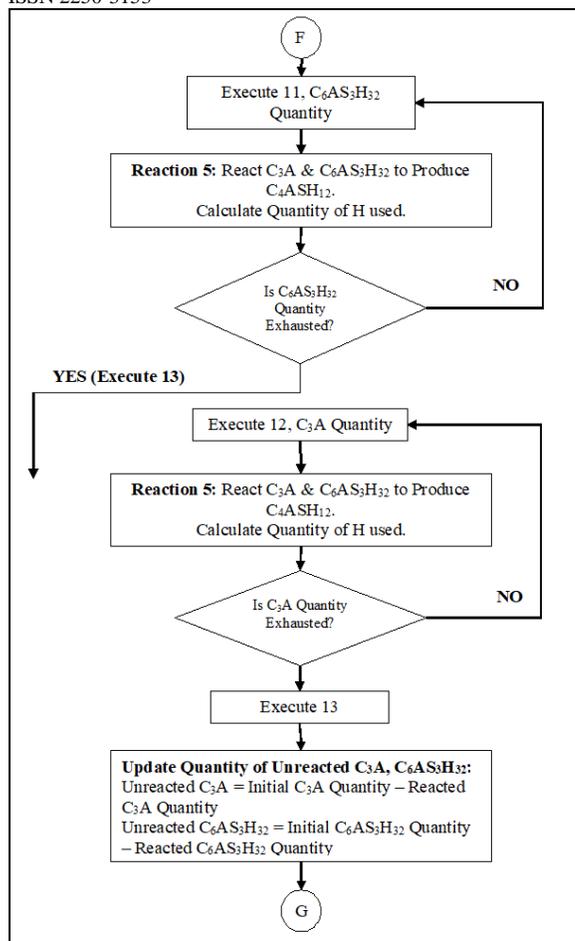


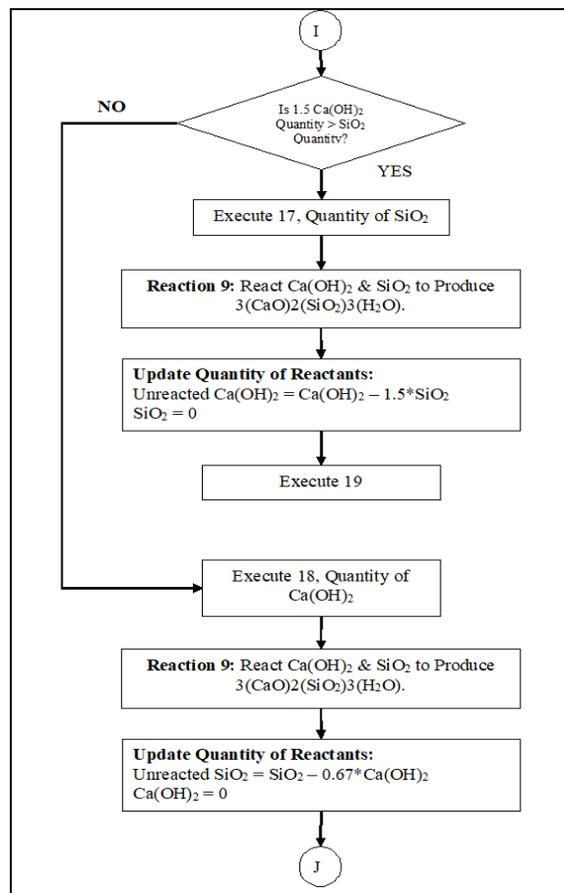
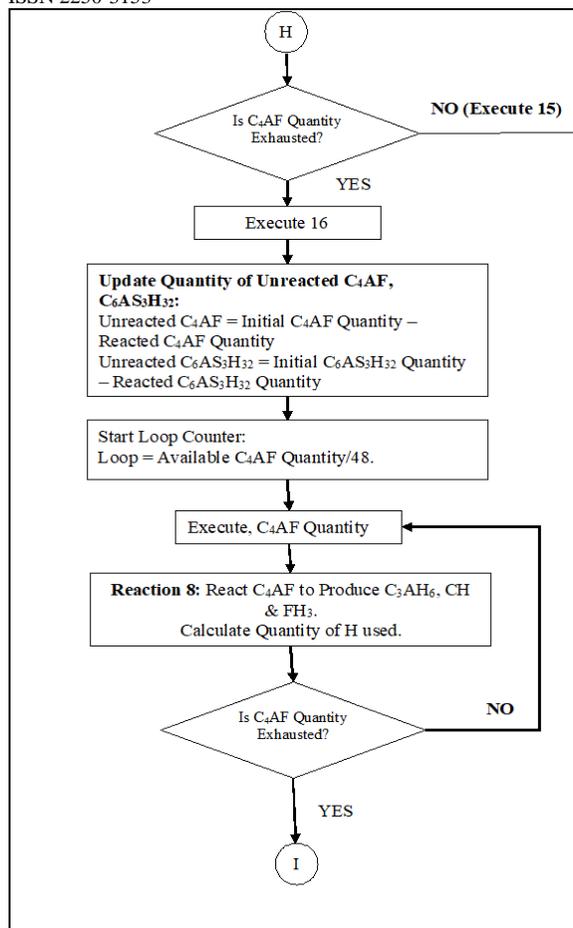
Figure 3 Computer model flow chart for the hydration of cement-SWFA paste

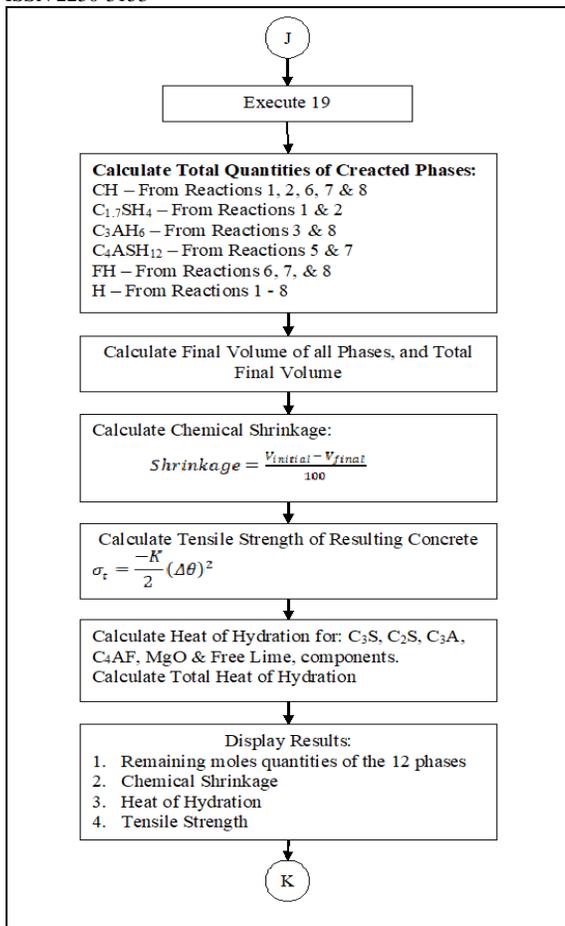


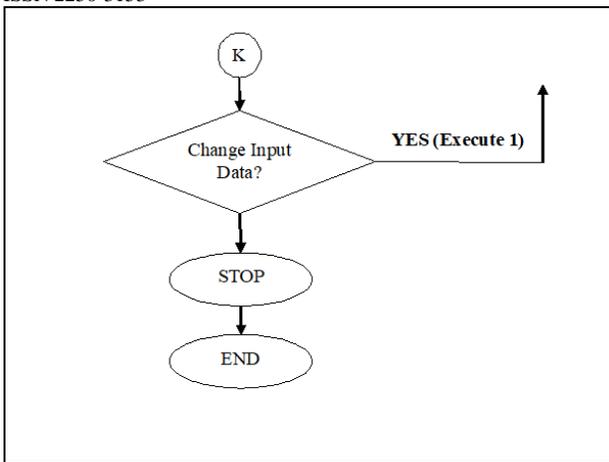












**RESULTS AND DISCUSSION**

**Model Results**

**Introduction**

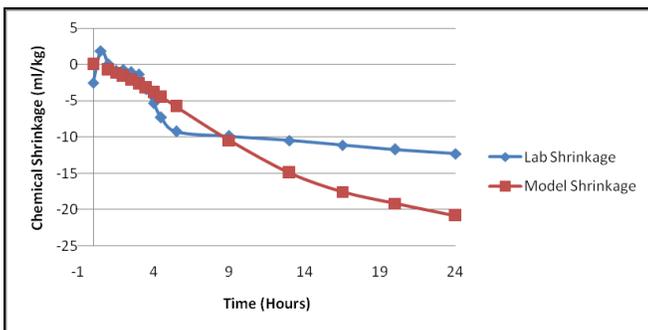
The hydration model described in in the preceding sections was used to derive predictions for chemical shrinkage and heat of hydration for SWFA-cement pastes containing between 0 – 20% SWFA, and 28 day cube strength values for concrete mixes containing SWFA-cement of between 0 – 20% SWFA.

The results of these predictions were then compared to experimental measurements and the findings are discussed in the following sections.

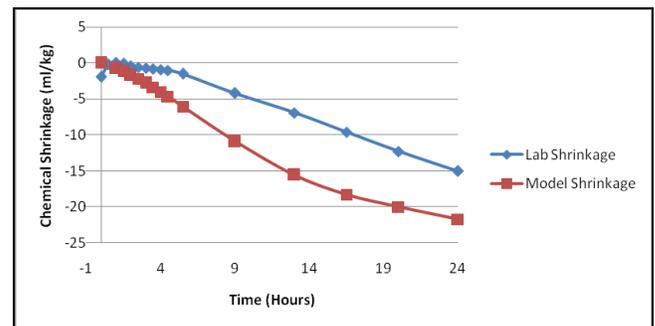
**Chemical Shrinkage**

Chemical shrinkage values derived from the model were plotted against those measured from the lab and are given in the Figures 4 – 10. From these figures, the model results are approximately 50% higher than those determined experimentally in the laboratory. This difference might have been due to some of the assumptions taken within the model in the chemical shrinkage approximations. 25 percent hydration is assumed to occur in the first 24 hours after mixing of the SWFA-cement with water. It is possible that this degree of hydration was not achieved in the experimental pastes, resulting in a smaller volume reduction compared to the model shrinkage.

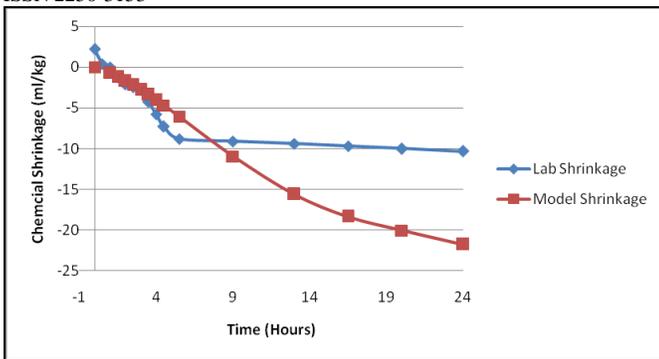
Also, in calculating the 25 percent degree of hydration, the model assumes that 25 percent of all the initial cement phases in the SWFA-cement paste (C<sub>3</sub>S, C<sub>2</sub>S, C<sub>3</sub>A and C<sub>4</sub>AF) are hydrated. In real hydrating cement pastes, C<sub>3</sub>A and C<sub>4</sub>AF hydration is much slower, going into months. This might also have contributed to the higher shrinkage predicted by the model.



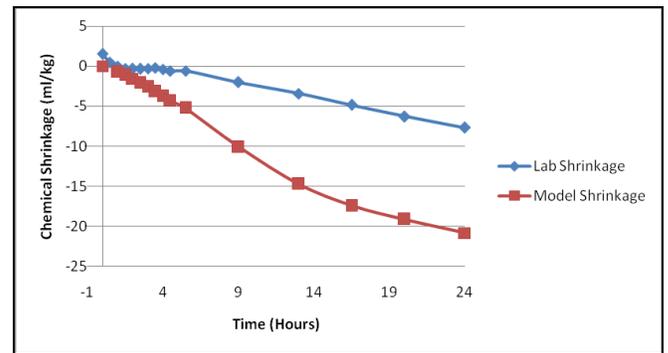
**Figure 4** A comparison of numerical chemical shrinkage with experimental results: 0% SWFA



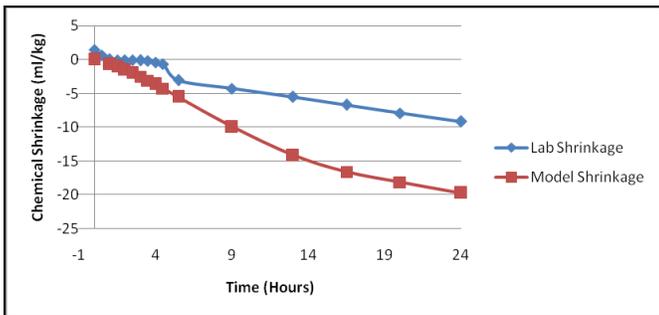
**Figure 5** A comparison of numerical chemical shrinkage with experimental results: 4% SWFA



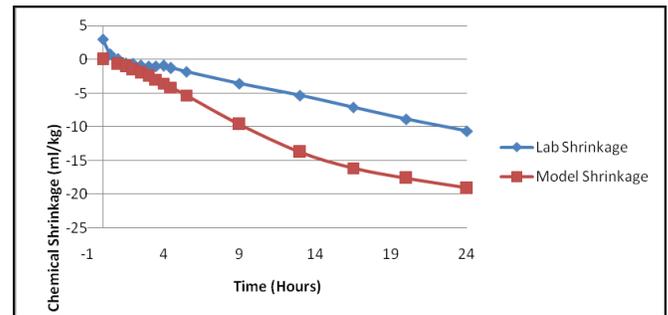
**Figure 6** A comparison of numerical chemical shrinkage with experimental results: 8% SWFA



**Figure 7** A comparison of numerical chemical shrinkage with experimental results: 12% SWFA



**Figure 8** A comparison of numerical chemical shrinkage with experimental results: 16% SWFA



**Figure 9** A comparison of numerical chemical shrinkage with experimental results: 20% SWFA

The 24 hour shrinkage values for the laboratory experiments and the model results are plotted in Figure 10. From this figure the model suggests an increase in the chemical shrinkage from 20.8 ml/kg at 0% SWFA content to an optimum value of 21.9 ml/kg at 6% SWFA content. The shrinkage then falls steadily to 19.1 ml/kg at 20% SWFA content. Laboratory results give a shrinkage of 12.3 ml/kg for 0% SWFA content. The shrinkage then increases to a maximum value of 15% ml/kg at an optimum SWFA content of 4%. This then reduces and increases again to a value of 10.6 ml/kg at 20% SWFA content. The difference between experimental and model values is thought to have been caused by the assumptions made in the model as discussed earlier in this section.



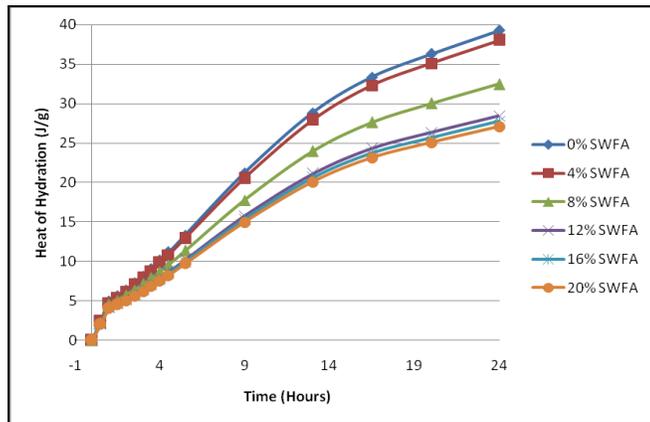
**Figure 10** 24 hour chemical shrinkage - laboratory and model results

From these results (Figures 4 – 10), the model suggests maximum shrinkage at about 6% SWFA content. This is qualitatively in agreement with the 4% maximum shrinkage observed in the laboratory shrinkage values.

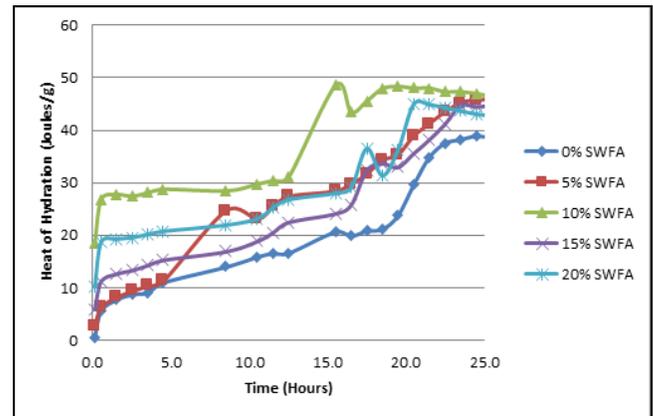
The model is also seen to qualitatively predict the increase and later decrease in chemical shrinkage with increase in SWFA content. This suggests an increase followed by a decrease in amount of hydration reaction with increase in SWFA content, with an optimum occurring at about 6% SWFA content. This is in agreement with mechanical test results achieved on concrete containing these mixes. On average, the model 24-hour chemical shrinkage predictions are about 98% more than those observed in the laboratory (i.e. correlation factor of 1.98), as evidenced by Figures 4 to 10.

### 5.1.1 Heat of Hydration

The model calculates the heat of hydration values as described in the preceding sections of this paper. Figure 11 shows heat of hydration model predictions for the first 24 hours for the study SWFA-Cement mixes.

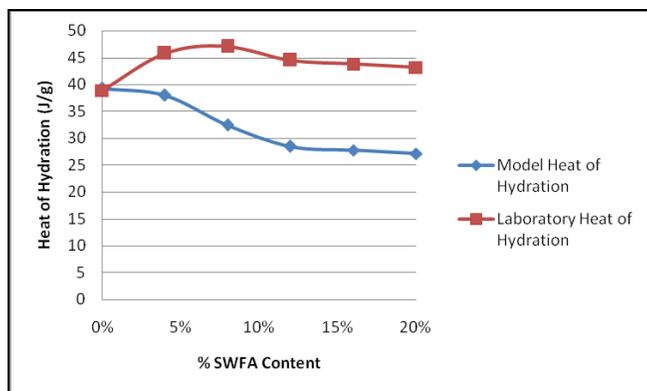


**Figure 11** Numerically determined heat of hydration (0 - 24 hours)



**Figure 12** Average experimental heat of hydration for SWFA - cement mortars [7]

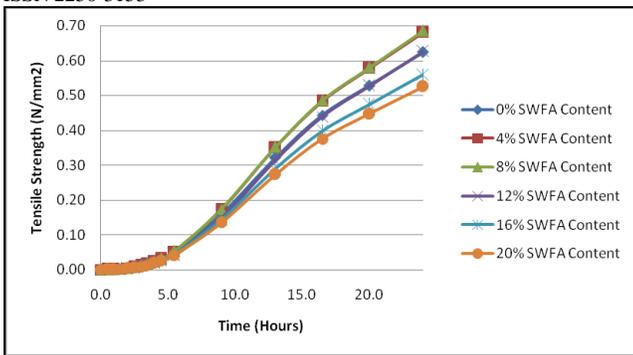
The model suggests a total heat of hydration value for cement without ash of about 39 J/g at age 24 hours. The shape of the curves is in agreement with other laboratory test results (Figure 12 [7]). A steady drop of the amount of heat of hydration with ash content is also suggested in the model results (Figures 11 & 13). This is not fully in agreement with the laboratory results which show an increase in the heat of hydration with increase in SWFA content, up to about 6% SWFA (Figure 13) followed by a steady decrease. On the average, the model predictions are about 73% of those gotten from the laboratory with the deviation between the model and laboratory results increasing with increase in SWFA content.



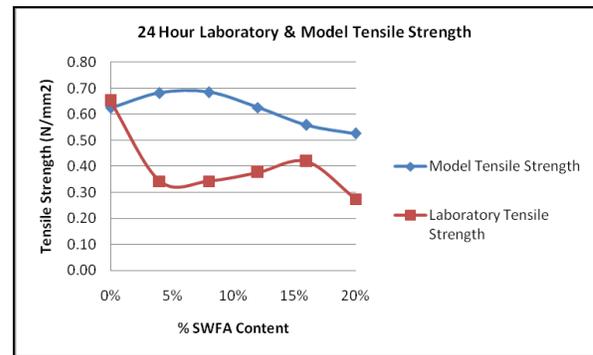
**Figure 13** Comparison of numerical and experimental 24 hour heat of hydration

### Concrete Tensile and Compressive Strength

Figure 14 gives model predictions for tensile strengths within the first 24 hours of hydration for concrete mixes containing SWFA-Cement mixes.



**Figure 14** 24 hour model tensile strength results



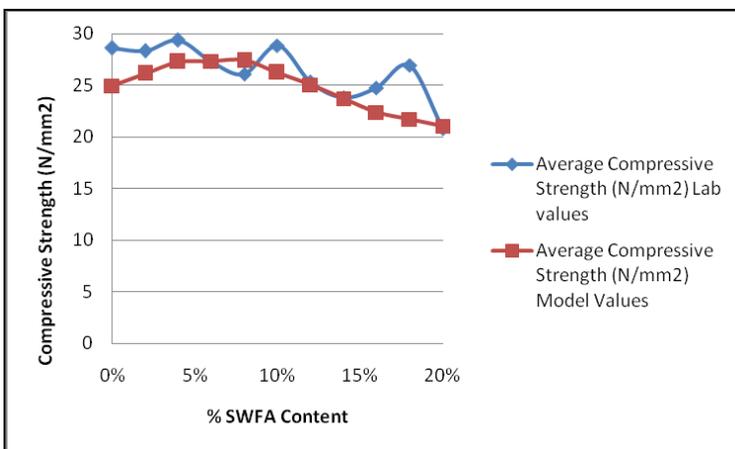
**Figure 15** Comparison of 24 hour experimental and numerical tensile strength values

The model suggests 24 hour concrete tensile strength (Figure 14) values between 0.62 N/mm<sup>2</sup> and 0.53 N/mm<sup>2</sup> for 0% and 20% SWFA content respectively. Assuming that concrete cube strength is approximately 10x its tensile strength, this transforms to 6.2 N/mm<sup>2</sup> and 5.3 N/mm<sup>2</sup> compressive strength after the first 24 hours of curing.

The model also suggests a slower strength gain in the first 4 hours before an acceleration period of strength gain which starts to slow down again after 15 hours. This is in agreement with the behavior of concrete whereby hardening is delayed in the early hours before an acceleration in the rate of hydration and subsequently the strength gain.

Figure 15 shows 24 hour laboratory and model tensile strengths. The model suggests a tensile strength of 0.62 N/mm<sup>2</sup> for 0% SWFA content concrete. This compares well with the 0.65 N/mm<sup>2</sup> observed in the 24 hour tensile strength. The model then predicts an increase in the tensile strength to an optimum strength at about 6% SWFA content. The laboratory results however show a decrease in tensile strength with a minimum occurring at approximately 6% SWFA content. The decrease has been attributed to possible cracking of the microstructure due to the higher amount of chemical shrinkage exhibited at 4% SWFA content. Beyond 15% SWFA both the model and laboratory predictions take a downward trend with increase in SWFA content. It is thought that this (15% SWFA content) is the point at which excessive shrinkage stopped significantly affecting the tensile strength. With this consideration, the drop in tensile strength beyond 15% SWFA content is almost entirely attributed to the reduction in hydration reactions. On the average, the model 24-hour tensile strength prediction is about 0.53 that achieved in the laboratory.

Assuming that about 25% of the concrete strength is achieved in the first 24 hours, and that the tensile strength of concrete is about 10% of its compressive strength [8], the 24 hour model outputs were used to approximate the 28 day strength of the concrete. The generated 28 day compressive strength values are plotted in Figure 16.



**Figure 16** Average 28 day cube compressive strength (laboratory & model results)

From Figure 16 the model compressive strength results approximately fit those of the laboratory. The model results show an increase from 25.0 N/mm<sup>2</sup> at 0% SWFA content to a maximum value of 27.3 N/mm<sup>2</sup> at 6% SWFA content, then a steady drop to 21.0 N/mm<sup>2</sup> at 20% SWFA content. Laboratory results gave a higher strength of 28.6 N/mm<sup>2</sup> at 0% SWFA content, with the rest of the results approximately agreeing with the model predictions.

Using the assumptions: (i) the 24 hour tensile strength is about 25% of the 28 day strength, and (ii) the model is found to be able to predict closely the compressive strength of concrete containing 0 – 20% SWFA content. The model values are also conservative in that they are either in agreement or slightly lower than actual laboratory compressive strength values, with an average correlation of about 0.94. The model strength predictions can therefore be safely used to predict the expected strengths of concretes containing between 0 – 20% SWFA.

The model is able to predict the chemical shrinkage of SWFA-Cement pastes closely for the early hours of hydration (0 – 4 hours) and also at 24 hours. This is because the model relies on chemical reactions governed by the relative quantities of CaO, SiO<sub>2</sub>, Fe<sub>2</sub>O<sub>3</sub> and Al<sub>2</sub>O<sub>3</sub> which were assumed to vary linearly with change in SWFA content in the cement paste.

## 5. Conclusions

The following conclusions can be made from this study:

- 1 The proposed hydration model is able to predict qualitatively the chemical shrinkage of SWFA-Cement pastes.
- 2 The proposed hydration model is able to qualitatively capture the increase in shrinkage between 4 – 6% SWFA content.
- 3 Within reasonable assumptions, the model is able to conservatively predict 28 day strength of concrete containing 0 – 20% SWFA content

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# Prefabrication As A Solution To Improve Productivity Of Construction Industry, Tamilnadu, India

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**Abstract-** Prefabricated construction system has been proven effective, sustainable, and labor-friendly to the construction industry. India is still in the initial process of adopting prefabricated construction practices and has conducted a few studies to date on the constraints of prefabricated construction up to the operation stage. This paper focuses on benefits, difficulties and measures in adoption of prefabrication in Tamil Nadu, India and offers some recommendations on extent usage of prefabrication. Twenty-four criteria, ten criteria for benefits in adopting prefabrication and seven criteria for difficulties in prefabrication and seven criteria for measures in adopting prefabrication are summarized as per the results of a literature review. A questionnaire was delivered to builders / constructors, architects, engineers, and client/ developers. A total of 65 valid respondents were collected. Based on severity index all the parameters were ranked accordingly. The findings presented in this paper may assist different stakeholders in better understanding issues with prefabricated construction practices in Tamil Nadu, India at present and, therefore, find workable solutions.

**Index Terms-** Prefabrication, Sustainable, Severity Index, Quality, Cost, Time

## I. INTRODUCTION

Indian Infrastructure and Construction sector has grown exponentially in the last few decades and the Government of India (GOI) have identified the sector as a major driving factor for the economic development of the country. India's infrastructure market is the third-largest in Asia and it includes power, bridges, dams, roads and urban infrastructure development [1]. According to Indian Construction Market – Growth, Trend and Forecast (2020-2025) report, the Indian construction market is expected to register a Compound Annual Growth Rate (CAGR) of 6% over the forecast period, 2019 – 2024. Infrastructure sector plays a vital role in the growth and development of the Indian economy. Nearly, 9% of India's GDP is spent on Infrastructure services. The construction industry plays a vital role in the development of the Indian economy by introduction of new system and technologies of construction. Prefabrication construction system is being used widely by many countries around the world for its potential to increase productivity and efficiency while not sacrificing quality. In India the uptake of prefabrication technologies continues to remain slow and prefabricated buildings comprise only 1 per cent of India's \$100 Billion Real Estate Market. The main reason for this being that Prefabrication as a technology is still battling a mindset blockade in India, with most developers averse to investing in modular methods of construction and hesitant to incorporate prefabrication in their new and ongoing projects [2]. The adoption of prefabrication will save construction time, reduce construction cost, lightweight and durable and sustainable in all aspects. Prefabrication has the capacity to offer alternative choice of solutions to the conventional construction methods adopted in India. This paper provides an overview of benefits, difficulties and measures in adoption of prefabrication in Tamil Nadu, India and offers some recommendations on extent usage of prefabrication.

## II. RESEARCH METHODOLOGY

Methodology selected for this research comprised of a questionnaire design, a questionnaire survey and interviews of the stakeholders of construction industry and a statistical analysis of the survey data.

### A. Questionnaire Survey

From extensive review of literature it was observed that there was no comprehensive list of performance criteria to identify the benefits, difficulties and measures in adopting prefabrication construction system. To compile a meaningful list of criteria, a critical review was conducted in related areas. Based on the derived criteria, an industry questionnaire survey was designed. The survey, which consisted of three main parts, aims at investigation the perspective of the construction industry on the benefits, difficulties and measures in adopting prefabrication construction system in the study area. The respondents were asked to rate the level of importance of the derived criteria based on a scale of 1–5, where 1 is 'Strongly Disagree', 2 'Disagree', 3 'Acceptable', 4 'Agree', and 5 'Strongly Agree'. To ensure a better understanding of the criteria, definition of each criterion was clarified and guidance on completion was

given in the questionnaire. Survey questionnaires were emailed to 180 stakeholders comprising of builders / constructors, architects, engineering consultants and client/developers within Tamil Nadu, India.

**B.Data Analysis**

To ensure that the rating scale (1–5) for measuring the criteria yields the same result over time, a reliability analysis using the internal consistency method was first examined. In order to identify the relative importance of adoption of prefabrication construction system based on the survey data, ranking analysis was performed. It was observed that the ratings in the scale indicate only a rank order of importance of the criteria, rather than how much more important each rating is than the other. Using parametric statistics (means, standard deviations, etc.) to rank such data would not produce meaningful results, and therefore non-parametric procedures must be adopted [3]. Severity index (SI) analysis was selected in this study to rank the criteria according to their relative importance. Five important levels are transformed from SI values: High (H) ( $0.8 \leq SI \leq 1$ ), High–Medium (H–M) ( $0.6 \leq SI < 0.8$ ), Medium (M) ( $0.4 \leq SI < 0.6$ ), Medium–Low (M–L) ( $0.2 \leq SI < 0.4$ ), and Low (L) ( $0 \leq SI < 0.2$ ).

**III. RESULTS AND DISCUSSIONS**

After the questionnaire was delivered and a follow-up reminder letter was sent to the respondents who had not returned the survey, a total of 65 responses were received. Among those 65 responses, 21 completed responses were from builders / constructors, 28 from engineers, 4 from architects, and 12 from clients / developers with an overall response rate of 36.11%. All of the survey participants were experienced construction experts. About 10% of them had more than 20 years of experience in the construction industry, 35% had experience between 16 and 20 years, 45% between 10 and 15 years and 10% less than 10 years. The severity index values were calculated and based on the magnitude of the severity indices, the ranking results for each category for all criteria are presented in descending order as shown in Table 1.

Table 1 Rank of performance criteria for adoption of prefabrication construction method.

Performance Criteria	Severity Index	Ranking by category	Importance Level
<b>Benefits in adopting Prefabrication</b>			
B1: Shorten construction time	0.951	1	H
B2: Reduce construction cost	0.908	2	H
B3 : Better Quality	0.907	3	H
B4 : Achieving Green Goals	0.855	4	H
B5 : Improve environmental performance / sustainability	0.840	5	H
B6 : Better Supervision	0.825	6	H
B7 : More adaptable to climatic conditions	0.818	7	H
B8 : Reduce construction waste	0.815	8	H
B9 : Integrity of the building	0.803	9	H
B10 : Fewer onsite resources	0.597	10	M
<b>Difficulties of Prefabrication</b>			
D1 : Inadequate suppliers of prefabrication	0.892	1	H
D2 : Inflexible for design changes	0.874	2	H
D3 : Lack of technical training	0.862	3	H
D4 : Lack of adequate transport and logistics	0.837	4	H
D5 : Proprietor do not want prefabrication	0.828	5	H
D6 : Not included in the design	0.818	6	H
D7 : Development type is not appropriate	0.809	7	H
<b>Measures in adopting Prefabrication</b>			
M1 : Inclusion of technical training	0.942	1	H
M2 : Advancement in prefab skills in workers	0.908	2	H
M3 : Environment / sustainability as the first priority	0.862	3	H
M4 : Government/stakeholder to invest in prefab development	0.822	4	H
M5 : Regulated Policy / Codal Provisions	0.812	5	H
M6 : Incentive scheme to inspire private sector	0.809	6	H
M7 : Adopting prefabrication to the future projects	0.800	7	H

### *A. Benefits in adopting Prefabrication*

Based on these ranking results, nine criteria were highlighted to have high importance level in evaluating benefits in adopting prefabrication with a severity index value between 0.951 to 0.803. These nine criteria are shorten construction time (B1), reduced construction cost (B2), better quality (B3), achieving green goals (B4), improve environmental performance / sustainability (B5), better supervision (B6), more adaptable to climatic condition (B7), reduce construction waste (B8) and integrity of the building (B9). From the analysis it was observed that shorten construction time (B1) ranked 1 with a severity index 0.951. The prefabrication construction system provides a significant reduction in time [5]. Construction time for prefabrication is less than half of on-site construction [6]. Up to 70% time saving can be achieved when compared in-situ construction and average reduction in construction time can achieve 20% when compared with onsite construction [4].

The prefabrication design has different complexities and pre-project planning is quite important for prefabrication construction system. Prefabrication require more engineers, quality controllers and skilled labourers, these requirements will increase the cost of the design phase [5]. The higher initial and transportation costs are the main economic hurdles of prefabricated versus conventional construction methods. From a multiple case studies carried out by many researchers the total cost of prefabricated construction is significantly higher than that of conventional construction methods [7]. Further, from various research papers it was observed that cost of pre-cast may vary with the type and the size of construction. For a small project the cost of pre-cast increases due to no production of elements in bulk. However, for bigger projects the cost may decrease significantly [8]. From the literature and questionnaire analysis it was found that reduce construction cost (B2) play a vital role in prefabrication construction system and ranked two in our study with a severity index 0.908. Better quality (B3) of the end product was ranked third by the respondents, since prefabrication is done under factory control environment. The quality of construction has the potential to reduce the cost as well as the time of any project.

Achieving green goals (B4) and Improve environmental performance / sustainability (B5) ranked fourth and fifth rank respectively with a severity index of 8.55 and 8.40 respectively. In the era of marching towards sustainability, the prefabrication construction system is a key tool to achieve green / sustainable goals. Prefabrication can be attained through better supervision since prefabrication usually has a greater potential for automation (e.g., digital fabrication) and intelligent management systems as well as workers in a prefabrication plant are able to be more proficiently experienced at specific tasks [4]. It was observed from our analysis better supervision (B6) ranked sixth with a severity index 8.25. More adaptable to climatic conditions (B7) ranked seventh with a severity index 0.818. Prefabrication is independent of adverse weather which has almost no impact on the schedule of the prefabrication manufacturing since it is done under factory control environment. Reduction in waste (B8) and Integrity of Building (B9) ranked eighth and ninth with a severity index 0.815 & 0.803 respectively. Prefabrication has many environmental benefits over conventional approaches in the construction phase and has greater performances regarding sustainable construction in terms of construction waste [9]. The least ranked parameter was fewer onsite resources (B10) with a mean value of 2.98 and severity index 0.597. The severity index is medium ( $0.4 \leq SI < 06$ ), because Precast beams and slabs eliminate field forming and shoring requirements and less finish works is required to complete at on-site.

### *B. Difficulties in adopting Prefabrication*

Apart from the benefits attributed to the usage of prefabrication, on the other side equal amount of difficulties are identified by many researchers in the adoption of prefabrication. For the purpose of this study seven criteria were accounted as presented in Table 1. Based on these ranking results, seven criteria were highlighted to have high ( $0.8 \leq SI < 1$ ) importance level in evaluating benefits in adopting prefabrication with a severity index value between 0.892 to 0.818. These seven criteria are inadequate suppliers of prefabrication (D1), inflexible for design changes (D2), lack of technical training (D3), lack of adequate transport and logistic (D4), proprietor do not want prefabrication (D5), not included in the design (D6) and development type is not appropriate (D7).

From the analysis it was observed that inadequate suppliers of prefabrication (D1) ranked 1 with a severity index 0.892. With the advantages outstripping the disadvantages, prefab homes can be a successful construction model in developing economies like India. India's growing interest in such construction has led to global makers of prefabrication machinery and parts, entering the country. There is an immediate need for popularisation and extensive use of prefabricated structures to increase the efficiency, quality and speed of construction and creation of more awareness among common people. The prefabrication technique has a clear-cut role to play in the Indian real estate sector to take it to the next level. It is all set to redefine the future of housing sector in India through introducing many suppliers of prefabrication. It was observed that there were few small scale prefabricated suppliers in the study area and this was a factor that could affect the adoption of prefabrication [10].

Inflexible for design change (D2) and lack of technical training (D3) ranked second and third in difficulties in adopting prefabrication with a severity index 0.874 & 0.862 respectively. The most of the respondents selected inflexible for design changes as a main hindrance in prefabrication, due to the standardised nature of prefabrication it is difficult to alter the design in later stage. As most construction work requires modifications to be done on-site, prefabrication limits the option of alterations in the design scope of the building [11]. Lack of technical training was seen as one of the most important issue in the adoption of prefabrication in India, the survey revealed that most of the stakeholders had theoretical knowledge but no practical training in the usage of prefabrication. Skilled labour is required in prefabrication, as precision assembly of the home is necessary, else improper assembly can result in issues such as joint failure and leaks. It can be concluded that the lack of technical training would have a negative impact on the adoption of prefabrication. The lack of skill labour can be addressed through Technical training programmes to equip construction workers with the adequate technical expertise required to carry out prefabrication work.

Lack of adequate transport and logistics (D4) ranked fourth with a severity index 0.837. Because parts and modules for prefabrication tend to be large, some sites with limited access and /or limited on-site space may not be suitable for prefabrication. Prefabrication are also not suited to smaller sized projects because of the expensive transportation of the larger assembled modules to sites [7]. The limited number of manufacturers of prefabrication means that some project sites may be at large distances from the nearest manufacturer. As a result, the large and heavy loads need to be transported long distances, leading to expensive transportation costs [10].

Some of the clients do not want prefabrication method of construction because, they felt that, either the cost would be high or the construction personnel do not have what it takes to execute prefabrication works so many respondents ranked proprietor do not want prefabrication (D5) as fifth with a severity index 0.828. It was observed from analysis, not included in the design (D6) ranked sixth with a severity index 0.818, since prefabrication structures cannot be customized, they have only limited number of designs. The life of buildings is 50-80 years and sometimes even more and the requirement and lifestyle changes a lot over the years. Many time it needs to modify the indoor space and this option is not available with design of prefabrication buildings [10]. Development type not appropriate to use prefabrication was ranked seventh with a severity index 0.809. The respondents discussed that some of the projects they execute were such that, they were not appropriate to use prefabrication because, the projects were complex and not standardized, and in some instances the projects were small and did not require repetition in any form which is the main advantage of prefabrication.

### *C. Measures in adopting Prefabrication*

Adoption of prefabrication is constrained by a lot of challenges at the project level and at the industry level. Considering the challenges faced, there is a need to address these concerns for the adoption of prefabrication technology at the sector level. This study identified some recommendations for the promotion, effective development and adoption of prefabrication in the construction industry in Tamil Nadu and India as a whole. The criteria selected to view the ideas of stakeholders in adoption of prefabrication were presented in Table 1. Based on ranking results, seven criteria were highlighted to have high ( $0.8 \leq SI < 1$ ) importance level in evaluating benefits in adopting prefabrication with a severity index value between 0.892 to 0.818. These seven criteria are inclusion of technical training (M1), advancement in prefab skills in workers (M2), environment / sustainability as the first priority (M3), government / stakeholder to invest in prefab development (M4), regulated policy / codal provisions (M5), incentive scheme to inspire private sectors (M6) and adopting prefabrication to the future project (M7).

The respondents rated inclusion of technical training (M1) and advancement in prefab skills in workers (M2) ranked first and second with a severity index 0.942 & 0.908 respectively. This survey revealed that, there is lack of practical knowledge on prefabrication skills among workers in the construction industry in the study area. Prefabrication method of construction require special skills in their execution and lack of it will adversely affect its adoption, the education sector must ensure that, practical training are incorporated in the curriculum and Technical training institutions to ensure practical training in the execution of prefabrication works to be taught during training. On the contrary the usage of prefabrication can also be adopted as a substitute for shortage of skill labour because large components are manufactured in the factory and assembled on site with few workers within a shorter time without compromising on quality.

The privileges of a prefabrication system significantly reduces the time of construction and is sustainable in nature. Since the components are manufactured in controlled environment, it provides environmental benefits like site safety, waste reduction, improved air quality and quality management. From the analysis it is clear that environment / sustainability as the first priority (M3) was ranked third by the respondents with a severity index 0.862. Government/stakeholder to invest in prefab development (M4) and regulated policy / codal provisions (M5) ranked fourth and fifth with a severity index 0.822 & 0.812 respectively. There is an immediate need for popularization and extensive use of prefabricated structures to increase the efficiency, quality and speed of construction by implementing government / stakeholder to invest in prefab development (M4) and regulated policy / codal provision (M5). Further, by introducing incentive schemes to inspire private sectors (M6) which was ranked sixth by the respondents in measures in adopting prefabrication with a severity index 0.809. The adoption of prefabrication for future project as a means to facilitate sustainability in the construction sector was a major item, though least ranked with a severity index 8.00 respectively. However, the severity index falls in the category of High, this shows the respondents are more focused on adopting prefabrication construction system.

The adoption of prefabrication construction system is low, despite their well-documented benefits. In the present study the questionnaire was concluded to examine the importance of respondents' intent to use or recommend prefabrication in future. It was observed from the survey that out of 65 responds 49 said that they would recommend the use or use prefabrication method of construction in future (representing 75.4%) when the need arises, 16 out of 65 respondents reported that they would not recommend or use prefabrication in the future (representing 24.6%).

## IV. CONCLUSION

The challenge facing construction practitioners during early project stages is that of selecting an appropriate construction method. The significant benefits of prefabrication construction are commonly cited when justifying the adoption of prefabrication. A

prefabrication construction system help reduces cost, environmental friendly, consistent quality and safety. However, there are some barriers in adopting the prefabrication construction system are inflexible for design change, lack of technical training and inadequate suppliers of prefabrication. This research confirms that prefabrication construction system has many sustainable benefits and it was found that majority of stakeholders responded that prefabrication construction system can be adopted in Tamil Nadu, India.

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# Law Enforcement Authority In The Country Border Region

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**Abstract:** *In the regulation of law enforcement especially law enforcement in the border region of the country in particular the region of the sea, almost all legislation has the authority of each institution to conduct law enforcement in the region the borders of the State, therefore must be well done so as to realize security in the borders of the country. The type of research used in this writing is the normative juridical law research, which is the legal research on the regulatory authority and implementation of the Authority provided by the positive legal provisions in factual Any particular legal event occurring in the country's border region. The research approach used is a statutory approach, the source of the legal material used is the source of secondary and tertiary legal materials as well as the collection of legal materials in this study is normative empirical. The arrangement of the Authority and implementation of the Authority on the legislation given to each law enforcement institution in the border region of the country in the sea region becomes ineffective and efficient in its implementation field by law enforcement institution due to the existence of a sectoral ego on every law enforcement institution so that there is a coordinated in the implementation of law enforcement in each law enforcement sector.*

**Keywords:** *authority, law enforcement and state territory*

## 1. INTRODUCTION

Indonesia is an archipelago (Archipelagic state) whose territory is comprised of oceans with islands, both large and small with a total of about 17,504 islands with an area of about 7.7 million km. Two-thirds of the area is 5.8 Million km is made up of seas, while the remaining 1.9 million km is land. With a coastline of approximately 81,000 km, Indonesia has become the country that has the second longest beach after Canada. Vast Indonesian waters extend from inland waters, archipelago waters, territorial waters and the exclusive economic zone of Indonesia (ZEEI) as well as the continental shelf, it often poses complex problems, whether Issues relating to the legal and economic and state security areas, all of which require comprehensive handling (Sondakh, 2004).

As the largest archipelagic country in the world, Indonesia has borders both land borders and sea borders with many countries. The Indonesian land borders borders Malaysia, Papua New Guinea, Singapore and East Timor. (Law of the territory of the State, law No. 43 year 2008, Ps. 6 (1) b). While the Indonesian sea is bordered by ten countries, namely India, Malaysia, Singapore, Thailand, Vietnam, the Philippines, the Republic of Palau, Australia, Timor-Leste and Papua New Guinea (PNG). (Indonesia, national territory Law, law No. 43 year 2008; LN No. 177 year 2008, TLN No. 4925, Ps. 6 (1) a). Borders with other countries, can occur when the land, internal water or territorial sea of the two countries are located adjacent (Sumardiman, 2014).

Arrangements regarding the determination of the territorial boundary of a country and activities in the sea have actually been formulated in a comprehensive international treaty known as UNCLOS 1982 (United Nations Convention on the Law of the Sea 1982 or the United Nations Law Convention 1982). In UNCLOS 1982 are known eight setting zones (regime) prevailing at sea, namely (1) Inland Waters, (2) Archipelago Waters (archipelagic Waters), (3) territorial seas (territorial Waters), (4) additional zones (contiguous Zone), (5) Exclusive economic Zone, (6) continental Shelf, (7) The High seas, and (8) International seabed Area (the international Sea of the areas).

Indonesia has ratified UNCLOS 1982 through Law No. 17 of 1985 and enacted law No. 6 of 1996 on Indonesian waters replacing law No. 4/PERP. 1960 which was adjusted to the soul or provisions of UNCLOS 1982. Further, for the purposes of determining the boundaries of Indonesian water region has been set forth in government Regulation No. 38 year 2002 on the geographical coordinates list of points of the Indonesian archipelago. However, the fact to date, the determination of the boundary of the Sea region of Indonesia with neighboring countries still have not been completed. In the absence of certainty the boundaries of the territorial waters, will be very influential in marine economic activities, such as capture fisheries, aquaculture, biotechnology industry, maritime tourism, sea transportation and more specifically to Exploration and exploitation of natural resources of oil and gas, which will certainly be hampered.

Geographically, the Indonesian archipelago is located between two continents of Asia and Australia and two oceans of the Pacific and Indian Oceans. Indonesia is the largest archipelago in the world with large and small islands reaching 17,504, and a total area of water reaches 5.8 million km<sup>2</sup>, and coastline length is approximately 95,181 km (Numbery, 2006), and has undergone additions with Long coastline (99,093 km). Indonesia also has a characteristic archipelago with sovereignty over land, sea and air and has sovereign rights outside the region of its sovereignty that is the natural resources to be managed and utilized for the prosperity of all people. With a strategic geographical position and wide geographical location will make Indonesia as a nation that can affect the various events in the world, and certainly will affect the management and utilization of natural resources in the region Sea.

The existence of Indonesia as the unitary State of the Republic of Indonesia (NKRI) will be influenced by the conditions and geographical location so that the governance of natural resources, border areas, and good defense are indispensable. The Indonesian sea areas are bordered by ten countries, namely India, Thailand, Vietnam, Malaysia, Singapore, the Philippines, the Republic of Palau, Papua New Guinea (PNG), Australia, and the Democratic Republic of East Timor. While the Indonesian land area is directly adjacent to three countries, namely Malaysia, Papua New Guinea, and Timor Leste with the overall length of the land border line is (2914.1 km.) (Madu et al, 2010).

History shows that its strategic location makes Indonesia contested by large countries to serve as colonies since the first. Several noted countries have sought to master Indonesia, such as Portugal, the Netherlands, Japan, the United States, and the Soviet Union during the Cold War era. To date, Indonesia is still a region of struggle for influence by major countries, including China and Korea as well as border disputes, such as Australia, the Philippines, Malaysia, Papua New Guinea, and Timor Leste are also potentially large occurred in Indonesia.

Borders, especially the country's borders are one of the crucial aspects of the world's geopolitics. Country borders are a major manifestation of country's territorial sovereignty. The borders of a country play an important role in determining the boundaries of sovereignty, utilization of natural resources, and maintaining the security and integrity of the region. The borders of the country in many respects are determined by the national and international historical, political, and legal processes (Moeldoko, 2014).

**1. The border area becomes an "urgency" region, both in internal and external context (international).** Some issues that have always been discourse on the frontier area are: (Moeldoko, 2014)

- a) Potential invasion of ideology and foreign cultures;
- b) The potential for transnational crimes;
- c) Illegal logging;
- d) Illegal fishing;
- e) Illegal exploitation of natural resources;
- f) Trafficking in human trafficking, especially women and children;
- g) Dark immigrants (illegal immigrants);
- h) Human trafficking (people smuggling);
- i) Narcotic circulation;
- j) The entrance of terrorists and robbers;
- k) Socio-cultural conflicts.

**2. In general, the border area issues include the following three aspects: (Moeldoko, 2014).**

- a. The socio-economic aspect of the border area is a less developed area (backward). It was due to a relatively isolated/remote location with a low accessibility level; Low levels of public education and health; The low level of social welfare of the Community's border areas (the number of poor people and villages left behind); And the rare information about the government and the development received by the community in the border area.
- b. Aspect of security defence of border area is a broad territory with uneven pattern of population distribution. It caused control by the government to be difficult. In addition, the oversight and development of the Territory is quite difficult to implement synergistically, steadily, and efficiently.
- c. The socio-economic aspects of society in the border region are generally influenced by socio-economic activities in neighboring countries.

Until now there are many cases related to Indonesian fishermen who were arrested by neighboring state authorities in the border waters that have not completed its maritime boundary determination. Among them were the arrest of 22 Indonesian fishermen by Australian authorities executed by the warship HMAS Wollongong. The arrest was carried out after Australian border guards found four Indonesian fishing boats within 14 miles of the territorial waters of the Australian exclusive economic zone while surveying in the northern regions. The Australian authorities subsequently held a detention of 22 Indonesian fishermen and seized 135 kg of catch fish and carried four fishermen belonging to Darwin Harbour (ABC Radio Australia, 2019). This is because Indonesia with Australia essentially has an exclusive economic zone agreement but there are some waters that have not been ratified.

Fishing cases around border waters also occur in Indonesian border waters with neighboring Malaysia. Where the Royal Malaysian authorities took the arrest against nineteen Indonesian fishermen who were caught in search of fish in the border waters area.

Indonesia and Malaysia are not yet completed. However, there is no significant detention of Indonesian fishermen by Malaysia, but often the capture of fishermen between the two countries is often a gravel disorder in bilateral relations between the two countries.

That if you pay attention to the problem in the country's borders, especially in the territory of the unitary State of the Republic of Indonesia, then the problem of law enforcement in the country's border area is something to be addressed in the form Policy between two countries bordering.

The problem that is quaint and should get the attention of the unitary Republic of Indonesia, is the problem of law enforcement authority. Therefore, in order to follow up on issues and problems that often occur in the border area, then the authors feel the need to do a thorough and comprehensive research on "Law enforcement authority on the border area Country ". Research objectives: To find out and find the concept of law enforcement authority on the country's border area. The benefit is, practically, as a contribution of thought to the Indonesian government in order to make a better policy on regulatory and law enforcement in the border region of the country.

## 2. RESEARCH METHODS

Research is a systematic, directional and purposeful scientific activity. Therefore, the materials or information collected must be relevant to the problem faced. This means that the data is relevant, about and precise. (Kartini, 1990). A method is a way of working or governance to be able to understand the object that is the target of science in question. The method is a guideline on how a scientist learns and understands the steps faced (Soekanto and Mamudji, 2007).

### A. Research type

In accordance with the problem and research objectives of the research, the type of research that will be used is normative research, which is a study that mainly examines the provisions of the positive legal, legal principles, Principles and legal doctrines to answer the issues of the law. (Marzuki, 2005)

This research is related to the problem of the borders of the country, especially the regional cooperation in the unitary State of the Republic of Indonesia, so that the problem of law enforcement in the country border area is something to be addressed in State policy or policy between the two bordering countries. The problem is quaint and should get the attention of the unitary Republic of Indonesia.

### B. Problem approaches

In this study the author examines law enforcement authorities on country border areas and the approach to problems used in this research is the approach of legislation (of approach), and conceptual approaches ( Conceptual approach) and case approach. (Marzuki, 2005).

The main approach in this research is the approach of legislation (of approach) and conceptual approach, it remembers the approach of legislation (of approach) as the basis for The law in analyzing the problems in this study is strengthened by the conceptual approach to obtain the argument of the law in answering the problem.

### C. Type and source of legal material

Research materials in the form of primary legal materials and secondary legal materials. The primary legal material referred to in the form:

The Constitution of the Republic of Indonesia year 1945, ACT number 43 year 1008 on the territory of the State, presidential regulation related to the country's border area, namely: Regulation 179 year 2014 about spatial plan of national border area in East Nusa Tenggara province; The 31-year presidential Decree 2015 on the spatial plan of the national border area in Kalimantan; Presidential Decree 32 year 2015 on the spatial plan of the national border area in Papua province; Presidential Decree 33 year 2015 on the spatial plan of the State border area in Maluku province; Presidential Decree 34 year 2015 on the spatial plan of the national border area in North Maluku province and West Papua province; 11 year presidential Decree 2017 on Spatial plan of national border area in North Sulawesi province, Gorontalo Province, central Sulawesi province, East Kalimantan Province, and west Kalimantan province; and Presidential Decree 49 year 2018 on the spatial plan of the national border area in Aceh province and North Sumatra province. In accordance with the regulation 49/2018, the spatial plan of the national border area is a role as an instrument of operationalization of regional spatial plan, and as a coordinating tool for development implementation in the national border and supporting areas of Aceh Province and North Sumatra province as well as the territory of Indonesia's territorial sea, the exclusive economic zone, and the continental shelf.

Secondary legal materials include materials supporting primary legal materials such as textbooks, articles in a variety of scientific magazines or journals of research results in the field of law, papers delivered in various forms of meetings such as discussions, seminars, workshops, and others.

The primary legal material in the form of legislation is collected by conducting inventory and catagorisation codes. Secondary legal material is collected with a card system, either with a summary card (containing a summary of the original text, in an outline and a subject with the original opinion of the author); A quote card is used to contain the subject record of the issue), as well as a review card (containing the analysis and author-specific notes).

#### **D. Processing and analysis of legal materials**

The primary legal material and the secondary legal material has been collected (inventory), then grouped. This is then examined by a statutory approach to obtaining an overview of the synchronisation of all legal materials.

The material that has been classified and stimulated is studied, examined and compared with the theoretical and legal principles expressed by experts, to finally be analyzed normatively.

In the processing and analysis of legal materials, the use of normative legal research type is used to address the law enforcement issues in the border region of the country, law enforcement obligations on the country's border region and Implementation of law enforcement in the border area.

Analysis of legal materials by using normative legal research type is intended to get a more optimal picture relating to the law enforcement Authority in the border area of the country.

### **3. RESULTS AND DISCUSSION**

#### **A. Law enforcement authority in the State border region**

##### **1. Government authority in law enforcement in state border territories**

Law enforcement according to Satjipto Rahardjo is an attempt to manifest ideas into reality, while Suryono Soekanto citing the opinion of Purnadi Purbacaraka said that law enforcement is the activity of organizing the relationship Steady and posturing values and attitudes of acts as a summary of the description of the final stage values to create (social engineering), nurture and maintain (control) the Peace of life.

Furthermore, according to Soewardi M the general sense of law enforcement is an activity to enforce or enforce provisions. Furthermore, it is further explained that the good legal system is concerned with the invasion of the value with the rules and with the real behavior (Tobing and Sriwulan Rios, 1998). The book of the Fifth Sea Law Seminar (1990) stated that in the sense of law enforcement implies that the ability to maintain and monitor the requirements of certain legal provisions both nationally and internationally in the waters In the Indonesian national jurisdiction and other waters in order to defend and protect other national interests (national legal Development Agency, 1990). Thus along the intensity of the threat is considered disturbing the orderly and legal interests, then the action taken in the face of the threat is law enforcement. Furthermore, it is stated that the general definition of law enforcement is interpreted as a state activity/its apparatus based on the sovereignty of the State and or under the provisions of the international law in order to ensure the prevailing laws of the sea, both national law rules and international law can be heeded or obeyed by any person and entity and State as the subject of law. Thus can be created order of national law and Order of international law.

Law enforcement at sea cannot be released from sovereignty enforcement issues at sea. The definition of law enforcement on one party and the enforcement of sovereignty on the other party can be distinguished but both cannot be separated because the enforcement of sovereignty in the sea includes law enforcement at sea. Enforcement of sovereignty can be implemented not only within the country, but it can also net out the boundaries of the country, while law enforcement in the sea is a process of arrest and investigation of a case arising as a result Violation of the sea on the provisions of the law that applies both international and national law, so that in the implementation of sovereignty and law enforcement in the sea is done simultaneously. Thus there are differences in law enforcement with enforcement of sovereignty depending on the intensity of the threat encountered. As long as the threat is considered to harm a country's existence, the action that can be taken against the threat is the enforcement of sovereignty (Tobing and Sriwulan Rios, 1998).

The authority to enforce sovereignty and the law is sourced to the sovereignty and jurisdiction owned by the state in question, in accordance with international law provisions. On the essence of sovereignty is the supreme and full power of a comprehensive nation (Book II B, Department of Defense and Security 1980), to undertake an act deemed necessary for the national interest of the country itself under national law With regard to international law (Book II B, Department of Defense and Security 1980).

The sovereignty of the country is spelled out in the form of authority or right of the state in question, among other jurisdictions, namely the authority of the State to establish and enforce legal regulations (Sondakh, 2004). Thus, the enforcement of law in the sea by the State through its authorities is the implementation of sovereignty itself because the authority and enforcement capabilities of the law are essentially sourced to the sovereignty of the State And is also a budding of sovereignty (Book II B, Department of Defense and Security 1980),. In the implementation of law enforcement in the sea differentiated between (i) Law enforcement functions relating to certain criminal acts at sea, and (ii) Law enforcement functions relating to general criminal acts occurring at sea (Sondakh, 2004).

The implementation of law enforcement in the sea relating to certain criminal acts listed in certain legislation is a special provision of criminal program law (lex specialis) (Book II B, Department of Defense and Security 1980). Referring to these

provisions, it can be concluded that in relation to the law enforcement function in the handling of general criminal acts (listed in the criminal CODE) occurring at sea, the law enforcement authorities in the sea have the Authority to act Initial completion in relation to law enforcement functions in the handling of certain criminal acts including a particular article in the criminal CODE, the general criminal law enforcement officers have the authority as a preliminary oppressing, which Further resolved by law enforcement officers in the sea who have authority in accordance with certain legislation (BPHN, 1990).

Judging from the field of activities, the implementation of law enforcement in the sea can be sorted sequentially, namely the field of Polysionyl and the field of judicial (investigation). In the field of polysionyl carried out daily sea operations (marine security) through the control/supervision of the national legislation and regulations. If the operation of the sea is found to be a violation of national law, the case is resolved through investigation of the activities of the judicial field (BPHN, 1990).

In a yutisial sense, law enforcement is interpreted as a process of activity in the completion of a case arising out of the breach in the sea on the provisions of the applicable law, both international and legal provisions National. Based on the above definition, the implementation of law enforcement in the sea is activities that include supervision, ship termination including boarding and inspection (investigation and inspection), and investigation when There is a criminal offence, while further settlement is carried out on land (BPHN, 1990).

Law enforcement at sea is necessary for security in the sea considering the existence of various forms of threat or disruption to the use or utilization of marine activities, among others:

- a. Threats of violence, namely threats using organized armed forces and have the ability to disrupt and harm personnel or countries. The threat can be piracy, piracy, sabotage of vital objects, the continuation and action of terror.
- b. Threat navigation, which is the threat posed by the condition of geography and hydrography as well as lack of compacted navigation aids, such as flare, buoy and others, so as to harm the safety of the cruise.
- c. The threat to marine resources, namely the pollution and destruction of marine ecosystems, and the conflict of marine resources management, which has a tendency to be easily politicized and hereinafter followed by the deployment of military forces, such as In islands disputes.
- d. Threat of violation of law, which is not fulfilled by national and international laws that apply in the waters, such as illegal fishing, illegal logging, smuggling and others (Purnomo, 2004).

The handling of law enforcement in the border region of the state is not detached from the legal authority attached to a state or an institution/organization of law enforcement, in the exercise of its authority in the law enforcement sector. The authority referred to herein is the legal authority, which is the act of taking discretion on the rights used to perform the law enforcement in the Sea (Purnomo, 2004).

Broadly, the government has the authority in law enforcement, and the authority is performed by the institutions associated in the implementation of law enforcement in the sea include, (i) The authority of the investigation, (ii) The authority of Prosecution, and (iii) the judicial authority as described below:

#### **A. Investigation authority**

According to the investigation experts is the first act or action of law enforcement to be authorized for that which is done after it has been discovered or suspected of a criminal offence, in which the investigation in Concreto begins after A criminal offence, so that the act is an application of criminal law and is repressive.

Investigation is conducted to seek and collect evidence that in the first phase should be able to give confidence, although still a temporary nature, to the prosecution of what is actually happening or about what criminal acts have The suspect (BPHN, 1990). The criminal Procedure Code distinguishes between legal acts called investigations and investigations, although the investigation is not a standalone function and is separate from the investigation function. Article 1 KUHAP formulates an investigation as a series of investigations in the matter and in the manner set forth in the criminal CODE to seek and collect evidence, which with such evidence makes the light (clear) about the crimes occurring and to find Suspects.

Understanding of the sea investigation due to the nature of the situation and because conditions in the sea itself is not possible after the criminal act. Therefore, the sea investigation is almost always in the case of criminal acts that caught hands. Thus the authority of law enforcement in the sea provided by the provisions of the legislation includes the investigation authority, so that if found crimes or violations in the sea can immediately take immediate action necessary for the most.

In the Armed Forces (PROTAP) handling of the Sea criminal act by the Indonesian Navy of the Navy the investigation is a set of investigators to seek and find an event alleged to be a criminal offence to To determine whether or not the investigation can be conducted in the manner stipulated in the criminal CODE and certain laws.

The understanding of Protap's investigation is a series of investigators in accordance with the criminal CODE and specific provisions governed by certain laws and is intended to seek out and collect evidence to make a light of criminal acts occurring and to

find their suspects. In case of an investigation of the Indonesian Navy National Army does not know *Locus Delicti* in the sense that the ship/suspect can be brought to the nearest port or in the port where the matter can be further processed.

## **B. Prosecution authority**

The prosecution's authority is the general Prosecution authority to file a suspect in the future of the trial based on the results of the investigation of what is actually happening or what crime has been done as well as who the suspect is accompanied by With existing evidence. As stated in article 1 paragraph 1 of Law No. 16 of 2004 concerning the Prosecutor of INDONESIA, a law enforcement officer whose main duty as a public prosecutor is prosecutors. Thus the authority of the prosecution is the authority given by Law No. 8 of year 1981 to prosecute and enforce the determination of judges.

## **C. Judicial authority**

The judicial authority is the authority of the Court handed over to the judicial bodies and is set by law with the principal duty to receive, inspect and prosecute and resolve any matters submitted in his presence In accordance with Law No. 4 of 2004 on judiciary. According to article 1 This Law of judicial authority is the power of the independent state to administer the judiciary to uphold the law and justice based on Pancasila, for the implementation of the Law State of the Republic of Indonesia. Pursuant to article 18 of the Court has the power to inspect, prosecute and break the criminal matter with the presence of the defendant unless the law determines otherwise.

The authority of this judicial body also covers cases of criminal acts and violations in the sea. If the difficulty in determining which State judicial law is authorized to deal with the consequences of crime and violation at sea, then the provisions of Article 85 and 86 of Law No. 8 year 1981 concerning criminal proceedings.

## **2. Regional Government special authorities in law enforcement in the border region of the country**

Since Indonesia has become a sovereign country, borders are already a problem that has not even found a bright point to date. The most common problem is the boundary dispute with neighboring countries directly adjacent to the land area and the Indonesian sea. In addition, the problem of community welfare residing in border areas is also worth noting. The border area is the entrance of a country, therefore it takes more attention. Development and also facilities such as education, health, transportation, information and so on must be adequate. People in the border area should be more concerned about their needs, so they are not isolated from the outside world.

The border area is an integral part of the territory formed by the law hence the arrangement, development and development of the frontier area is something that is very important and fundamental in order to accelerate the implementation of national development and community services, and aims to improve the welfare and living standards of society. Border of an area is a major manifestation of regional sovereignty/region, where borders play an important role in determining the boundaries of sovereignty, resource utilization and legal certainty for the implementation of governance activities.

Country borders have potential and opportunities to develop well, if a number of fundamental constraints and obstacles have also caused various fundamental problems, such as the low level of community life, the high social and economic gaps, political problems, security and order can be managed for the resolution well, through a better policy in a more integrated and thorough sense with the spirit of renewal and change in various aspects/dimensions , as it changes and paradigms of thinking and strategy, rules, organizations and governance include management areas; and resource support. In such a way the process of all of these things, so that the creation of conditions that better guarantee the process and achievement of the objectives of the national development generally and the management of borders of the country and border areas in particular (Rupidara, 2010).

In addition, in this border area also keeps many latent problems that if not resolved will be detrimental to both parties, especially the people who dwell on the region. The latent danger is one of the conflicts of land that often occurs between people in the region. There are four types of borders that often bring about conflict, namely:

1. Territorial, where a country/region claims a certain region as a legitimate possession,
2. Positional, where a country/region disputed the definition and demarcation of its boundaries with other countries/regions,
3. Functional, a country has a dispute about the use of functions of objects in the border area,
4. Resources Based, where a country/region competes to gain mastery over a country/region competing to gain mastery over an area of a poulitce boundary.

In the perspective of defense, country borders are the sovereignty of the country, these two things have a very close connection that the realization of the sovereignty of the State can well maintain the borders of the country, likewise also vice versa with the defense State borders Well then it is an embodiment of State sovereignty. However, border management is not only up to the safety and orderly sense in the region but includes many dimensions including human development in the economic, educational, health and infrastructure aspects of the frontier. Likewise, with the dimensions of public political life need to be done so that the

people who dwell in the area understand the political rights and participate actively in the process, planning, implementation and development that Implemented in the region.

Border areas need to get serious attention because the condition will support the sovereignty of a region. Awareness of the differences between regional border areas has encouraged bureaucrats and policy-makers to develop a study on the arrangement of frontier areas equipped with the formulation of Its systems that will Be a strategic issue because of the arrangement of border areas associated with the nation state building process against the emergence of internal conflict potential in a region and even with neighboring territories. Therefore, the region that has a direct border with other countries should be given special authority in the management and enforcement of law because it borders directly with other countries and is a very important region and To maintain the country's border needs with other countries.

The granting of different autonomy over one region or region of some areas is a governance practice that is quite common to be found in the experience of political arrangements in many countries. This experience takes place both in the form of a devolved unitary state, as well as in federative setting format. In the treasures of political science and governance, these incomparable regulatory patterns are referred to as asymmetrical decentralization, asymmetrical devolution or federalist asymmetrical, or in general asymmetrical intergovernmental arrangements. Principally, the various forms of asymmetric-patterned power are one of the policy instruments intended to address the two fundamental fundamentals facing a country, which are issues of political patterns, including those is sourced to uniqueness and cultural differences; And the problems of the technocratic-medical pattern, namely the capacity of a region or an area in carrying out the basic functions of government.

The reasons for the technocratic-managerial pattern are generally related to the capacity of the local government. This arises when the area is unable to provide adequate and efficient public services as other areas of the same level. The asymmetric approach allows authorized government officials at the national level to maximize its function range and power. This range of functions and powers can be restricted in the later days when the capacity has awakened adequately enough. Therefore, measurement of capacity is required. Asymmetric-related political arrangements were taken as policy strategies to maintain the basic boundaries of a country's political units and or as an assimilation of a particular cultural uniqueness. With varying degrees of success, minority representation at sub-national level as well as privileged/special status provision for one region or region area can encourage groups/regions, demanding privileged/specificity status, negating/minimizing violence and maintaining territorial integrity.

The special autonomy or asymmetric decentralization in Indonesia is a historical sustainability that has begun from the colonial period and affirmed in three constitutions that have occurred in Indonesia. The basis of the policy can be referenced in the constitution as the highest legal entity. Special autonomy regarding fundamental affairs related to the pattern of central and regional relations concerning the design of authority, institutional, financial and different control. Special autonomy can at least be given in consideration: conflict, history and culture, border areas, state capitals and economic development. Research shows there are at least five reasons why asymmetric decentralization should be conducted in Indonesia.

**First**, the reasons for conflict and the demands of separatism. It is undeniable that two districts (three provinces), Aceh Province, Papua Province and West Papua province get special treatment in the form of special autonomy due to conflicts between the two areas and the national government, among others Due to resource scramble. Special autonomy for both regions is governed by, for ACEH enacted LAW No. 44 year 1999 on the implementation of privileges of the province of Aceh and ACT No. 11 year 2006 concerning ACEH government; And for the provinces of Papua and West Papua enacted LAW No. 21 of 2001 on special autonomy in Papua province. If summarized, special autonomy for ACEH and Papua is principally comprised of: first, the Special Autonomy Fund as compensation for the three provinces can still be joined in the Republic of Indonesia. Secondly, recognition of the local identity manifested in political institutions. In ACEH the process is characterized by a new institution representing customs and religion. In Papua, authority is given to customs and churches. Third, recognition of local symbols such as flags, languages and others. Fourth, local political party. Aceh made use of local party momentum with the growth of the local party and won the elections, while in Papua it did not exist even though the space for this already existed. Fifth, there is affirmative action to become a local leader. In Aceh its form can read Al Quran, in Papua the leader must be indigenous Papuans who are denied by the Papua People's Assembly. Sixth and perhaps most importantly, the resource-related settings. In addition to large amounts of otsus, regional resource management is a specific issue. ACEH has some specific specificity related to resource management, such as land, forest and oil exploitation. Because of the exciting affairs of this resource, the Government has not submitted to ACEH in the form of supporting regulations such as government regulation according to the deadline stated in the LAW.

**Second**, the country capital reasons. This special treatment is only given to the province of DKI with the province of DKI Jakarta with the enactment of LAW No. 29 of 2007 about the provincial government of special region of Jakarta Capital as the capital of the unitary Republic of Indonesia. Given that the region is affordable with the best infrastructure in the country, special treatment is realized in the absence of the owner for the Regent/mayor and there is no district DPRD/city appointed by the governor. Consequently, the governor's election uses an absolute system majority where the winner is at least 50% of the vote. In other regions, except Yogyakarta, get more than 30% of the vote.

**Third**, historical and cultural reasons. Special areas of Yogyakarta have a special treatment given its history in the revolution and the scramble for independence. In the course of history, the position of the special region of Yogyakarta as the provincial autonomous Region in accordance with the meaning of article 18 of the Constitution 1945 (before the change) is governed by the LAW No. 22

year 1948 on the main law of local governance. As a follow-up then the special region of Yogyakarta was formed by Law No. 3 of 1950 on the formation of special regions Yogyakarta Government Regulation number 31 year 1950 as amended, and plus the last with Act No. 9 Year 1955 (Government Gazette year 1959 number 71, addition to Government Gazette number 1819) is still valid. In such legislation, DIY includes Yogyakarta NgaHadiningrat Sultanate area, and the Duchy of Paku Alam. In each law governing local government, the privilege of Special region of Yogyakarta (DIY) is still recognized, as the last stated in Law number 32 year 2004. Currently DIY privileges is governed by Act No. 13 of 2012 which includes (LAW No. 13/2012 on the privileges of Yogyakarta Special Region article 7 paragraph (2): 1. Procedures for filling the position, position, duties, and authority of the Governor, and the deputy Governor; 2. Institutional regional Government of DIY; 3. Culture; 4. Land; and 5. Spatial planning. This special authority is located at the provincial level in the procedure of filling the position of Governor, and the deputy governor of one of the conditions that must be fulfilled by the prospective governor, and the deputy governor is ruled as Sultan Hamengku Buwono for prospective governor, and reigned as the Duke of Paku Alam for prospective deputy governor. Institutional authority.

The DIY regional government is organized to achieve effectiveness, efficiency and governance, and community service based on the principles of responsibility, accountability, transparency, and participation by paying attention to the form, and The arrangement of the original government which is further regulated in *Perdais*. Cultural authority is held to preserve, and develop the results of copyright, flavor, carcass, and the works of values, knowledge, norms, customs, objects, art, and the sublime traditions that are rooted in the next DIY society Arranged in *Perdais*. In the implementation of the authority of Yogyakarta Sultanate, and the Duchy of Pakual securities expressed as a legal entity. Sultanate, and the duchy was authorized to manage, and utilize the land of sultanate, and the land of the duchy aimed at the enormous development of culture, social interests, and welfare of society. Authority of the Sultanate, and the duchy in the spatial confined to the management, and utilization of the land of Sultanate, and the land of the duchy which is further arranged in *Perdais*. *Perdais* is a special regional regulation established by the Parliament of DIY and the Governor to arrange the implementation of special Authority. In addition, the Government provides funding in order to conduct the affairs of DIY privileges in the income budget, and State expenditure in accordance with the needs of DIY and financial capabilities of the State.

**Fourth**, the reason for the border, the border needs to get special treatment considering its role as boundary with neighboring countries. The border areas hold important functions because of the complexity of the problem encountered. The border area should be treated as a front page instead of the RI's backyard. Treat the border areas, for example in West Kalimantan should be different, for example by requiring the governor to come from the military because of the potential of high border crossing in addition to the strengthening of and education services and Health. The details about asymetrisms of borders still require further study. That is, the new provincial plan should include asymmetric settings related to border functions. Provincial expansion is not only the same as other regions in Indonesia but already have to pay attention to the specificity that is held concerning the different authorities, institutions, finances and controls so there is no need to make two laws. Unfortunately, until the establishment of North Kalimantan province passed the HOUSE, the space asymetrisms does not exist. Why is the discourse about the special autonomy of the areas so important? The border area is the cultural division of a community that is thought to be derived from the same cultural roots but by the government policy of the two neighboring countries, eventually divided into two different entities. The border area is also a reflection of the level of prosperity between the two countries and not infrequently, this area becomes the event of conflict between the different inhabitants of his nationality because of certain objectives. Even border areas are one of the potential areas to smuggle and harm the country in large quantities, even the loss of state for land and sea when the nominated can reach  $\pm 20$  billion US \$ per year. While poverty is a classic problem in the border area, which until now has not been resolved. Border areas are also very prone to follow-up illegal logging where the cause is some of the boundary of Indonesia and neighboring countries, namely Malaysia, damaged eaten time and lost or buried by nature. The land boundary of the Republic of Indonesia is directly adjacent to the countries of Malaysia, Papua New Guinea and Timor Leste. While the Indonesian Sea region borders with 10 countries, namely India, Malaysia, Singapore, Thailand, Vietnam, Philippines, Republic of Palau, Australia, East Timor and Papua New Guinea. The sea border area in general is the outer islands of which there are 92 islands and includes small islands. North of Indonesia borders Malaysia in the form of land in the island of Borneo, precisely in west and East Kalimantan. In addition to land boundaries, it also borders the sea with the country of Singapore, Malaysia, Philippines. To the east, it borders land and sea with Papua New Guinea in Irian Jaya Island. To the south is bordered by East Timor in Nusa Tenggara Timur and bordered by Australia to the Indian Ocean. To the West borders the Indian Ocean.

The problem of Indonesia's territorial borders is no longer a new thing today. Since Indonesia has become a sovereign country, borders are already a problem that has not even found a bright point to date. The boundary problem is not only the physical limit that has been agreed but also about the way of life in the area, such as traditional fishermen or other activities around the border area. There are ten neighboring countries whose waters are directly adjacent to the archipelago. They are Malaysia, Singapore, Thailand, India, Philippines, Vietnam, Papua New Guinea, Australia, Republic of Palau and Timor Leste. Based on the problems that have been disclosed first, then all we need to know in advance is the sense of the boundary itself.

According to, (Haryati and Ahmad. 2007) boundary is a separator of the regional Geographical Unit (physical, social, cultural) ruled by a country. A common impression of the country boundary on the map is the sign of the sovereignty and jurisdiction of a country usually a strong line on the map. Politically, the borders of the country are sovereignty lines consisting of land, ocean and including the potential of the Earth's stomach. Meanwhile, boundary and frontier terms are distinguished.

The boundary is defined as "an international boundary marks the outer limits of the area over which government has sovereignty" (Carlson and Allenk 1960), which is a sign limiting the most outer part of the region ruled by a country. The frontier is

the boundary or dividing line between the two countries. Boundary has an internal meaning, while the frontier has the significance of the relation between the two neighboring countries. If "A boundary is a line, separating factor, which is inner oriented" then "a frontier is a zone of transition, an integrating factor...." (Alexander, 1966).

In this condition, give more freedom to the local government to take care of their own household with sufficient funding becomes a rational choice. Therefore, the provision of special autonomy to the border area becomes an option that can be considered. There are a few reasons why granting special autonomy to border areas has become an alternative solution for border problem solving in Indonesia and also as part of an effective and efficient law enforcement effort by local governments. The author tried to analyse the above border issues in several perspectives :

## 1. Geopolitical perspectives

The view on geopolitics was raised by Haushofer. Geopolitics can be said to be a development of political geography, where the state is seen as an organism that lives and develops over time. The development or evolution took place in spatial in order to meet the needs of the people of the nation or demand for space (Lebensraum). The German geologists at that time, particularly Haushofer, geopolitics grew rapidly as one of the branches of science, where politics and space were the main focus. Thus, Haushofer named geopolitics as a science of the state covering political, spatial, economic, sociological, anthropological, historical and legal areas.

The boundaries of the country become the center of attention of political geographers because the country's borders are part of state affairs. The location of its oversight and the trade is the most prominent state task given that the government's goal is to protect the country's territorial territory and protect its citizens ' autonomy. The Government's purpose in the border area is a strict protection, the outside party that will enter a country should be discontinued or selected, state-owned land must be on the watch to determine if the outside Act adverse (Haryati and Ahmad, 2007 ).

The borders of the country also depict the sovereignty of a country where its existence is recognised by the world. In addition, security in the border area is also one of the factors supporting the presence of the country in the region to protect the rights of its citizens. Problems or conflicts that often occur in these frontier areas may interfere with the security stability of a country, so that when the security stability of a country is disrupted it is not possible that social, economic and Communities in the region are unable to go well.

The policy of improving the security and community order is a more integrated and comprehensive policy covering various aspects/dimensions of national development, because basically the condition of security and order is the accumulation of functions of various aspects/dimensions. The sovereignty policy of the unitary Republic of Indonesia in the border, directed at a more integrated and comprehensive set of ways and efforts in its various aspects/dimensions, generally encompasses two fundamental policies of the policy of sovereignty in a narrow sense and in a broad sense.

In a narrow sense, the sovereignty policy of the unitary State of the Republic of Indonesia is directed at the rank of the boundary guard effort to divide the territory of both countries marked by the boundary pillar by the Indonesian national armed Forces with the support of Other components. In the broad sense, the policy to handle the sovereignty of the unitary State of the Republic of Indonesia, directed in the manner and efforts to guard the interests of the unitary Republic of Indonesia in the region including the borders of the country and its border areas By all components of the nation and country in realizing the sovereignty of the country in the sense that truth the state of the supreme power of the unitary Republic of Indonesia for its territory including the country's borders and its border areas, Based on the recognition and real strength of the unitary State of the Republic of Indonesia in keeping the country's territory including borders and border areas, for the welfare of all Indonesians.

In the context of modern politics, the management of frontier territories effectively and continuously can be seen not only need the presence of the symbols of the implementation of the State Government in question but also the extent of politics and approaches Development carried out in the regions in question can be felt benefits to the local people and recognized its reputation by other countries. In more concrete the unitary State of the Republic of Indonesia, the management of the border region should be used a new paradigm that makes the frontier region no longer a rear fence but is the front porch of a country. Thus, in the management of border areas, the development politics pursued with the new paradigm as an example can be realized by the extent that Indonesia can design a master plan of border management National and Integrated (Hariyadi, 2007).

## 2. The economic perspectives

Based on the conditions and problems of the border area, the policy of border management in the areas of economic affairs is geared towards increasing added value and more value to the potential and economic resources in the region. Border. This policy covers the following things :

- a. Empowering the community in the field of natural resources management so that it becomes more productive and economical value to ensure the adequacy of food and nutrition and increased revenue to participate in fulfilling other social needs in terms of Education, health and societal relations.
- b. Empowerment of people in the field of religious life and state ideology to ensure the implementation of a harmonious life between citizens.

- c. Increasing the degree of public education to ensure the primary education of 9 years and the availability of skilled personnel of the management of natural resources and services in the border area.
- d. Increasing the degree of public health to reduce cases of maternal and infant deaths, cases of endemic diseases such as malaria and diseases due to low hygiene such as frambosia, decreased cases of malnutrition in toddlers and IMS disease and HIV-AIDS.
- e. Increased health conditions of residential environment for the provision of healthy housing and sanitary environment of household border villages and border buffer; Management of reservoirs, bbly-bbly and other water storage areas for the prevention of diseases that are endemic.
- f. Development and rehabilitation of transportation infrastructure in the form of village roads, roads between villages, sub-districts and districts.
- g. The activation of the border market equipped with a strict procedure on the management of traffic goods and services with a strict arrangement of service portions between border market traders and inter-state merchants.

From this problem, we need to do the handling efforts as one form of social strengthening of the community so that the life degree of people in the border area in the economic field can increase. These efforts can be done as follows :

- a. Encourage or give input to the central government in order to intensively hold negotiations with the Democratic Republic of East Timor to allow a signed agreement to be implemented;
- b. With all the limitations of carrying out the cross border trade agreement so that it can be run properly and this can be done if both parties respond and prepare well;
- c. The district government borders to be more active in encouraging and facilitating residents and merchants around the border in order to utilize the existing market buildings and supporting infrastructures for trading activities;
- d. Optimization of the utilization of assistance by improving the intensive coordination between the central and provincial governments from planning up to monitoring and evaluation.

In addition to the steps of the treatment, which need to be done also is the implementation of the trading policies that have been there, namely:

- 1) Improve the construction and development of industries in border areas;
- 2) Increase the competitiveness of industrial products, especially the small medium industry in the border area;
- 3) Encouraging the participation of professional society (higher education, non-governmental organizations, banking institutions) to play a role in the construction and development of industries in the border region;
- 4) Improving supervision of goods circulating in the border area;
- 5) Improving the distribution system of goods in the border area;
- 6) Improve coaching to small merchant border areas;
- 7) Increase cross border trade and exports in border areas;

The seventh trade policy is not only the slogan that can only be announced without having to be implemented because the implementation of these policies can improve the welfare of the Economic community that resides on Areas of the region in particular and in general the regional economy, so that implementation of these policies is a way or effort to increase the level of life of the community in the border area. The purpose of this cross border trade is;

- 1) Facilitate the trade of residents living in border areas;
- 2) Improving the welfare of the population living in the border area;

- 3) Facilitate the placement of people's traffic and goods;
- 4) Increase the management capacity of potential border areas;
- 5) Reduce smuggling.

### 3. Empowerment Perspective

It is undeniable that the community conditions in the border area are always haunted by social issues such as poverty and retardation. When viewed deeper, the type of poverty that occurs in the border area can say structural and situational poverty. The meaning of structural poverty in this context is not the presence of the Government to implement the development of the region which is reflected in the lack of tools and supporting infrastructure to fulfill basic needs such as education, Health and transportation and housing. While situational poverty is the poverty that occurs due to prolonged conflicts in other regions, causing a massive exodus on the territory that caused the destination region to receive the exodus Excessive burden, this group of Exodus became the new group of poor people in the region.

The problem then makes the frontier area a very backward region and prone to social conflicts in the area of land struggle and so on. This problem is a homework for the government to solve it primarily to reduce the poverty rate in the region, a way that can be used to overcome the problem by empowering communities who reside in The border area because so people can free themselves from the circle of poverty both physically and mentally. Through this empowerment concept the government can build a strategy to start to increase community participation both in the process and implementation of the development and enforcement, concept or policy of development embrace two philosophies The basic public touch and bringing the public in a policy concept that really touched the needs of the community and also able to bring people into the room policies or known as participatory development.

Like what Jim Ife expressed, that empowerment is to provide resources, opportunities, knowledge, and skills to the citizens to improve their ability to determine their own future and participate in it. and influences the lives of its people (Zubaedi, 2007). While the principle of democracy is described in community participation in every stage of planning. The concept of empowerment that is done with the intention to realize the independence and welfare of the community on an ongoing basis, so that welfare means fulfilling the basic needs of society, while independence means able to organize To mobilize resources in their environment, able to access resources outside of their environment, and manage these resources to address the social problems that occur in their environment.

The concept used in implementing the program is the concept of empowerment. This concept is used due to the emergence of two surface premises, namely failure and expectation. The failure in question was the failed economic development models in tackling poverty and the sustainable environment. While hope arises due to the development of alternatives that incorporate democratic values, gender equality, equality between generations and adequate economic growth (Friedman, 1992). Thus the border area can be used as a front porch of the nation where the initial reflection of the nation's face can be seen from the country's border area so that the management of borders not only to the safe and comfortable but also On the development of its human character to realize the improvement of the welfare of the people who settled on the border area, therefore the local government in the border region of the country is given special authority to regulate Law enforcement in the border area.

The regional government authority as referred to in article 9, article 10, and article 11 of Law No. 43 year 2008 on the territory of the State, mentioned as follows:

Article 9: "Governments and local governments are authorized to govern the management and utilization of state territories and border areas.

Article 10 paragraph (1): In the management of state territories and border areas, the government is authorized :

- a. Establishing the management and utilization policies of the state and border areas;
- b. To conduct negotiations with other countries regarding the determination of the state boundary in accordance with the provisions of international laws and regulations;
- c. Establish or create a sign of the national territorial boundary;
- d. To do data collection and naming of islands and islands and other geographical elements;
- e. To permit international flights to traverse the territorial airspace on the lines specified in the legislation;
- f. Provide cross-peace permits to foreign vessels to traverse the territorial seas and archipelago waters on the lines specified in the legislation;
- g. Carry out supervision in additional zones necessary to prevent violations and punish violators of legislation in the field of customs, fiscal, immigration, or sanitary regulations in the territory of the State or territorial sea;
- h. Establish airspace prohibited by international flights for defence and security;

- i. Create and update a map of the state territory and submit it to the House of Representatives at least every 5 (five) years; Dan
- j. Maintain the integrity, sovereignty, and security of the State territory and border areas.

Paragraph (2) "In order to implement the provisions as intended in paragraph (1), the Government is obliged to set the cost of development of border areas.

Subsection (3) "In order to exercise its authority, the government may assign the local government to exercise its authority in the framework of the assistance in accordance with statutory regulations.

Article 11 (1) "In the management of state and border areas, the provincial government is authorized:

- a. Implement government policies and establish other policies in the framework of regional autonomy and assisted work;
- b. Coordinate development in the border area;
- c. To undertake the development of the border area between regional governments and/or the local government with third parties; Dan
- d. Supervise the implementation of the development of border areas implemented by the Regency/city.

Paragraph (2) in order to implement the provisions as referred to in paragraph (1), the provincial government shall be obliged to establish the cost of development of border areas.

Article 12 (1) in the management of state and border areas, government of the District/city is authorized:

- a. Implement government policies and establish other policies in the framework of regional autonomy and assisted work;
- b. Maintain and maintain boundary marks;
- c. Coordinate in the framework of the implementation of development tasks in the border area in the region; Dan
- d. To undertake the development of the border area between regional governments and/or the local government with third parties.

Paragraph (2) "In order to implement the provisions as referred to in paragraph (1), the Regency/city government is obliged to establish the cost of development of border areas.

To conduct law enforcement and management of national territory boundaries and to manage border areas at the central and regional level, governments and local governments established national governing bodies and regional management bodies.

Community involvement in conducting law enforcement and management in the border area is governed by article 19 of LAW No. 43 year 2008 about state territory by doing in the form of:

Paragraph (1):

- a. Developing the development of border areas;
- b. Maintain and maintain the border area.

Paragraph (2) "to implement the provisions as intended in paragraph (1), the Government may involve the public to participate in the management of the border area.

Subsection (3) "The participation of the community as referred to in paragraph (1) shall be implemented in accordance with the provisions of legislation.

After seeing the problem in the framework of legal theory of local government, the analysis is carried out by conducting observations to conduct a system of local government in Indonesia under the Constitution 1945, in The legal principles associated with the problems written. Because of this normative writing, the interpretation and construction of the law performed using the logic of the deductive thinking, inductive answers of the problems and objectives of this writing. The system of local government in Indonesia under Act 1945 is an embodiment for the national mandate to carry out the public, which is entrusted to the order of the center and the region in implementing the system of local governance in Indonesia must be under the Constitution of the Republic of Indonesia year 1945. Where in the general provisions of number 2 and number 3, LAW No. 23 of 2014, mentioned that (1) The local government is the implementation of government affairs by local governments and the regional House of Representatives according to the principles of autonomy and the co-administration with The principle of widest autonomy in the system and principles of the unitary Republic of Indonesia as referred to in the Constitution of the Republic of Indonesia year 1945; (2) The local government is the governor, regent, or mayor, and the local device as an element of local governance, therefore in implementing the system of local government in Indonesia, carrying out other duties and authorities in accordance with The laws and regulations, so that the achievement of local government objectives in the case of law enforcement in the country's border area is realized.

In the latest system of government no longer implements the centralization system, but rather the regional autonomy system that gives some authority that must be decided on the central government can now be decided at the local government level. The advantages of this system are that most decisions and policies in the area can be decided in the area without interference from the government in the center.

But the lack of a decentralized system on special autonomy for the region is an excessive euphoria in which the authority is only concerned with the interests of the class and group and is used to dredge personal gains or persons. It happens because it is difficult to control the Government at the central level.

In order to implement the law enforcement system in the local government can be carried out well in the border area, it is necessary to understand by all parties or instruments that are interested in local government law enforcement. Therefore to realize the role of community and local government in conducting law enforcement in the country's border territory then it should be granted rights and authority to the region in the border with special duties and obligations in Achieving the goal of granting autonomy in law enforcement in the border of the country, so that there is a harmonious relationship between the center and the area and between regions in order to maintain the integrity of the unitary Republic of Indonesia (NKRI).

### 3. CONCLUSION

Government authority and local governments in the border area in conducting law enforcement in the border area of the country in the territory run by law enforcement institutions ranging from the level of investigation, prosecution up to Judicial level is felt not maximally due to various constraints that is a limitation of law enforcement infrastructure in the border area of the country with the area of the border state that does not compare straight with the number of personnel enforcement The law in the field.

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# Level of awareness of chemotherapy and its side-effects among cancer patients admitted for chemotherapy at Teaching Hospital Batticaloa, Sri Lanka

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**Abstract-** Cancer is a serious epidemiological problem and is the second leading cause of death worldwide. Most of the cancers are treated with chemotherapy as it is one of the widely used treatment. But ability of cancer patients to control the side-effects associated with chemotherapy is limited due to lack of knowledge and awareness of the disease and its treatment. A hospital based descriptive cross-sectional study was conducted to assess the level of awareness of chemotherapy and its side-effects among 160 including both male and female cancer patients, above 20 years of age who were under chemotherapy in Oncology unit at Teaching Hospital, Batticaloa from March 2017 to February 2018. The entire population was selected for this study. Data were collected through a structured interviewer administered questionnaire. Data analysis was done by using SPSS v19 statistical software for descriptive statistics test to look into the research problems. Among the study population, 21.2% of patients had received oral chemotherapy while 78.8% of patients had received intravenous (IV) chemotherapy. Most of them had a poor and very poor overall knowledge level regarding chemotherapy and its side-effects (oral= 61.8%, IV= 57.1%). The most known side effect was fatigue (73.4%). In conclusion, The overall knowledge regarding chemotherapy and its side-effects among cancer patients receiving oral and intravenous chemotherapy was unsatisfactory. So better educational programs to improve the knowledge and awareness of chemotherapy and its side-effects among cancer patients at THB is a contemporary need.

**Index Terms-** Cancer patients, chemotherapy, Side-effects, Teaching Hospital, Batticaloa

## I. INTRODUCTION

Cancer is one of the most common disease occurring worldwide as well as in Sri Lanka. According to the World Health Organization (WHO) the incidence of cancer is about 8.8 million deaths in year 2015 and it can be risen up to 12 million in 2030. And about 70% of deaths have been reported in low and middle income countries. The incidence of cancer in Sri Lanka was 82.6 per 100,000 population and 11286 deaths were occurred in year 2010[1, 2].

Cancer is defined as “a large group of diseases characterized by the growth of abnormal cells beyond their usual boundaries that can then invade adjoining parts of the body and/ or spread other organs” and causing fatal conditions that has led to death[1]. Even though various types of treatments are available for cancer including surgery, chemotherapy, radiotherapy, hormone therapy, treatment with biologic modifiers and targeted therapy; most of cancers are treated with chemotherapy as it is one of the widely used treatment [3]. But all these treatments are associated with side-effects [4]. The side-effects associated with cancer chemotherapy depend on type of drug, dosage, frequency, duration of administration and whether they used in combination [5]. It can be divided as short-term and long-term side-effects. The short-term effects include emesis, diarrhea, premature menopause, infertility, nausea, weight loss, stomatitis, etc. while the long-term effects include alopecia, secondary malignancy, myelo suppression, neuropathy, anemia and fatigue [6]. Although chemotherapy introduced in 1940's, patients have lack of knowledge about chemotherapy and its side-effects, causing burden for quality of life. Therefore the knowledge regarding chemotherapy is very much essential among cancer patients as well as in normal population [7].

There were many studies have been carried out around the world to assess the awareness regarding chemotherapy and its side-effects. But in Sri Lanka the publications were very rare and there is no any publication in Batticaloa District. Therefore, this research study has been conducted to assess the level of awareness of chemotherapy and its side-effects among cancer patients admitted for chemotherapy at Teaching Hospital, Batticaloa (THB).

## II. METHODS AND MATERIALS

A hospital based Descriptive Cross Sectional study was conducted to assess the level of awareness of chemotherapy and its side-effects among 160 cancer patients (above 20 years of age) including both male and female who were under chemotherapy in Oncology unit at Teaching Hospital, Batticaloa from March 2017 to February 2018. The entire population of patients admitted for chemotherapy was included in this study. Data were collected from those willing to participate in the study; respondents who were not receiving chemotherapy, less than 20 years old, who refused to participate in this study, who were not in good conscious level and the respondents who were not present at the time of study were excluded from the study. The respondents were thoroughly explained about the study and written consent was obtained before the data collection. Anonymity was ensured and emotional support was given throughout the study. Data were collected by investigators through a structured interviewer administered questionnaire. The accurateness of the provided information was checked with their Bead Head Tickets and clinical records. Collected data were transferred into SPSS v19 statistical software to analyze data based on the research problems and objectives. The descriptive statistical test was used to describe socio-demographic factors, to identify the level of knowledge about chemotherapy and its side-effects among cancer patients admitted for chemotherapy at THB. The marks were given out of 100 separately for the questions to analyze the knowledge on chemotherapy and knowledge on side-effects of chemotherapy. Knowledge about chemotherapy, in patients receiving oral chemotherapy contained 7 questions, in patients receiving Intra Venous (IV) chemotherapy contained 7 questions. Knowledge regarding side-effects of chemotherapy contained 5 questions. The overall knowledge regarding chemotherapy was obtained by the average of marks gained for the knowledge on chemotherapy and knowledge on side-effects of chemotherapy. The allocated marks were represented in the following table (Table 1) [8, 9].

**Table 1: Scoring System**

The Level of knowledge	Allocated marks range
Very poor	0-19.9
Poor	20-39.9
Satisfactory	40-59.9
Good	60-79.9
Excellent	80-100

Ethical clearance was obtained from the Ethics Review Committee, Faculty of Health-Care Sciences, Eastern University, Sri Lanka and the permission was obtained from both Director and the consultant oncologists of THB.

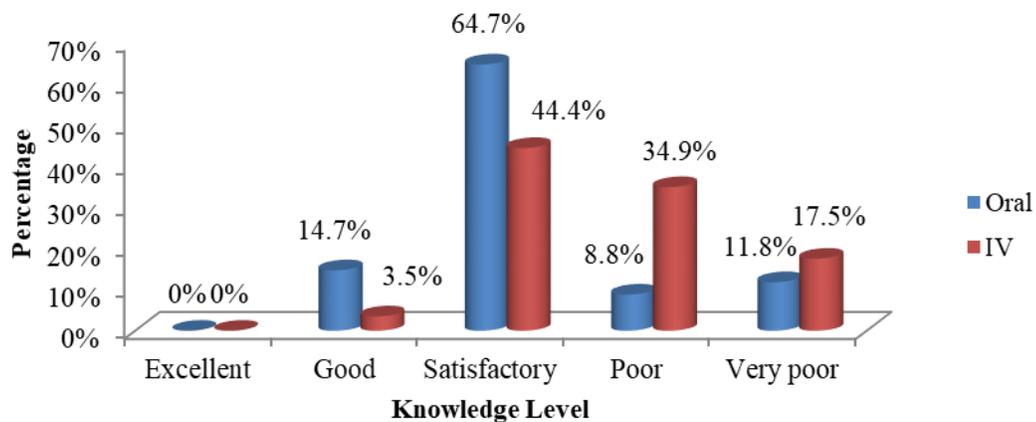
## III. RESULTS AND FINDINGS

**Table 2: Distribution of socio-demographic characteristics**

Variable (n= 160)	No	Percentage (%)
<b>Age</b>		
20-30	16	10
31- 40	21	13.1
41-50	40	25
51- 60	47	29.4
61- 70	31	19.4
>70	5	3.1
<b>Marital status</b>		
Married	149	93.1
Living together	1	0.6
Separate	2	1.3
Unmarried	7	4.4
<b>Ethnicity</b>		
Tamil	68	42.5
Sinhala	13	8.1
Muslim	79	49.4
<b>Religion</b>		
Hindu	58	36.3
Christian	10	6.3
Buddhist	13	8.1
Islam	79	49.4

<b>Education level</b>		
Primary (Grade1-5)	65	40.6
Junior secondary (Grade6-9)	32	20.0
Senior secondary (Grade10-13)	47	29.4
Tertiary/Collegiate	16	10
<b>Occupation</b>		
Self-employment	40	25
Government	13	8.1
Retired	4	2.5
Non-government	5	3.1
Unemployment	98	61.3

This study was conducted among 160 cancer patients at THB. Among them, 69.4% of respondents were female and 30.6% of them were male. Majority of the respondents (29.4%) fall in the age range of 51-60 years and 93.1% of patients were married. In addition to that, 49.4% of patients were Muslims and they were the plurality while 42.5% of patients were Tamil. According to the religion 49.4% of patients were Islamic while 36.3% of patients were Hindu. From the participants, 61.3 % of patients were unemployed (Table 2).



**Figure 1: Knowledge about Chemotherapy among the participants**

Among 160 participants, 85% of patients knew that there are treatments available for cancer. But names of the chemotherapy medications were known by least amount (5.6%) of patients. Only 22.5% of participants reported the duration of chemotherapy that they had received. In the study sample, 21.3% of patients were receiving oral chemotherapy and 78.8% were receiving IV chemotherapy at the time of the study. From the participants under oral chemotherapy, all of them knew the accurate frequency of the medications that they were receiving. Among the respondents under IV chemotherapy, 49.2% of patients knew that how often the repetition of chemotherapy cycle occurs.

The majority of the patients under oral chemotherapy had an adequate level of knowledge (good and satisfactory knowledge were 14.7% and 64.7%). Patients receiving IV chemotherapy, more than half of them had inadequate level of knowledge (52.4%, include patients with both poor and very poor knowledge). But none of the above had excellent knowledge (Fig 1)

**Table 3: Knowledge regarding the side-effects of chemotherapy**

Variables	No	Percentage (%)
<b>Side-effects of chemotherapy</b>		
Yes	143	89.4
No	17	10.6
<b>*Description of side-effects among side-effects known patients (n=143)</b>		
Pain	84	58.7
Hair loss	85	59.4
Fatigue	105	73.4
Nausea /Vomiting	93	65
Diarrhea	25	17.5
Memory impairment	24	16.8

Constipation	15	10.5
Mouth sore	33	23.1
Dry mouth	27	18.9
Bone marrow suppression	9	6.3
Loss of appetite	63	44.1
Fever	21	14.7
<b>Premedication to manage side-effects</b>		
Yes	54	33.8
No	106	66.2

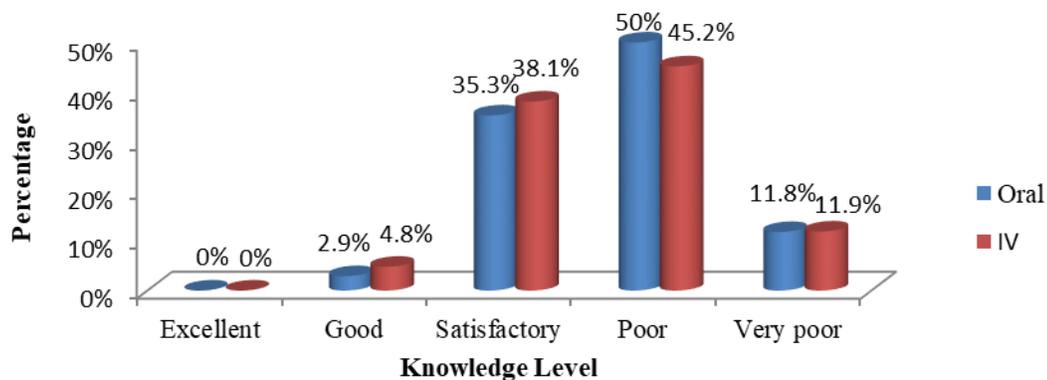
\*- These respondents have been obtained as multiple choice.

Out of 160 patients, 89.4% of patients had told that there are side-effects associated with chemotherapy. Out of them the most known side-effect was fatigue (73.4%). More than half of them were reported nausea/vomiting (65%), hair loss (59.4%) and pain (58.7%). Similarly, 33.8% of patients knew that premedication is giving before chemotherapy to manage side-effects (Table 3).



**Figure 2: General knowledge regarding side-effects of chemotherapy based on scoring system**

In the study sample, 23.8% and 35% of respondents had very poor and poor knowledge level regarding side-effects of chemotherapy. 2.5% of them had excellent knowledge level respectively. More than half of the study sample (59.4%, include patients with both poor and very poor level of knowledge) had inadequate level of knowledge regarding side-effects of chemotherapy (Fig 2).



**Figure 3: The overall knowledge regarding chemotherapy and its side-effects among patients receiving oral and IV chemotherapy**

Overall knowledge of chemotherapy and its side-effects among the patients under oral chemotherapy (out of 34 patients), 61.8% of them (include patients with poor and very poor knowledge) had inadequate level of knowledge while others (38.2%, include patients with good and satisfactory knowledge) had an adequate level of knowledge. When considering the overall knowledge of chemotherapy and its side-effects among respondents under IV chemotherapy (out of 126 patients) 42.9% of them (include patients with good and satisfactory knowledge) had a satisfactory level of knowledge while majority of them (57.1%, include patients with poor and very poor knowledge) had unsatisfactory level of knowledge regarding chemotherapy and its side-effects (Fig 3).

#### IV. DISCUSSION

The incidence of cancer rising day by day globally as well as in Sri Lanka [1, 2]. Chemotherapy is one of the most effective and widely used (48%) treatment available for cancer [2, 4].

This study results showed that most of the patients (85%) knew that there are treatments available for cancer. Although all of these patients were on chemotherapy, 15% of patients didn't know that there are treatments available for cancer. And only 5.6% of patients knew the names of chemotherapy medications that they were receiving. Similar results had shown in two other studies done in Nigeria and Maryland [10, 11].

The findings of present study revealed that the level of knowledge regarding chemotherapy is adequate in patients receiving oral chemotherapy while it is inadequate in the patients receiving IV chemotherapy. Results of other studies done in Maryland, Nigeria and Sri Lanka had shown that participants had good knowledge on chemotherapy while it is limited in a study done in China [10, 11, 12, and 13].

Regarding the knowledge on side-effects of chemotherapy, previous studies reported that most of the patients knew only about hair loss [8, 14]. This study found fatigue as the most known side-effect and in addition to that more than half of the study sample had known pain, nausea/vomiting and hair loss. In present study, 10.6% of patients had said that there are no associated side-effects of chemotherapy. A study done in Malta revealed that out of 44 respondents 8 (18.2%) patients didn't know about possible side-effects of chemotherapy [15].

The results of this study indicated that only 33.8% of patients knew that pre medication is given before chemotherapy to manage side-effects. Opposed to this, a study indicated that understanding about pre medication was very higher (97%) among patients under chemotherapy [11].

The findings of this study revealed that more than half of the study sample had an unsatisfactory (poor and very poor knowledge level) level of knowledge regarding side-effects of chemotherapy (59.4%). Similar results had shown in a study done in Iran while opposite results had shown in other two studies done in Namibia and Sri Lanka [8, 14]. A study done among patients receiving oral chemotherapy revealed that their level of knowledge regarding side-effects of chemotherapy was inadequate [16].

#### V. CONCLUSION

In conclusion the overall knowledge regarding chemotherapy and its side-effects was poor (oral= 61.8%, IV= 57.1%) among the study population. The maximum knowledge of chemotherapy was seen among the patients receiving oral chemotherapy and the most known side-effect was fatigue. But none of the participants in the study sample had excellent overall knowledge level regarding chemotherapy and its side-effects. Through generalizing of this findings, help to improve the knowledge about chemotherapy and its side-effects among cancer patients who are receiving chemotherapy at THB. Furthermore, it will help them for early detection and management of side-effects of chemotherapy.

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# Motivation In Relation To Teachers' Performance

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## ABSTRACT

This research used the descriptive-correlational method to determine the level of motivation in relation to teachers' performance. The quantitative data were gathered from 89 teachers of District 6, Bayawan City Division, Negros Oriental for SY 2018-2019. Also, the researcher conducted a survey questionnaire. Descriptive-correlational method was used in this study. The statistical tools used in the analysis of the data were percentage, mean, weighted mean, and spearman rank correlation coefficient. The study found out that the level of motivation as perceived by the teachers was "very high" in terms of the following aspects: (a) existence needs; (b) relatedness; and (c) growth needs. In addition, it was also found out that the level of teachers' job performance is at a "very satisfactory" level. Moreover, there is no significant difference in the level of teachers' motivation when they are grouped and compared according to variables of age, sex and length of service, however, variables on highest educational attainment and average monthly income are found to be significant. Lastly, the relationship between the level of teachers' motivation and the level of teachers' job performance is found to be insignificant.

Keywords: Level of Motivation, Teachers' Performance, Existence, Relatedness, Growth Needs

## I. RATIONALE/ INTRODUCTION

Teachers serve as one of the most important elements of our educational system. In the Philippines, the attainment and failure of educational activities depends highly on their performance in executing the teaching and learning process, facilitating classroom management in the learning environment, participating in curriculum improvement and development, and promoting professional growth and engagement. Balogun (2016) indicated that teachers' decisions and behaviors are likely to influence their well-being and job prospects especially pertaining to their work ethics in classroom settings. In the Division of Bayawan City, for instance, teachers are said to be motivated by a number of factors such as existence needs, relatedness, and growth needs.

Teacher motivation depends critically on effective management, particularly at the school level. If systems and structures set up to manage and support teachers are dysfunctional, teachers are likely to lose their sense of professional responsibility and commitment (Mark, 2015). Hence, a teacher has to update professionally, personally and be rightfully motivated so he/she could discharge his/her diverse tasks and responsibilities with efficiency and effectiveness (Lopez & Irene, 2015).

At present, it can be said that many factors exist which promote teachers' motivation. These factors may be viewed as material, psychological, etc. It is also found that a teacher's daily experience on the job determines the activities which are psychologically most rewarding.

Moreover, without motivation, teachers' performance would be highly hindered. The level of motivation of workers will determine the teachers' response to the organizational rules, responsibilities and opportunities. Also, motivation is the force that initiates, guides and maintains goal-oriented behaviors (Callo, 2014).

It is important to note that teacher motivational level can rise when the teaching job enables teacher to satisfy the life supporting elements of his or her physical body like food, water, shelter etc. It can also rise, when the teacher feels useful in his or her job and when he or she feels satisfied with what she or he is doing. Also, in the literature, there are many determinants of teacher motivation. These include teacher status, class size, workload, professional development and salary.

Furthermore, motivation and performance are very important factors in terms of school success and students' achievements. For this, the main thing they required is skilled and competent teachers (Kevin, 2016). Hence, the relationship between teachers' level of motivation and level of performance should be examined.

In this connection, the researcher as one of the teachers of Bayawan City Division would like to shed light on the matter as she observed that quality teaching has become the focus of many education systems, and yet little attention has been given to teacher motivation that could ensure quality teaching and improved learning results. Hence, this research sought to ascertain the

true picture of the state of motivation of teachers, investigate the relationship between motivational factors and teachers' performance in District 6 of Bayawan City Division, Negros Oriental for SY 2018-2019.

## REVIEW OF RELATED LITERATURE

Teachers are the pillar of an educational system. The attainment and failure of educational activities depends highly on their performance. Teachers' decision and behaviors are likely to influence the well-being and prospect of a nation including the lives of the country's next generation (Balogun, 2016).

Teacher motivation depends critically on effective management, particularly at the school level. If systems and structures set up to manage and support teachers are dysfunctional, teachers are likely to lose their sense of professional responsibility and commitment. Teachers' management is most crucial at the school level, where the importance of teachers' work and their competence in performing it are crucially influenced by the quality of both internal and external supervision (Mark, 2015).

Studies on motivational strategies on teachers have shown that teachers by some kind of incentives are recognized as being effective. Incentives are often given in the form of money, that is money can be seen as part of the reward system designed to reinforce behaviour and therefore to motivate people to work towards the achievement of goals and those of the organization. The recognition of the goals and objectives of any establishment largely depends on how the workers perceive and react to their jobs. This attitude controls teachers output. Without motivation, teacher performance would be highly hindered. The level of motivation of workers will determine the teachers' response to the organizational rules, responsibilities and opportunities. Sala (2017) conceptualized the economic basis of human motivation. He believes that people work primarily for money and they are motivated to do only that which provide them with the greatest rewards.

Motivation is the willingness of an employee to contribute high levels of effort towards his or her work, conditioned by the capacity of the effort to satisfy needs as well as his or her personal environment. A motivated employee willingly tries hard to contribute his or her best performance towards accomplishing his or her work. Motivation plays a role in achieving goals and objectives and is equally important for organizations that work in team based environments or for workers who work independently. For an organization to ensure that the employees' workplace goals and values are aligned with the organization's mission and vision, they should create and maintain high levels of motivation leading to high performance. Teachers' motivation has become an important issue given their responsibility to impart knowledge and skills to learners (Zalwango, 2014). Moreover, motivation encourages teachers to facilitate knowledge and skills of academic to learners (Kelvin, 2016).

According to Reiss (2014) motivation means a feeling of enthusiasm, interest or commitment that makes somebody want to work, a reason for doing something or behaving in a certain way. Psychologically, it means the forces determining behavior, the biological, emotional, cognitive or social forces that activate and direct behavior.

As of now, it can be said that many factors exist which promote teachers' motivation. These factors may be viewed as material, psychological, etc. In particular, it is found that a teacher's daily experience on the job determines the activities which are psychologically most rewarding.

Motivation is the inner drive that pushes individual to act or perform and it is one of the most important factors that move every human being to achieve his or her goals. This includes personal as well as professional goals and targets (Mbwana, 2015).

Motivation and performance are very important factors in terms of school success and students' achievements. If changes occur in school external environment then it is necessary for a school to adopt that change because it may motivate to gain a competitive advantage. For this, the main thing they required is the skilled and competent teachers (Kevin, 2016).

Teachers' job performance is a concern of everybody in the society (Mbwana, 2015). In this respect, teacher performance connotes the teacher's role of teaching students in class and outside the class. The key aspects of teaching involve the use of instructional materials, teaching methods, regular assessment of students, making lesson plans, assessment of pupils, conduct of fieldwork, teachers' participation in sports, attending school assembly and guidance and counseling. Therefore, teacher job performance is the teacher's ability to integrate the experience, teaching methods, instructional materials, knowledge and skills in delivering subject matter to students in and outside the classroom. Teacher performance was measured by regular and early reporting at school, participation in extra-curricular activities, supervision of school activities, adequate teaching preparation (schemes of work, lesson plans), marking and general punctuality among others.

Performance of a given school depends more on the teacher's effort and if that a given teacher is unhappy with his/her job, he/she will not put emphasis into his/her teaching (Mark, 2015).

However, (Chudi, 2013) found out that teachers refused to teach effectively in class causing a decline in performance because of irregular payment of salaries. Disparities in teacher effectiveness in public and private schools areas are a preoccupation of policymakers throughout the developing world. In Tanzania, for example, the leading students' performance comes from private schools. In response, the government has tried to provide incentives to teachers in terms of hardship allowance in order to motivate and retain them, especially in rural areas. Yet despite the popularity of such policy, little is known about what real motivate teachers and keep them in their job despite "hardships" in remote location.

Performance may be defined as the ability to join skilfully the right behavior towards the attainment of organizational goals (Ali et al., 2014). Susa (2018), the Ministry of Education demands a very high measure of loyalty, dedication, patriotism, hard work, and commitment from its teachers. Similarly, the role and contexts of motivational methods cannot be overemphasized because high motivation heightens performance which is in the interest of all educational system.

In view of the fact that a sizeable increase in teachers earning will significantly enhance teachers' commitment and performance. It is pertinent to note that good social status of teachers considerably impact on their morale and thereby, motivate them. As of now, it can be said that no school system can have high achievement more than the level of teachers' motivation within the system. Therefore, all those factors which contribute to appreciable improvement in teachers' morale and commitment should be upheld with utmost priority. Hopefully, when this is done, it will unfold a multifaceted payoff, namely, increased pupils' learning outcomes and high teachers' output. In fact, it is a good exercise to investigate the extent to which the twenty first century teacher's job content versus reward system (in terms of pay package and promotion) affects high teacher's output (Nyam, 2014).

## II. RESEARCH ELABORATIONS

This contains the researcher design, research environment, respondents, instruments and data gathering.

### Design

The study used the descriptive-correlational research design and a self-made questionnaire. Three analytical scheme were used, the descriptive, comparative and relational.

### Environment

The study was conducted in District 6, Bayawan City Division which is composed of six Public Elementary Schools namely Nangka ES, Guisocon ES, Holy Family ES, Kasla ES, Tavera ES, Magsulay ES and Matunoy ES.

### Respondents

The respondents of the study, the level of motivation in relation to the level of teachers' performance are the 89 Public Elementary School Teachers of District 6 Bayawan City Division during the SY 2018-2019.

### Instruments

This research study used the descriptive correlation design of the variables covering social belongingness, curiosity, cultural parenting orientation and education. This design used survey guide as a tool to gathered data.

### Data Gathering

For the data gathering procedure, the self-made questionnaire is the main instrument to be used which undergone validation of experts and reliability testing analysis.

### Treatment of Data

Different statistical tools were used to quantify all problems such as Frequency and Percentage, Mean, Mann Whitney U-Test, and Spearman Rank Correlation.

## III. RESULTS OR FINDINGS

**Table 1. Level of Motivation of the Respondents in the Area of Existence Needs**

Existence Needs	Mean	Interpretation
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1	Adequate salary with respect to the nature of my work or the teaching profession.	4.17	High
2	Sufficient benefits and compensations which are at par with other organizations.	4.27	Very High
3	Financial incentives through fringe benefits and bonuses.	4.30	Very High
4	Wide range of health benefits like that of health care (maxicare, blue cross, caritas, etc.)	4.10	High
5	Primary needs such as durable house with amenities.	4.27	Very High
6	Living a happy and contented life with my family whom I foster strong relationship.	4.44	Very High
7	Engaging myself in convenient lifestyle and satisfying leisure activities.	4.30	Very High
8	Feeling contented, fulfilled and satisfied with my job.	4.29	Very High
9	Enjoying high prestige and social standing in my work.	4.27	Very High
10	Working for a stable and secured future through my profession.	4.31	Very High
<b>Overall Mean</b>		<b>4.27</b>	<b>Very High</b>

The level of motivation of the respondents in the area of existence needs resorted to the overall mean score 4.27 interpreted as “very high” level. It could be inferred that salaries and financial incentives as well as a number of benefits are determining factors in promoting the level of teachers’ motivation in performing his/her assigned duties.

It was found out that the teacher-respondents perceived that there is a “very high” level of motivation in item number 6, “Living a happy and contented life with my family whom I foster strong relationship”. Having the highest weighted mean compared to the rest of the items, 4.44 as perceived by the teachers, it could be inferred that teachers are living with contentment while fostering happy and strong relationship with their respective family members. As then revealed in the study of Hechanova (2014) who investigated the needs of the Filipino working population and the relationship between these needs and employee engagement, it has been found out in an interview where workers were made to determine the needs that motivate them as to the different types such as job-related, career-related, organization-related, and family-related, among these, family is a novel addition to the extant theories of work motivation of the employees.

On the other hand, the item which obtained the lowest mean score of 4.10 is item number 4, “Wide range of health benefits like that of health care (maxicare, blue cross, caritas, etc.)”. It could be inferred that public school teachers do not have enough and sufficient access to wide range of health benefits promoting their physical well-being and wellness. This is supported by the study of Puntero (2019) who made mention on health care and benefits as the factors to be given attention by the government in promoting teachers’ health and wellness for the latter to perform well his/her assigned duties and responsibilities.

Financial incentives are often given in the form of money, that is money can be seen as part of the reward system designed to reinforce behavior and therefore to motivate people to work towards the achievement of goals and those of the organization. In affirmation, studies on motivational strategies on teachers have shown that teachers by some kind of incentives are recognized as being effective (Sala, 2017). She further asserted that people work primarily for money and they are motivated to do only that which provide them with the greatest rewards. In the same manner, Nyam (2014) put forward the fact that a sizeable increase in teachers earning will significantly enhance teachers’ commitment and motivation to perform better for the welfare of their classroom learners and environment as well as office workplaces.

On the other hand, Mark (2015) showed that motivation of teachers was affected by factors such as poor working conditions and low salary or pay. Based on the findings, the study recommends that the government should improve teachers’ compensation and pay as well as improve working conditions.

Pescuela (2015) supported this notion dwelling on the very fact that a higher performance has a monetary equivalent which also increases employee’s desire to perform better. Castor (2016) further noted that among the factors which give level of satisfaction are overtime pay policies, benefit scheme, tidiness and cleanliness in the workplace and opportunities for advancement.

**Table 2. Level of Motivation of the Respondents in the Area of Relatedness**

	<b>Relatedness</b>	<b>Mean</b>	<b>Interpretation</b>
1	Organization foster supportive climate to its members.	4.24	Very High
2	Friendly and congenial are my peers or colleagues in the office or in the workplace.	4.31	Very High
3	The organization promotes good working conditions through the presence of camaraderie.	4.35	Very High
4	The organization demonstrates social acceptance and belongingness.	4.31	Very High
5	The organization promotes trust and confidence in the workplace.	4.34	Very High
6	The organization values the contributions of each member for better performance management.	4.35	Very High
7	The organization pay due attention to the needs of its members for better work engagement.	4.37	Very High

8	The organization promotes public acknowledgement for better work accomplishments.	4.35	Very High
9	The organization practices immediate feedback to manage expectations of its members.	4.25	Very High
10	The organization promotes teamwork and cooperation among its members in work activities	4.28	Very High
<b>Overall Mean</b>		<b>4.31</b>	<b>Very High</b>

Table 2 showed that the teachers’ perception on the level of motivation in the area of relatedness obtained an overall composite mean of 4.31 denoting a verbal equivalent of “very high” level. Based on the given finding, it is evident that good social status and working conditions of teachers considerably impact on their morale and thereby, motivate them. In this connection, Nyam (2014) and De Castro and Portugal (2014) put emphasis on the role of school heads in maintaining a remarkable atmosphere among employees which is necessary to demonstrate larger commitment and intense devotion to quality service.

The item which obtained the highest weighted mean of 4.37 as perceived by the teachers is item number 7, “The organization pay due attention to the needs of its members for better work engagement”. This implies that that aside from wages and salaries, recognition for good work done, participation in decision making and conducive working environment were the major factors that really affect teachers’ level of motivation and work engagement. In the same manner, Hechanova (2014) who investigated the needs of the Filipino working population and the relationship between these needs and employee engagement put emphasis on the presence of needs such as job-related, career-related, organization-related as predictors of engagement. Garcia (2016) in fact shared the findings that a significant relationship was noted between the working conditions of the teachers and their job performance.

On the other hand, the item which obtained the lowest mean score of 4.24 is item number 1, “Organization foster supportive climate to its members”. It means that teachers as employees seek support from the Department of Education itself especially in a number of employee engagements pertaining to their classroom duties and professional development. In support to this, Aguado (2015) noted that the teachers given support is a way of appreciating their efforts from the school management. Furthermore, this constitute higher priority in gaining prestige in the teaching profession as part of personal gratification and self-motivation and as valuable substance of the academic institutions.

**Table 3. Level of Motivation of the Respondents in the Area of Growth Needs**

<b>Growth Needs</b>		<b>Mean</b>	<b>Interpretation</b>
1	Opportunities to learn new things through attending seminars, workshops and training activities.	4.28	Very High
2	Prospects for career advancements through study leave benefits, scholarship grants and graduate degree obtained.	4.25	Very High
3	Promotion of my abilities contributing to research undertakings and other developments.	4.09	High
4	Chances to exercise leadership in the organization and make necessary contributions as part of it.	4.13	High
5	Breaks to use my special abilities in working as part of a team and in a variety of work commitments.	4.11	High
6	Recognition for promoting professional growth and development.	4.17	High
7	Opportunities for promotion to higher positions through career progressions and prospects.	4.16	High
8	Participation in work related activities to enhance my skills and abilities.	4.17	High
9	Opportunities to engage in feedback system mechanism to the top level management in order to enhance organizational practices.	4.22	High
10	Remarks or constant feedbacks regarding my work progress and development for better work engagement.	4.26	Very High
<b>Overall Mean</b>		<b>4.18</b>	<b>High</b>

Table 3 displayed that the overall composite mean of the teachers in the level of motivation in the area of growth needs is 4.18 with a transmuted rating of “high” level. Based on the finding, it could be inferred that attending to teachers’ growth needs through career advancements, research undertakings, and training activities serve as motivating factors in improving teachers’ performance at work.

Item number 1, “Opportunities to learn new things through attending seminars, workshops and training activities” obtained the highest weighted mean of 4.28 as perceived by the teacher labelled as “very high” level. It means that most of the time, this professional development is conducted in various purposes: to get certified, to become upgraded, to prepare them for new roles, to get refreshed in teaching pedagogies, and to get information regarding curriculum related updates. Along similar stance, Bush and Kaparou (2015) noted the relationship between delivery of instructional leadership and encouragement of teachers' professional development in centralized context. Hence, teachers must be supported and nurtured in their professional development through seminars, workshops, and training activities (Pescuela, 2015). Babalola and Hafsatu (2016) then added that school heads should motivate their teaching force towards creativity, initiatives and productivity.

However, item number 5, “Breaks to use my special abilities in working as part of a team and in a variety of work commitments” obtained the least weighted mean. It could be inferred that teachers were given less opportunities to use their talents and skills in individual engagements and group work commitments. This has been supported by the findings shared by Cadalso (2019) who indicated on the teachers’ misunderstanding of some office duties and refusal to work and chairmanship. Along with it, it has been revealed that teachers lack requirement for professional growth which lead to the occurrence of the negative interpretation of feedback.

In addition, remarks or constant feedbacks regarding work progress and development for better work engagement is also one of the factors that must be taken into consideration. In affirmation, this has been supported by literature on feedback environment which claimed that supportive environment fostered by the school heads lead to the improvements of teachers' well-being and performance. Frantz et al. (2016) also put emphasis on these factors which can in turn increase teachers’ engagement and empowerment. As indicated, the relationship between teaching personnel and their environment affect motivation to work and perform (Taylor, 2015). In addition, Chau et al. (2015) showed that supervisory feedback environment that is supportive as perceived by teachers are associated with the higher instrumental as well as image enhancement motives.

**Table 4. Level of Teachers’ Performance when Grouped According to Variables**

Variables	Groupings	N	Mean	Interpretation
Age	Younger	44	4.07	Very Satisfactory
	Older	45	4.14	Very Satisfactory
Highest Educational Attainment	Lower	30	4.04	Very Satisfactory
	Higher	59	4.14	Very Satisfactory
Length of Service	Shorter	44	4.07	Very Satisfactory
	Longer	45	4.14	Very Satisfactory
Average Monthly Income	Low Income	42	4.07	Very Satisfactory
	High Income	47	4.14	Very Satisfactory

Table 4 disclosed the level of teachers’ job performance when the respondents are grouped according to the different variables such as age, highest educational attainment, length of service, and average monthly income. As reflected in the table, all of the variables lead to a “very satisfactory” evaluation result.

Foremost, teachers’ job performance is a central construct in the field of work both in the industries and organizations. It refers to the ways individuals perform their jobs (Soodmand & Doosti, 2016). Having a high job performance means that teachers have the ability to combine relevant inputs for the enhancement of the teaching and learning process (Werang, 2014) and improvement of student learning (Werang, Betaubun & Radja Leba, 2014).

Moreover, the above reflected findings were coherent with the results of the local studies of Secong (2014), Pescuela (2015), Torres (2015), and Agir (2019) among others which all revealed that majority of the teachers have “very satisfactory” ratings as then shown in their performance evaluation system.

Also, Scott as cited in Ali et al. (2014) noted that job performance has been viewed as the total output that employees give to the organization as the sum total of their abilities, opportunities, and motivation. In the context of the Department of Education, having a high job performance yield into satisfactory up to outstanding ratings which means that the teachers perform well with their work and have displayed effectiveness, efficiency and timeliness in doing their duties most especially related to the different Key Result Areas: content knowledge and pedagogy, learning environment and diversity of learners, curriculum and planning, assessment and reporting, and plus factors. In view thereof, the job performance evaluation results serve as a determining factor on the teachers' level of participation in the day-to-day running of the school organizations.

In the similar way, Selamat et al. (2013) noted that teachers' job performance is a way related to teachers' effectiveness. This is further supported by Balogun (2016) as he noted that teaching is a highly noble profession and teachers are the asset of the society and the nation.

**Table 5. Significant Relationship between the Level of Motivation and the Level of Teachers' Performance**

Correlates	N	Rho	Level of Significance	p - value	Interpretation
Level of Motivation	89	0.102	0.05	0.342	<b>Not Significant</b>
Level of Teachers' Performance	89				

As reflected in Table 26, there is no significant relationship between the level of motivation and the level of teachers' performance.

Since the r-computed value is 0.106 which is greater than the p-value of 0.000 level of significance, the null hypothesis which states that there is no significant relationship between the level of motivation and the level of teachers' performance is not rejected. The results of the study showed that there is no significant relationship between the level of motivation and the level teachers' job performance. It further implies that the level of motivation have no influence on the level of teachers' performance.

The result is supported by the study of Sala (2017) and Puntero (2019) that the motivational factors have no significant relationship in teachers' job performance as to the variable of age as both younger and older are all working to satisfy their existence needs, relatedness and growth needs. In a similar way, Pescuela (2015) and Alabata (2019) revealed that the length of service is not a predicting factor as both categories of teachers, the novice and the experienced both help each other in their respective work functions towards a better job performance in the educational system as anchored on efficiency, timeliness and effectiveness.

#### IV. CONCLUSIONS

On the bases of the foregoing findings of the study, the researcher arrived at the following conclusions:

The teachers were motivated by adequate salary, rewards, and incentives with respect to the nature of the teaching profession in itself to finance the needs of their family members towards positive engagement and socialization process.

There is a need for education leaders to pay attention to the needs of the teachers to promote professional and organizational commitment towards employee engagement, school improvement, and performance management.

The teachers value opportunities to learn new things through workshops and trainings as well as professional schooling as career advancements facilitate personal growth and professional development. The teachers performed well their work functions and job descriptions towards organizational efficiency, timeliness and effectiveness.

The teachers are motivated by salaries, step increments, financial incentives, fringe benefits and bonuses. Hence, higher job performance has a monetary equivalent which also increases the employees' desire to perform better.

Attending graduate studies which equates to instructional effectiveness and promotion to higher position in the teaching field leading to higher salary received served as a motivational factor for teachers to perform better in their workplace

environment. Those who attended professional schooling and received higher salary rate are motivated to attend to their growth needs toward positive work engagement. It means that regardless of the variables stated, all teachers perform their mandated key result areas to better deliver basic education services.

The teachers are motivated to perform their work and deliver their assigned functions as they have a positive regard of the teaching profession as they considered it their mission and vocation. In addition, these teacher-educators also desire to have a positive evaluation result in order to contribute to the betterment of school organization and educational administration.

## V. RECOMMENDATIONS

In the light of the findings and conclusions of the study, the following recommendations are advanced.

The level of motivation of the respondents in the area of existence and relatedness were very high. It is therefore recommended that the government should provide adequate wages and salaries, incentives and reward systems to the teachers. This can be done through revisiting the current salary range given to our teachers by the national government in congruence to the standard cost of living. Also, the Department of Education in coordination with the local government units could utilize the Special Education Funds (SEF) as well as other monetary incentives through LGU initiatives to grant monetary reward system to our teachers. In the same manner, as to relatedness, teachers should be given recognition for the positive contribution to the organization as they desire to contribute to school improvement and performance management which could be done through Awarding Ceremonies for Recognizing Well Performing Employees in the conduct of DepEd Events.

The level of motivation of the respondents in the area of growth needs was only high. It is therefore recommended that teachers should be encouraged to attend professional schooling through graduate school programs both in master's and doctorate degrees as well as attending training activities on professional development as these would not only promote increased knowledge in instructional planning, teaching-learning process and classroom management but also higher positions in the field of teaching which also equate to higher salary rate. Aside from attending graduate studies and training activities, DepEd could as well address teachers' growth needs through In Service Trainings (INSET) and the conduct of Learning Action Cell (LAC) Session in the school levels.

The level of teachers' performance when grouped according to aforementioned variables is at very satisfactory level. It is therefore recommended that positive engagement should be sustained in the same manner that teachers' performance management should be intensified for them to perform better toward the outstanding level demonstrating organizational efficiency, effectiveness and timeliness. The school heads, master teachers, education supervisors and other educational leaders should intensify monitoring and evaluation in the conduct of supervisory visits to teachers as well as provide positive working environment for them to perform better with their respective work engagements.

## APPENDIX A

### Motivation in Relation to Teachers' Performance

#### Part I: Profile of the Respondents

Name (Optional) \_\_\_\_\_

Age: \_\_\_\_\_

Highest Educational Attainment: \_\_\_\_\_

Length of Service: \_\_\_\_\_

Average Family Monthly Income: \_\_\_\_\_

Latest IPCRF Numerical and Adjectival Rating: \_\_\_\_\_

#### Part II. Questionnaire Proper

#### Level of Motivation

**Instructions:** Please check the number that indicates the level as to which you are motivated with the given factors: existence, relatedness, and growth needs. Please refer to the guide below in choosing your option. It is important that you honestly answer each item. Please do not leave any item unchecked. Rest assured that your individual information will be treated with strict confidentiality.

Code

Interpretation

5

always

**4**  
**3**  
**2**  
**1**

**often**  
**sometimes**  
**rarely**  
**almost never**

<b>A. Existence Needs</b>	5	4	3	2	1
<i>What is the level of your motivation according to the following items?</i>					
1. Adequate salary with respect to the nature of my work or the teaching profession.					
2. Sufficient benefits and compensations which are at par with other organizations.					
3. Financial incentives through fringe benefits and bonuses.					
4. Wide range of health benefits like that of medical care.					
5. Primary needs such as durable house with amenities.					
6. Living a happy and contented life with my family whom I foster strong relationship.					
7. Engaging myself in convenient lifestyle and satisfying leisure activities.					
8. Feeling contented, fulfilled and satisfied with my job.					
9. Enjoying high prestige and social standing in my work.					
10. Working for a stable and secured future through my profession.					
<b>B. Relatedness</b>	5	4	3	2	1
<i>What is the level of your motivation according to the following items?</i>					
1. Organization foster supportive climate to its members.					
1. Friendly and congenial are my peers or colleagues in the office or in the workplace.					
3. Organization promotes good working conditions through the presence of camaraderie.					
4. Organization demonstrates social acceptance and belongingness.					
5. Organization promotes trust and confidence in the workplace.					
6. Organization values the contributions of each member for better performance management.					
7. Organization pay due attention to the needs of its members for better work engagement.					
8. Organization promotes public acknowledgement for better work accomplishments.					
9. Organization practices immediate feedback to manage expectations of its members.					
10. Organization promotes teamwork and cooperation among its members in work activities.					

<b>C. Growth Needs</b>	5	4	3	2	1
<i>What is the level of your motivation according to the following items?</i>					
1. Opportunities to learn new things through attending seminars, workshops and training activities.					
2. Prospects for career advancements through study leave benefits, scholarship grants and graduate degree obtained.					
3. Promotion of my abilities contributing to research undertakings and other developments.					
4. Leadership in the organization and make necessary contributions as part of it.					
5. Breaks to use my special abilities in working as part of a team and in a variety of work commitments.					
6. Recognition for promoting professional growth and development.					
7. Opportunities for promotion to higher positions through career progressions and prospects.					
8. Work related activities to enhance my skills and abilities.					
9. Opportunities to engage in feedback system mechanism to the top level management in order to enhance organizational practices.					
10. Remarks or constant feedbacks regarding my work progress and development for better work engagement.					

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# The impact of foreign maids on rearing of children in Saudi Arabia from Saudi families Perspectives

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**Abstract-** This study aims at examining the impact of foreign maids on the upbringing of children in Saudi Arabia from the point of view of Saudi families. The study aimed to provide theoretical and scientific frameworks on the impact of foreign maids on moral education that could benefit education planners and development and decision makers. This paper attempts to find out about the reality of foreign maids in Saudi Arabia and examining the impact of the of foreign maids on the moral education of children. The study assumed that there were statistically significant differences at the level of indication ( $\geq\alpha005$ ) between the average responses of the sample members to the impact of foreign maids on the moral education of children in Saudi Arabia from the point of view of Saudi families due to age variables, economic level, Sex, the number of family members, both parents, the nature of the work of each parent. The study used a random sample of a percentage of (25%) From the study sample. The study sample consists of all Saudi families that have foreign maids in al-Jouf area and (2850) families were participated in this study. The study recommended the expansion of family-oriented projects that focus on raising parental competence and the efficiency of foreign maids in influencing the moral education of children and showing the negative effects on the individual and society when all occupations and crafts that society needs are carried out by foreigners.

**Index Terms-** influence, foreign maids, child-rearing.

## I. INTRODUCTION

The topic of foreign maids in Saudi Arabia in particular with its many manifestations and problems, both visible and varied, is one of the most frequently discussed topics. The focus of the prevailing attention is the material implications of the expansion of the use of foreign maids, with an explanation of the social, educational and moral implications behind the use of foreign maids to which Saudi Arabia is exposed, and the essence of the effect lies in the fact that the maids are Foreign women are among the most insecure categories of foreign migrant workers in Saudi Arabia in general and with children in particular. The phenomenon of foreign maids is an example of foreign women's employment, which has negative effects on the education of children and on the culture of Saudi society and on its values, heritage, civilization and language and shows the negative effects on the upbringing of children in the family first, then in school, in addition to providing children with unacceptable behavioral patterns, compared to those of the society in which they live.<sup>2</sup> The social and moral impact is that the presence of foreign domestic workers is a psychological burden on children, where the child is exposed to psychological problems as a result of the absence of parents and his requirements and needs, besides the feeling of the child often insecurity and guilt, he sits He is often alone with a foreign maid and may deposit things in the subconscious and keep them and not tell his parents about them. This entails the possibility that the child will experience behavioral deviations in the future in the event of accumulated frustration and painful situations with the maids. He may also be physically abused as a result of the maid beating him when he refuses to obey her orders (3). In addition, these foreign maids weaken the language and influence the culture, in addition to creating isolation among parents, as the child who grew up in the arms of a foreign nanny, behaves differently to that of his colleagues, and the degree of integration and harmony with his colleagues and interaction is weak, which in turn weakens relationship between colleagues themselves and between mother and father. This negatively affects their loyalty to their culture and the nature of their education and upbringing.

The study is an attempt to find out the impact of foreign maids on the moral education of children in Saudi Arabia from the point of view of Saudi families, the problem of study was the following main question: - What is the view of Saudi families about the impact of foreign maids on the education of children in Saudi Arabia? The importance of the study stems from the influence of foreign maids on the customs of young people, and on the socialization of children, and affects in one way or another the process of their advancement and growth and the building of their level educational personality. The study assumed that there are statistically significant differences at the level of indication ( $\geq\alpha005$ ) between the average responses of the sample members to the impact of foreign maids on the moral education of children in Saudi Arabia from the point of view

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of Saudi families in terms of age variables, the level The study aimed to provide theoretical and scientific frameworks on the impact of foreign maids on moral education that can benefit education planners, development planners and decision makers. Learn about the reality of foreign maids in Saudi Arabia and find out the impact of the presence of foreign maids in the moral education of children. The study followed the survey approach for the purposes of the study. The data for this study was collected by questionnaire and interview. The study community is made up of all Saudi families with foreign maids in al-Jouf region, where the sample of the study was randomly selected by a percentage of (25%) From the study community, which means that the sample consisted of approximately 700 Saudi families with foreign maids.

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  - (2) Khalifa, Ibrahim (2000). Foreign nannies in the Gulf Arab House: presentation and analysis of some field studies, Riyadh: Arab Education Office for the Gulf States.
  - (3) Ansari, Anbara (2007). The impact of foreign maids on child-rearing. Jeddah: Community House

**Table (1) shows the distribution of study members from Saudi families in the light of their variables.**

variables	levels	number
Age	24-18	174
	29-25	155
	39-30	225
	40 and more	146
Total		700
Gender	male	398
	female	302
Total		700
Economic level	weak	38
	average	273
	good	389
Total		700
Number of family members	4-1 ن	280
	7-5 نم	230
	10-8 نم	124
	رثكاف 11-	66
Total		700
The nature of the work of the head of the family	Government employee	485
	Private sector employee	74
	businessman	118
	others	23
Total		700
Parental availability	Yes	550
	No	150
Total		700
Aggregate		700

## II. THEORETICAL FRAMEWORK

### **The reasons for spread and the use of foreign maids and their negative and positive effects**

In the past few years, the phenomenon of the use of foreign domestic workers in Saudi families has become a widespread phenomenon. It would not have taken the form of the phenomenon until it took the form of the generality and extended its impact to a very large percentage of Saudi families. So that attracted the attention of officials and attracted a lot of researchers studying to address this dangerous and strange phenomenon on Saudi society by studying and researching to find out the causes of its spread and reduce it and reveal its harms on the new youth and the family (1), that Saudi Arabia is one of the countries that It has a small population of citizens compared to other countries in the world, and has had to use foreign migrant workers to participate in the implementation of development and modernization projects. This is perhaps the first and main reason for the beginning of the spread of foreign labor. (2) . Migrant workers played an important role in the social construction of Saudi society, as their arrival generated movement, progress and the acquisition of technology, so social construction is based on migrant workers (6). Despite these positive social effects of foreign employment, there are negative social effects of such employment, which far outweigh the positives. The results of several studies on the negative effects of foreign employment have raised that the phenomenon of migration in general and Asia in particular to the Gulf region poses a great danger to the Western region in general and the oil countries in particular. This risk may not be evident now, but the likelihood of it appearing in the future is high. We can limit the most important consequences of the phenomenon of employment Foreign below:

1. Threatening the Arabism of the region by distorting Arab culture, such as the disintegration of the family and Arab society.
2. Establishing western consumption patterns by marginalizing the productivity of society.
3. Increasing the gap between Arabs and their implications for the issue of Arab unity.
4. Impact on development with its reflections of deviations and distortions (1).

There are also some other aspects that bring many of the risks of such foreign labor to social aspects, for example, "the increasing reliance on migrant labor has been determined by the size of national employment and therefore the growth

and maturity of the national working class. This has had serious long-term repercussions. The effects of this employment have not been limited to these aspects, but have been clearly dangerous for the security and stability of society, but will undoubtedly play a destructive role in social, value and national construction over generations to come, in addition to its negative impact on the current generation. Any group living in an Arab environment lives within its national and national culture, and its cultural presence becomes a threat to Arab culture only if there is one very important element (2).

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(1) Al-Falih, Matrouk (1999). *Towards a theoretical framework to get out of the problem of non- implementation of solutions: the status of the foreign employment symposium in the Arab Gulf countries, Arab Future Magazine, year 7, issue 5, 7(5), 25-39.*

(2) Yusuf, Sultana (2000). *Children in the UAE are attached to Asian women in their first two years of life and related to the appearance of behavioral disorders in pre-pubescent. Unpublished master's thesis. Ain Shams University, Ain Shams, Egypt.*

### **Factors and reasons for the spread of foreign maids**

There are some reasons that helped this employment to permeate the construction of the Gulf family, the most important of which was mentioned by al-Ghraib (2009) (3). Wallabies (2006) (4)

1. Increasing the responsibilities of the housewife: The change in the shape of the family after the emergence of oil, and the transformation of large extended families into small nuclear families, has increased the burdens and responsibilities of the housewife. As the demands and diversity of daily life increased, the head of the family alone bore all the burden of her family, prompting her to hire a maid or a nanny to relieve her of some of her burdens. 2. Women's work: women have accepted to work in the various areas available to them. In doing so, she added another burden to her family burden, and to make up for her absence from home, she hired a foreign maid to run her home, her family and her children. 3. Lack of alternatives: The conditions of modern life that required women to go out to work did not adequately provide alternatives from kindergartens and nurseries that house the children of working women during the period of busy working at the level to which the mother is satisfied, forcing many mothers to use Foreign maids. 4. Ease of recruiting foreign maids: 5. Low wages for foreign maids: As the level of family income rises, the amount paid by the maid as a wage is not a significant burden on these families, and for the maid this wage is a significant amount. Given the convergence of interests of the parties, this phenomenon is on going on. 6. Social status: The high standard of living and increased material resources has led to a tendency for families to take up luxuries, including the presence of maids at home. Some families have a large number of servants without the actual need for them, but being at home is a traditional manifestation of pride and pride. 7. Lack of awareness of the effects of the use of foreign maids:

It is clear that families are still not fully aware of their educational role, and the education process is partly or entirely assigned to the maid. The lack of awareness or disregard for this basic fact has contributed to the emergence of the phenomenon of reliance on domestic servants and the consideration of child care and upbringing as part of their daily tasks. The effects of the use of foreign domestic workers on society, family and children: The mother's dependence on the maid altogether has many negative effects on children, including: some maids neglecting them may lead to the death of the child or his or her deformities and disabilities. (1). The negative effects on the child's personality include all aspects of his personality. A large part of the child's personality is formed as a result of the educational practices he received in his early years, which illustrates the importance of providing a healthy educational environment within the family that ensures healthy educational growth. If the issue is so serious, the use of a maid by the family is considered to be a lack of educational outlook on the parents. The maid is a culturally, socially and geographically alien element of the child. Most of them are characterized by a low level of health and culture, where ignorance, underdevelopment, disease and lack of Arabic language prevail. Studies in this area confirm that 68.3% are not familiar with child-rearing and home affairs, that one third are illiterate, two thirds provide children with false information, and 97.5% are dangerous examples of Buddhist and pagan beliefs (3). And with this maid's call.

- (3) *The Stranger*, Abdul Aziz (2009). *The impact of the maids on the socialization of the child field study on a sample of Saudi families. Journal of Cooperation.* 23 (67) 71-17
- (4) Labib, Ali (2000). *Reasons for the spread of Asian employment, foreign labor in the Arab Gulf countries, Beirut: Center for Arab Unity Studies, 6th edition.*
- (1) Youssef, Fadia (2005). *On UNICEF's Strategy in the Gulf Region: Research on the Impact of Foreign Nannies on Gulf Families, Abu Dhabi, Al-Ittihad, November 2, 1983.*
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If this issue is agreed upon, the issue of the presence of this foreigner within the family in the form of a nanny or a maid becomes one of two things: either he is ignorant of the educational issue and this is dangerous, and not knowing its impact while insisting on its existence, and this is more serious, and It is more likely that the family is not fully aware of its educational role. In terms of the psychological effects of the child, it may result in several reasons: changing the nanny every several months or every year, the child cannot form a fixed image of who he or she is dealing with. The total reliance of the mother on the maid to meet the needs of the child, which creates a kind of self-reliance in the child, where the mother is seen dependent on the maid, and the mother is usually the ideal of the child. Leaving the child all the time with the maid and the lack of a close relationship between him and his mother, increases the child's attachment to the maid - which will inevitably leave - which occurs when the child is a kind of frustration that results in distrust of people and lack of continuity in his relationships with them, and these psychological problems do not appear at an early age . The treatment of the child by the maid is cruel during the absence of the mother, resulting in a lack of physical development in the child, in addition to the negative impact on his psychological and mental development (1). In terms of their effects on children's physical health, Morteza pointed out (2002). (2) It is noted that most maids do not have the necessary awareness to care for children, and therefore expose them to malnutrition. In terms of the strange customs that nannies and servants pass on to children, there are many that do not belong to the religion, customs or traditions of The Islamic society. Aprett Ben Ayban (2012) (3) and Al- Subai'i (2007) (4) a range of negative effects on the presence of maids, including :

### 1. Social impacts

The most important negative social effects of foreign maids on children can be summarized as follows:

A- Laziness and dependency: the individual learns to depend on the environment in which he lives and the presence of foreign workers in Saudi Arabia helped to educate the individual dependency and dependence on others, and this is clearly evident in the presence of domestic workers where we find that the individual is lazy about serving himself even in the simplest things have proved Study (Al-Aidan, 1993). 56% of the sample of housewives surveyed said that family members had learned to rely, which is a large percentage, especially if we know that (37.3%) From the sample,

it didn't show anything. B- The way and quality of the dress: The dress is the usual dress of the Saudi citizen, whether they were young or old, as well as the one-piece curtain dress for women, but with the entry of expatriate workers and their mixing with Saudi society, the way of dress has changed, so many types of clothes that were not known in the past. C- Safour and mixing: The presence of thousands of non-Saudi families in the kingdom's land and of different nationalities and different religions has led to the creation of some kind of behavioral changes in the personality of the Saudi citizen. D. Conflict of roles and family relations: employment in personal services has affected the aspect of family relationships. The presence of a mediator who shared some of the roles of the mother reduced the intensity and depth of the mother's interaction with her children, as well as the possibility of the child being influenced by those with whom he stays longer and the tendency of the child to emulate them in language, values and For behavioral patterns (6). The presence of the driver and his participation in some of the roles of the father reduced the intensity of the father's interaction with his family members,

- (1) Tokhi, Wafa (2004). *How do we deal with this problem? Relations with Maids, Dubai: Al Bayan Newspaper, September 12, 2004.*
- (2) Morteza, Salwa (2002). *Child rearing problems and solutions;*
- (3) Ben Ayban, Ibrahim (2012). *Migrant workers in Saudi Arabia and the negative effects of their existence and the roles of educational institutions in reducing their recruitment and avoiding their effects. Journal of Psychological and Educational Studies. 6(2) 28-1*
- (4) Al-Subai'i, Nawal (2007). *The use of domestic workers by women working in the education sector: causes, problems and solutions. King Saud University Publications, Riyadh.*
- (5) Eidan, Noura (2002). *The size of the applicant and how important they are to the Saudi family. Unpublished Master's thesis, Um al-Qura University. Mecca, Saudi Arabia.*
- (6) Kantar, Fayez (1992). *The Evolution of the Relationship between Child and Mother, World of Knowledge Magazine, Kuwait, Issue 166*

In some families, the driver spends more time with family members than the father, and this affects their language, values and behavior. E. To dissolve jealousy of souls and influence good values: Saudi society is known to contain a number of good values such as: generosity, honesty and honesty, justice, kindness to the young, and respect for the great... However, with the passage of time and the arrival of migrant workers, some of these values have begun to decrease, and many bad habits such as smoking, beards, drug use, theft, hairstyles, nails and the way some religious rituals are performed have spread. G. The tyranny of material aspects: the physical aspects began to overwhelm everything, and everything became appreciated on the basis of its material value and we began to see that it is rare for a human being to serve a friend, colleague, neighbor or passer- by without taking into account the material returns from it, unlike the previous one, which was provided on the basis that it was Social custom or religious duty. H- Its effects on the Arabic language: with the arrival of migrant workers to the Kingdom, the foreign vocabulary in the language of the Saudi citizen increased not with employment, but went beyond that until his

language became in daily communication - even with his own skins - did not give up foreign vocabulary and terminology and did not stop at this limit but exceeded it The composition and formulation of some sentences and phrases. 2. Economic implications: The massive presence of migrant workers in Saudi Arabia is a major competitor to Saudi labor, which ultimately increases unemployment rates of both convincing and blatant types, and one of the most important economic negative effects of migrant workers is: A- Pressure on goods and services and increasing the budget deficit: migrant workers and their families receive various state services such as education, health, services and facilities free of charge or at nominal prices in addition to their access to subsidized goods for citizens, and this creates a kind of increased public expenditure and pressure on Services allocated to the citizens of the state (practical, 1422 Ah) and there is a waste of about (1586697) of migrant workers under the age of "19" (General Statistics Department, 1425 Ah), which means that their presence within the Kingdom is considered a significant burden on the state and has little returns. (b) Increasing the proportion of cash transfers abroad: Cash transfers of migrant workers constitute a large proportion of state revenues and these heavy remittances have devastating economic effects, as these amounts can be exploited in various internal development projects, with total labor remittances for 2000. It reached 39.5 billion riyals (10%) Of the total Saudi revenues (Al-Khairi, 1424 AD). C- Obstructing the plans of the rehabilitation and employment programs of national cadres: dependence on migrant workers hinders the plans and programs of preparing and qualifying national cadres to meet the queen's employment needs, because there is an expatriate employment trained, ready and cheap at the same time. D- Contempt and contempt for certain professions: the continuation of migrant workers at long-term employment in certain jobs leads to contempt for the Saudi citizen to that work, which has been associated with migrant workers, E. Unemployment: As the migrant worker competes with the Saudi people in earning a living and entices institutions and companies to hire this expatriate worker because the migrant worker will be satisfied with a little money, a little Saudi currency is equivalent in some countries equivalent to hundreds of money (currency differences) and this tempts the migrant worker in Stay up with low pay as the owner of the enterprise is tempted to hire him and leave the Saudi. 3. Security and political implications: There is no doubt that no matter how far away from his country and no matter how much he has the means to live in a home other than his own, he remains very loyal and nostalgic for his country of origin, and even tries to spread his ideas, and some migrant workers have customs and traditions that represent a danger to the security and safety of society. Moral deviations, theft, begging, prostitution and drugs at the hands of some migrant workers mean putting serious seeds in society. There is also a mutual influence between the employment and the political ties of the states concerned, and from this point of view migrant workers can play such a prominent role in the political aspect that relations between the Government of these maids and the Government of the states in use may worsen. The crisis in political relations between two States as a result of certain positions has a profound impact on the mutual employment of those two States.

### **Application framework**

To answer the study's question concerning the impact of foreign maids on the moral education of children in Saudi Arabia from the point of view of Saudi families. Calculation averages and standard deviations were calculated for each area of impact. Where it was as follows.

1. **The area of the influence of foreign maids on the development of conscience and moral behavior in children:**
2. **Table 2. Mathematical averages and standard deviations of the paragraphs of the area of influence of foreign maids on the development of conscience and moral behavior in the child ranked downward**

Number	statements	Arithmetic Average	Standard deviation	class
1	The presence of a maid does not encourage responsibility for the child's moral behavior.	3.37	1.13	medium
8	The presence of the maid doesn't help revive moral values	3.20	1.04	medium
4	Having a maid gives the baby a feeling of selfishness.	3.19	1.10	medium
5	The presence of a maid weakens the child's acquisition of great importance to the social value system.	3.10	1.11	medium
6	The presence of the maid makes the child reach the stage of moral adulthood and does not realize the situations to be taken in different circumstances.	3.10	1.01	medium
7	The maid does not provide proper guidance to place the rules in the child's hands.	3.10	1.00	medium
2	The presence of the maid makes the child refuse to abide by the moral rules and underestimate the non-congenital behavior.	3.09	1.05	medium
9	The presence of a foreign maid does not help the child gradually reach the stage where he or she can solve his own problems.	3.05	1.04	medium
3	The presence of a maid breeds in children a so- called personal conscience.	2.98	1.05	medium

Table (2) Shows that the arithmetic averages of paragraphs in the area of the effect of foreign maids on the development of the child's conscience and moral behavior ranged from (2.98 to 3.37), with paragraph (1) stating that "the presence of the maid does not encourage responsibility for the child's moral behavior" in the first place and on average. My account was 3.37, while paragraph 3 read "The presence of the maid is born in the children of the so-called personal conscience" in the last place and my account average is (2.98). 2. The area of the influence of foreign maids on the norms and values prevailing in society among children: Table (3) shows that the mathematical averages of the paragraphs of the area of influence of foreign maids on the standards and values prevailing in society among children ranged from (2.90 to 3.49), where paragraph No. 6 came in.

It reads "The family's reliance on the education of foreign maids does not help to acquire social, cognitive, emotional and emotional skills" in the first place and with a mathematical average of (3.49), while paragraph 9 and the text "The presence of the maid makes the child have difficulty in absorbing the elements of culture" Social standards and values" are last place disputing a mathematical average of 2.90. Table 3. Mathematical averages and standard deviations of the paragraphs of the area of influence of foreign maids on the prevailing norms and values prevailing in society among the child rank edited downward

Number	statements	Arithmetic Average	Standard deviation	class
6	The family's reliance on the upbringing of foreign maids does not help to acquire social, cognitive, and emotional skills.	3.22	1.29	medium
8	The presence of a foreign maid makes the child depend on imitation and simulation depending on the circumstances	3.15	1.09	medium
3	The presence of a foreign maid reduces the child's learning of the ways and lifestyles of his or h community	er3.14	1.08	medium
5	The presence of the maid has a negative perception of himself with his physical, mental emotional, social, values and other personalities.	3.13	1.23	medium
1	The presence of a foreign maid weakens the child's sense of respect for moral values as it is of great importance to him.	3.02	1.23	medium
10	With a foreign maid, a child cannot acquire th psychological tendencies and behavioral patterns that the group agrees to.	3.00	0.97	medium
7	Having a maid does not help the child to acquire knowledge, values, trends and all types of behavior such as methods of dealing	2.92	0.79	medium
2	The presence of a foreign maid does not help to blend values with personal hopes, individual ideas and experiences to characterize the child's life with the character of those values and ideas.	2.92	0.79	medium
4	The presence of a foreign maid does not help the child to introduce the values and standards of the community into the concept of himself.	2.91	0.79	medium
9	The presence of the maid makes it difficult for the child to understand the elements of culture, social norms and values	2.90	1.06	medium

The area of the impact of foreign maids on the relationship between parents and children:

Table (6) shows that the mathematical averages of the paragraphs of the area of influence of foreign maids on the relationship between parents and children ranged from (3.25 to 3.81), with paragraph 7 and the text "The child lacks the presence of the maid. Foreign to possess the skill of dealing with parents" in the first place and with an average account of (3.81), while paragraph no . (8) and the text "The presence of a foreign maid does not help to build a relationship between parents and children based on trust and love" in the last place and with an average account of (3.25).

### 3.The area of influence of foreign maids on the relationship between parents and children:

Table (6) shows that the mathematical averages of the statements of the area of influence of foreign maids on the relationship between parents and children ranged from (3.25 to 3.81), with paragraph (7) stating that "The child lacks the presence of the maid. Foreign to possess the skill of dealing with parents" in the first place and with an average account of (3.81), while paragraph no . (8) and the text "The presence of a foreign maid does not help to build a relationship between parents and children based on trust and love" in the last place and with an average account of (3.25).

**Table 4. Mathematical averages and standard deviations of the statements of the area of influence of foreign maids on the prevailing norms and values prevailing in society among the child rank edited downward**

Number	statements	Arithmetic Average	Standard deviation	class
7	The child with the foreign maid lacks the skill of dealing with their parents	3.81	1.29	high
9	The effect of maids deprives children of the natural family care needed to develop them.	3.76	1.30	high
6	The presence of a foreign maid gives the child a feeling of a significant barrier between the parents and the result of the heavy attachment to the maid.	3.63	1.23	medium
10	The presence of a foreign maid loses the child emotional support from the parents	3.61	1.35	medium
5	The presence of a foreign maid affects the lack of family relationships based on interpretation	3.60	1.45	medium
1	The presence of foreign maids prevents family compatibility between parents.	3.53	1.41	medium
3	The presence of foreign maids determines to a large extent the child's personality and social compatibility.	3.49	1.33	medium
2	The presence of maids does not create the family climate required for successful social education.	3.47	1.19	medium
4	The presence of a foreign maid in the home creates a child's perception of a negative self, which is manifested in lack of self-esteem and appreciation.	3.32	1.17	medium

8	The presence of a foreign maid does not help to build a relationship between parents and children that built on the basis of trust.	3.25	1.39	medium
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**The area of the influence of foreign maids on the linguistic development of the child:**

**Table 5. Arithmetic averages and standard deviations of the paragraphs of the area of influence of foreign maids on the effect of the linguistic development of the child ranked downwardly**

Number	statements	Arithmetic Average	Standard deviation	class
7	The presence of a foreign maid reduces the space for dialogue with the child	3.44	1.26	medium
4	The possibility of the child experiencing difficulty in pronunciation and speaking, especially in letters that East Asians cannot pronounce, such as al-Dad and Al Ain,	3.33	1.26	medium
8	The child suffers a lot of sarcasm, which develops the sense of inferiority and alienation with his peers.	3.33	1.22	medium
2	The effect is the inability to pronounce the correct letters, and to acquire the vocabulary to be learned.	3.24	1.20	medium
3	The child learns the language of the nanny before learning Arabic.	3.18	1.31	medium
6	The language of the maids occurs the overlap between languages which affects the mother tongue.	3.18	1.09	medium
5	The child's linguistic output is lower as he does not seek to memorize as many words as possible.	3.13	1.17	medium
1	The child is delayed by those of his or her age in learning the language.	3.07	1.36	medium
10	The child is unable to express or speak and may experience depression that leads to personality disorder.	3.06	1.01	medium
9	The child is born with confusion or stuttering, which is the fertile ground for future social anxiety growth.	3.01	1.08	medium

Table (5) shows that the arithmetic averages of statements of the area of influence of foreign maids on the effect of the child's linguistic development ranged from (3.01 to 3.44), where statement No. 7 and the text "The presence of foreign maid reduces the space for dialogue with the child" in the first place and with a mathematical average of (3.44), while statement 9 reads "The child is born with confusion or stuttering, which is the fertile ground for future social anxiety growth", with a mathematical average of 3.01. To answer the question of the study concerning: Are there statistically significant differences at the level of indication ( $\geq \alpha 005$ ) between the average responses of the sample members to the impact of foreign maids on the moral education of children in Saudi Arabia from the point of view of parents due to age variables, the level Economic, gender, number of family members, provide both parents, the nature of the work of each parent? Age variable: To answer the study's question concerning the existence of statistically significant differences at the level of indication ( $\geq \alpha 005$ ) between the average responses of the sample members to the impact of foreign maids on the moral education

of children in Saudi Arabia from the point of view of parents due to the change of age ( 18,24, 25-29, 30-39, 40 and above) The researcher used the analysis of single contrast analysis and table (6) explains this. Table 6:

Results single contrast analysis to reveal the differences between the average responses of sample members to the impact of foreign maids on the moral education of children in Saudi Arabia from the parents' point of view due to the change in age

areas	variables	Total squares	Degrees of freedom	Squares Average	P-value	The significance
Development of conscience and moral behavior	Between groups	3.214	3	1.071	3.214	.271
	Within groups	571.668	697	.820	571.668	
	Total	574.882	700		574.882	
Prevailing standards and values	Between groups	3.855	3	1.285	1.531	.205
	Within groups	585.092	697	.839		
	total	588.947	700			
Parent-child relationship	Between groups	14.350	3	4.783	3.460	.016
	Within groups	963.579	697	1.382		
	total	977.929	700			
Language growth for the baby.	Between groups	3.277	3	1.092	1.172	.319
	Within groups	649.438	697	.932		
	total	652.715	700			

The results in table (6) indicated that there were no statistically significant differences in all areas of study attributed to the age change, except in the area of the impact of foreign maids on the relationship between parents and children. The results indicated that there were no statistically significant differences in the field of development of conscience and moral behavior attributable to the age variable based on the calculated (1.30) (P) value (0.27). The results also indicated that there were no statistically significant differences in the area of standards and values prevailing in society in the child due to the change in age, where the value of (P) calculated (1.53) at the level of indication (0.20). The child's linguistic development area is also attributable to the age change, with the calculated (1.17) p value at an indicative level (0.31). The results also indicated that there were statistically significant differences in the area of parent-child relationship due to the age change, with the calculated (3.46) value of "P" at the level of significance (0.01). To see the significance of the differences, the Toki test was used for dimensional comparisons. Table 7. Toki test results to reveal the differences between the average responses of sample members to the effect of foreign maids on the relationship between parents and children due to the age change

domain	Age variable levels	24-18	29-25	39-30	40 years and over
Parent-child relationship	24-18		-0.20	*-0.38	-0.16
	29-25			-0.17	0.04
	39-30				0.22
	40 years and over				

It is clear from table (7) that there are differences between Saudi families aged 18-24, 30-39 in favor of individuals aged 30-39.

**B- Economic level variable:**

To answer the study's question concerning the existence of statistically significant differences at the level of significance ( $\geq \alpha 005$ ) between the average responses of the sample members to the impact of foreign maids on the moral education of children in Saudi Arabia from the point of view of parents attributed For the economic level variable (weak, average, good), the researcher used a single contrast analysis and table (8) to illustrate this. Table 8: Results of the analysis of monogamy to reveal the differences between the average responses of the sample members to the impact of foreign maids on the moral education of children in Saudi Arabia from the parents' point of view due to the change in economic level

areas	variables	Total squares	Degrees of freedom	Squares Average	P-value	The significance
Development of conscience and moral behavior	Between groups	8.40	2	4.20	5.18	0.01
	Within groups	566.48	698	0.81		
	total	574.88	700			
	Between groups	12.11	2	6.05	7.33	0.00

Prevailing standards and values	Within groups	576.84	698	0.83		
	total	588.95	700			
Parent-child relationship	Between groups	5.65	2	2.83	2.03	0.13
	Within groups	972.28	698	1.39		
	total	977.93	700			
Language growth For the baby.	Between groups	17.86	2	8.93	9.82	0.00
	Within groups	634.85	698	0.91		
	total	652.72	700			

The results in table (8) indicated that there were statistically significant differences in the areas of study attributable to the change in the economic level, with the exception of the area of influence of foreign maids on the relationship between parents and children. The results indicated that there were statistically significant differences in the field of development of conscience and moral behavior attributable to the economic level variable based on the calculated (P) value of 5.18 at the indicative level (0.01). The results also indicated that there were statistically significant differences in the area of standards and values prevailing in society in children due to the change in the economic level, where the value of (P) calculated (7.33) at the level of indication (0.00). The child's linguistic development area is also attributable to the age change, with the calculated (9.82) p value at an indicative level (0.00). The results also indicated that there were no statistically significant differences in the area of parent-child relationship due to the change in the economic level, where the calculated value of (P) (2.03) was at the level of significance (0.13). To see the significance of the differences in the areas, the Toki test was used for dimensional comparisons.

**Table 9. Toki test results to reveal the differences between the average responses of sample members to the impact of foreign maids on the moral education of children in Saudi Arabia from the parents' point of view due to the change in economic level**

domain	Age variable levels	weak	average	good
Development of conscience and moral behavior	Weak		*-0.43	*-0.26
	Average	0.43		0.17
	good	0.26	-0.17	
Prevailing standards and values	Weak		*-0.54	*-0.35
	Average	0.54		0.18
	good	0.35	-0.18	
The child's linguistic development	Weak		*-0.59	*-0.33
	Average	0.59		0.26
	good	0.33	-0.26	

It is clear from table 9 that there are differences between Saudi households with a low economic level on the one hand and the medium and good economic level on the other and for the benefit of individuals with a good economic level.

**C. Gender variable**

In order to answer the study's question concerning the existence of statistically significant differences at the level of indication ( $\geq\alpha005$ ) between the average responses of the sample members to the impact of foreign maids on the moral education of children in Saudi Arabia due to the change of gender (male, female) has been used The researcher test (t) and table (10) illustrate this. Table 10. Test results (t) among the average responses of sample members to the impact of foreign maids on the moral education of children in Saudi Arabia are attributable to the change of gender (male, female)

domain	sex	number	average	deviation	T	The significance
Development of conscience and moral behavior	Male	398	3.16	0.93	1.13	0.26
	female	302	3.09	0.87	1.14	0.26
Prevailing standards and values	Male	398	3.16	0.92	2.30	0.02
	Female	302	3.00	0.90	2.31	0.02
Parent-child relationship	Male	398	3.63	1.13	2.22	0.03
	female	302	3.43	1.24	2.19	0.03
Language growth for the baby.	Male	398	3.29	0.95	2.77	0.01
	female	302	3.08	0.97	2.76	0.01

The results in table (10) indicated that there were statistically significant differences in the areas of study attributable to the change of gender, with the exception of the area of development of conscience and moral behavior. The results indicated that there were no statistically significant differences in the field of development of conscience and moral behavior due to the change in the economic level. The results also indicated that there were statistically significant differences in the area of norms and values prevailing in society in children due to the gender variable and the male benefit in terms of the mathematical average of 3.16, as well as the area of parent-child relationship due to the gender variable. The study also showed that the number of women in the public service was 12.5 per cent. D- The number of individuals has changed: to answer the study's question concerning the existence of statistically significant differences at the level of significance ( $\geq\alpha005$ ) between the average responses of the sample members to the impact of foreign maids on the moral education of children in Saudi Arabia from the point of view of the parents is attributable to a variable The number of individuals (1-4, 5-7, 8-10, 11-and-above) the researcher used a single contrast analysis and table 11 explains this.

Table 11: Results of single contrast analysis to reveal the differences between the average responses of sample members to the impact of foreign maids on the moral education of children in Saudi Arabia from the parents' point of view in terms the changing number of individuals

domain	variables	Total squares	Degrees of freedom	Squares Average	P-value	The significance
Development of conscience and moral behavior	Between groups	7.47	4	1.87	2.29	
	Within groups	567.41	696	0.82		
	total	574.88	700			
Prevailing standards and values	Between groups	4.20	4	1.05	1.25	
	Within groups	584.75	696	0.84		
	total	588.95	700			
The child's linguistic development	Between groups	15.37	4	3.84	2.78	
	Within groups	962.56	696	1.38		
	total	977.93	700			
Development of conscience and moral behavior	Between groups	2.19	4	0.55	0.59	0.67
	Within groups	650.52	696	0.93		
	total	652.72	700			

The results in table (11) indicated that there were no statistically significant differences in the areas of study due to the change in the number of family members, except in the area of the impact of foreign maids on the relationship between parents and children. The results indicated that there were no statistically significant differences in the field of development of conscience and moral behavior attributable to the economic level variable based on the calculated (P) value of (2.29) at the indicative level (0.06). The results also indicated that there were no statistically significant differences in the area of standards and values prevailing in society among children due to the change in the number of family members, where the calculated value of (1.25) was at the level of significance (0.29). The child's linguistic development is also attributable to the variable number of family members, with the calculated (0.59) p value (0.59) at the level of significance (0.67).

The results also indicated that there were statistically significant differences in the area of parent- child relationship due to the variable number of family members, with the calculated (2.78) (2.78) value of the meaning level (0.03). To see the significance of the differences in the areas, the Toki test was used for dimensional comparisons.

Table 12. Toki test results to reveal the differences between the average responses of sample members to the impact of foreign maids on the relationship between parents and children due to the changing number of family members

domain	Variable levels of family members	4-1	7-5	10-8	11 and more
Parent-child relationship	4-1		-0.20	*-0.38	-0.16
	7-5			-0.17	0.04
	10-8				0.22

	11- and more				
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It is clear from table (12) that there are differences between Saudi families, which have a family of 1-4 on the one hand and families with families ranging from 5-7 to 8-10 on the other, and for the benefit of families with 5-7 members.

**E. The change in parental availability:**

To answer the study's question concerning the existence of statistically significant differences at the level of significance ( $\geq \alpha 005$ ) between the average responses of the sample members to the impact of foreign maids on the moral education of children in Saudi Arabia is due to the variable availability of parents (Yes, No )

**Table 13. Test results (t) among the average responses of sample members to the impact of foreign maids on the moral education of children in Saudi Arabia are attributable to the change in parental availability (yes, no)**

domain	Parental availability	number	average	deviation	T	The significance
Development of conscience and moral behavior	Yes	550	3.11	0.90	-1.00	0.32
	No	151	3.20	0.93	-0.98	0.33

Prevailing standards and values	Yes	550	3.07	0.91	-0.77	0.44
	No	151	3.14	0.95	-0.75	0.45
Parent-child relationship	Yes	550	3.54	1.18	-0.29	0.77
	No	151	3.57	1.19	-0.29	0.77
Language growth For the baby.	Yes	550	3.19	0.95	-0.34	0.73
	No	151	3.22	1.01	-0.33	0.74

The results in table (13) indicated that there were no statistically significant differences in the areas of study due to the variable availability of parents.

**F- parent’s work variable**

to answer the question of the study concerning the existence of statistically significant differences at the level of indication ( $\geq \alpha 005$ ) between the average responses of the sample members to the impact of foreign maids on the moral education of children in Saudi Arabia from the point of view of the parents attributed To change the nature of the work of the employer of the family (government employee, private sector employee, entrepreneurship, etc.) the researcher used the analysis of monogamy and table (14) explains this. Table 14: Results of mono-variation analysis to reveal the differences between the average responses of sample members to the impact of foreign maids on the moral education of children in Saudi Arabia from the parents' point of view due to the changing nature of the work of the employer of the family

domain	variables	Total squares	Degrees of freedom	Squares Average	P-value	The significance
Development of conscience and moral behavior	Between groups	8.36	3	2.79	3.43	0.02
	Within groups	566.52	697	0.81		
	total	574.88	700			
Prevailing standards and values	Between groups	4.09	3	1.36	1.63	0.18
	Within groups	584.85	697	0.84		
	total	588.95	700			
The child's linguistic development	Between groups	18.34	3	6.11	4.44	0.00
	Within groups	959.59	697	1.38		
	total	8.36	3	2.79		

Development of conscience and moral behavior	Between groups	566.52	697	0.81	1.33	0.26
	Within groups	574.88	700			
	total	4.09	3	1.36		

The results in table (14) indicated that there were no statistically significant differences in the areas of study due to the change in the number of family members, except in the areas of the impact of foreign maids on the development of the child's conscience and moral behavior and the area of the influence of foreign maids on the relationship between parents and children. . The results indicated that there were no statistically significant differences in the area of prevailing standards and values attributable to the change in the nature of the work of the employer based on the calculated (1.63) (P) value (0.18). The results also indicated that there were no statistically significant differences in the area of linguistic growth due to the changing nature of the work of the employer of the family, where the value of (P) calculated (133) at the level of indication (0.26). The results also indicated that there were statistically significant differences in the field of development of conscience and moral behavior, with the calculated (P) value (3.43) at the level of significance (0.02). There are also statistically significant differences in the area of parent-child relationship due to the changing nature of the work of the employer of the family, where the calculated value of (P) (4.44) at the level of significance (0.00). To see the significance of the differences in the areas, the Toki test was used for dimensional comparisons.

**Table 15. Toki test results to reveal the differences between the average responses of sample members to the impact of foreign maids on the development of conscience, moral behavior and parent-child relationship due to the changing nature of the work of the employer of the family**

domain	Variable levels of parent work	Government employee	Private sector employee	Free business	others
Development of conscience and moral behavior	Government employee		0.15	*-0.21	-0.05
	Private sector employee			-0.36	-0.20
	Free business				0.16
	others				
Parent-child relationship	Government employee		*0.35	*-0.12	0.22
	Private sector employee			*-0.47	-0.13
	Free business				0.34
	others		0.15	*-0.21	-0.05

It is clear from table (15) that there are differences between Saudi families, where the nature of the work of the head of the family is a government employee on the one hand and the work of the government on the other hand, and for the benefit of Saudi families, and the nature of the work of the head of the family is free work.

**Discussion of the results related to the question: What is the impact of foreign maids on the moral education of children in Saudi Arabia from Saudi family's perspectives**

To answer this question, computational averages and standard deviations were calculated for each area of impact.

The area of the effect of maids on the development of conscience and moral behavior in children: the results shown in table (2) showed that all its paragraphs received intermediate estimates by members of the Saudi family. This may be due to the disadvantages of having maids in the home, where the presence of maids has a negative and harmful impact on the language, habits and behavior of young children of tradition and learning age, where children are used to sharing their behavior and participating in their holidays. The maid also has the right to deprive the child of the tenderness of his mother in his upbringing and the stability of his body, where the maid cannot compensate those who are not born. 2. The area of the influence of foreign maids on the prevailing standards and values in

society: the results in table (3) showed that all its paragraphs obtained moderate estimates from the point of view of Saudi families, and this may be due to the belief of Saudi families that there are many disadvantages for foreign domestic workers in a specific area Standards, whose existence helps to penetrate conservative society and study its customs and morals, until the values of Western life are disseminated, in addition to the fear of illegal relations between maids and family members. 3. The area of influence of foreign maids on the relationship between parents and children: The results of table (4) showed that all of its paragraphs received intermediate estimates, with the exception of two paragraphs that received high estimates from the point of view of Saudi families. The reason for this is the conviction of the parents that the presence of foreign maids at home has significant negative effects unless the parents limit these effects by cooperating in raising children and not allowing the maids full freedom in matters of the house, so that the family members cooperate to serve themselves as much as possible and distribute responsibilities. On family members reduces the chances of the maids affecting the relationship between parents and children. 4- The area of the influence of foreign maids on the linguistic development of the child: The results of table (5) showed that all its statements were based on intermediate estimates from the point of view of Saudi families. This is due to the attitudes of parents towards foreign domestic workers and their impact on the child's linguistic development.

This trend follows from their knowledge that the maid contributes to the upbringing of the child in an important period or age that is considered the structural basis for the formation of the child's personality, which is the early childhood period, and reflects the extent of the danger resulting from the use of maids to contribute to the education of the child who affects his acquisition of the language and culture the traditions and customs of his society. Third: Discussing the results related to the question: Are there any statistically significant differences at the level of indication ( $\alpha = 0.05$ ) between the average responses of the sample members to the effect of foreign maids on the moral education of children in Saudi Arabia from the parents' point of view due to age variables, The economic level, gender, number of family members, both parents provide the nature of the work of each parent. A- Age variable: The results showed that there were no statistically significant differences in all areas of the study due to the age change, except for the area of influence of foreign maids on the relationship between parents and children, where the effect was in favor of individuals aged 30-39. This may be due to the awareness of the study sample members of the negative sins of foreign maids and their impact on the moral education of the child, where all the members of the study agreed on the negative impact of maids on moral education regardless of their age groups. They are more vigilant in following up and developing the moral aspects of their children without the need for maids. B. Economic level variable: The results of the study indicated that there were statistically significant differences in the areas of study attributable to the change in the economic level, with the exception of the area of the influence of maids on the relationship between parents and children, where the differences were in favor of individuals with a good economic level. The study sample members agreed on the impact of foreign maids on the moral education of the child to distract from the economic level of Saudi families, and this indicates the parents' interest in the moral education of the child and his understanding of the negative effects of the maid, especially when contributing to the upbringing of the child. In all physical, religious, psychological, moral and social aspects. C. Gender variable: The results showed that there were no statistically significant differences in the development of conscience and moral behavior attributable to the gender variable. The results showed differences in other areas attributable to gender change and to the benefit of females. This may be attributed to the fact that females are more aware than males in the upbringing of congenital children because of the fact that fathers are busy working throughout the day, which enhances the chances of foreign maids influencing the moral education of children and therefore mothers are more careful and attentive to the importance of this effect than their male spouses. According to the researcher, the mother's instinct, which is characterized by tenderness and clear love, helps to make differences to their advantage more than males. D. The number of individuals changed: The results indicated that there were no statistically significant differences in all areas of the study attributable to the change in the number of individuals except the area of parent-child relationship, in which the differences were in favor of families with 5-7 members. The study sample members agreed on the impact of foreign maids on the moral education of children regardless of the number of family members. This may be due to the negative effects on the home of foreign maids, including their impact on children's intellectual, mental, religious, psychological and moral needs, followed by the low level of education of the maid, her lack of knowledge of desirable behaviors and her lack of awareness of the prevailing values in Community. E. Variable parental availability: The results indicated that there were no statistically significant differences in all areas of study due to the variable of parental availability. Regardless of the availability of parents, the study members agreed on the importance of ethical education for children and regardless of the availability of parents on the importance of moral education for children and the impact of foreign maids on this. According to the researcher, this is due to the belief of the parents that foreign maids have a lack of cultural awareness, lack of knowledge and lack of knowledge of modern educational methods, all of which are the result of illiteracy and poor educational level. The nature of the work of the head of the family has changed: the results of the study indicated that there were no statistically significant differences in the areas of prevailing standards and values and the linguistic development of the child due to the changing nature of the work of the employer. While there were differences in the development of conscience, moral behavior and the relationship between parents and children, due to the changing nature of the work of the head of the family and to the benefit of self-employed family members. This may be due to the attitudes of Saudi families towards the presence of foreign domestic workers and their impact on the moral education of children. Foreign services bring to home values, customs, cultures and languages, creating a turbulent cultural mix in the Saudi family. Thus, through their contact with foreign maids, parents feel threatened in their originality, tradition and way of daily life. Recommendations: The state should encourage the private sector to use national labor through government incentives and subsidies for companies and private institutions that train Saudi workers. Expansion of family-oriented projects focused on raising parental competence and the efficiency of foreign maids in influencing the moral education of children. Supporting and activating the role of associations working in the field of children, especially in remote areas, to educate the family about

the importance of childhood and the right educational methods in dealing with children morally and to reduce the roles of foreign maids in return. Raising awareness among students about the seriousness and effects of some expatriate workers and showing the negative social, economic and security implications that may come from them, an awareness that is not intended to provoke hatred but to be aware of the facts of these negatives. To demonstrate the negative effects that occur on the individual and society when all the work, professions and crafts needed by society are provided by employment. To organize an environment that promotes self-esteem and autonomy for children, encourages social and positive interaction and promotes children's moral development. Educating young people through the various media about the harm associated with some members of migrant workers and their impact on society because the impact on these young people is an impact on the kingdom's development future. To activate the partnership between all the media and those working in the field of children to broadcast what is new in the field of moral development and for all segments of society. Rationalizing the recruitment of migrant workers. Focus on the need for children to have the skill to deal with parents and give the child the natural family care necessary for their development by taking responsibility for the parents and not leaving child-rearing matters to foreign domestic workers. Further studies and research on the impact of foreign maids on child rearing from the point of view of officials in the Ministry of Labor and include variables other than those not included in the study

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# Evaluation of Stiffness of Concrete Beams Reinforced with Dry and Green Bamboo

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## ABSTRACT

This project was conducted to determine the feasibility of bamboo reinforcement for concrete beams as a cheaper alternative to steel for low cost housing. The bamboo selected for use was *Dendrocalamus giganteus*, in both green and dry forms, which was both untreated and uncoated.

Bamboo samples were made; 10 for the dry bamboo and another 10 for the green bamboo. Tensile test was then carried out using the Hounsfield tensometer. These samples were tested under gradual loading administered by the tensometer until failure occurred and the failure load was recorded. It was found out that green bamboo had a higher average value of tensile stress which was 120.0 N/mm<sup>2</sup> whereas that of the dry bamboo was 45.3 N/mm<sup>2</sup>.

Pull-out test was also conducted on the bamboo as well as the steel, in order to allow for a comparison. This was done by a pull-out machine in the laboratory. It was found that steel reinforcement was pulled out an average length of 7.75 cm using a force of 23.5 kN while it only took a force of 1 kN to pull out an average length of 6.9 cm of the green bamboo and 7.05cm of the dry bamboo.

Lastly, beams of the same specifications and dimensions were cast, replacing only the tensile reinforcement with bamboo in relation to its tensile strength. This was done so as to enable easy comparison between bamboo and steel. The beams were then tested under a four point loading until failure. The beam with steel reinforcement (control) failed at a load of 38 kN, the beams with green bamboo reinforcement failed at an average load of 25 kN while the beam with dry bamboo failed at a load of 22 kN.

After all the tests conducted, it was concluded that while steel reinforcement performed better under testing, bamboo can potentially be used as a cheaper alternative in concrete beams although further research in the field needs to be conducted.

## 1.1 Background

It has been observed that the timber demand worldwide is increasing at a speedy rate but the supply is depleting. Bamboo is regularly used for scaffolding, bridges and housing commonly as a temporary exterior structural material. In many regions of the tropics that are over populated, certain bamboo provide the one satisfactory material that is appropriately cheap and ample to meet the great need for economical housing [1].

The fact that it grows speedily means that it absorbs large quantities of CO<sub>2</sub>. This in turn means that its cultivation for subsequent use in the building industry would help in reducing the rate of climate change [1].

Research has shown that certain species of bamboo have ultimate tensile strength similar to that of mild steel at yield point and it ranges from 140N/mm<sup>2</sup>- 280N/mm<sup>2</sup>.

Bamboo can withstand more tension than compression. The fibres run axially and the outer zone is where there are the highly elastic vascular bundles which have a high tensile strength. This tensile strength has been found in some cases to be higher than that of steel. However, constructing connections that are able to convey this tensile strength is not achievable. Axial parallel elastic fibres that have a tensile strength of up to 400 N/mm<sup>2</sup> can be found in the silicated outer skin. This can be compared to extremely strong wood fibres which can withstand a tension up to 50 N /mm<sup>2</sup> [2].

Bamboo, like other woods, changes dimension with change in moisture content. It has been found that bamboo is a hygroscopic material and therefore its moisture content varies with change in humidity and the temperature of the surrounding environment. Bamboo can be used to replace reinforcement in building constructions [3].

Bamboo has significant elasticity making it suitable for construction in earthquake prone areas. Due to the low weight of bamboo, it is easily transported and worked therefore making the use of cranes and other big machinery unnecessary [3].

Due to its high content of silicate acid, bamboo is very good at resisting fire. When filled up with water, bamboo can withstand a temperature of 400<sup>o</sup>C while the water inside cooks [3].

The main reason that bamboo is viewed as a temporary material is because it lacks natural durability. It is vulnerable to insect attacks and fungi. It can have a service life of as low as a year when in contact with the ground. Durability of bamboo can be increased considerably by suitable specifications and designs as well as careful use of safe and environmentally friendly preservatives for example boron [4]. Bamboo used as reinforcement absorbs water during the casting and curing of concrete and thus increases in size. Cracking of concrete may occur due to the differential thermal expansion of bamboo in relation to concrete [4].

The shrinkage and swelling of bamboo in concrete, results in a major limitation in the usage of bamboo as a replacement for steel. In order to improve the bond between bamboo and concrete, an effective waterproof treatment is required.

## Materials and Methods

### Material Sampling and Preparation

Steel, river sand, and coarse aggregates used in the study were sourced from materials suppliers in Nairobi county. Steel was cut to the specific sizes required in the casting of the beams. No preparation was required for the sand. Two coarse aggregates sizes 10mm and 20mm and class 32.5R Portland Pozzolana cement Bamboo were used

The bamboo used in this study was the “giant bamboo” specifically the specie *Dendrocalamus giganteus*. Three culms cut approximately 1 m from the ground were acquired, two of which were green and one which was dry. Table 1 summarizes dimensions of the bamboo samples collected for use as reinforcement.

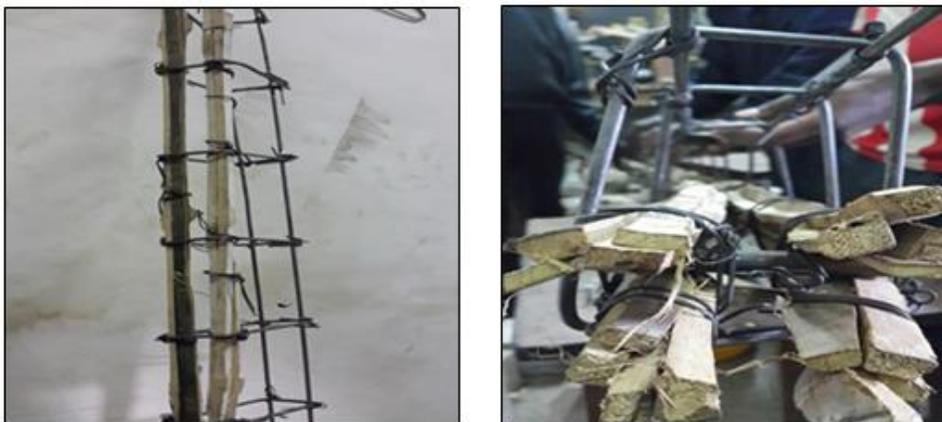
**Table 1:** Description of the bamboo samples obtained

	Sample A (Green)	Sample C (Dry)
Length (m)	8.15	3.1
Diameter, smaller end (cm)	6.75	9.0
Diameter, larger end (cm)	12.7	11.75
Thickness, smaller end (cm)	0.7	0.5
Thickness, larger end (cm)	1.3	1.05

### Design of Beams

A conventional control beam of dimensions 100mm width x 180mm depth x 2000mm length was designed to BS 8110 and reinforced using mild steel round bars, 2R12 bars bottom reinforcement, 2 R6 bars top reinforcement, and R6 links @ 150 CTRS.

Based on this control beam the equivalent amount bamboo (based on relative tensile strength of the bamboo, approximately 120 N/mm<sup>2</sup> green bamboo and 45.3 N/mm<sup>2</sup> green bamboo, and steel bars, approximately 250 N/mm<sup>2</sup>) was calculated for bamboo reinforced beams. Both steel and bamboo tensile strengths were determined from tensile tests results. Total cross sectional area of green bamboo reinforcement was found to be 3.33%, and dry bamboo 6.89%, of the concrete cross section, compared to the 4% limit of the standard.



**Figure 1:** Arrangement of green and dry bamboo reinforcement

### Concrete Mix

Class 25 concrete was used in making the beams, Table 2 summarizes the relative quantities of the concrete mix. A total of 9 cubes (150 x 150 x 150mm for concrete compression strength), 2 cylinders (150mm diameter by 300mm height for concrete tensile splitting test), and 4 beams were prepared

**Table 2:** Concrete mix constituents

Concrete Constituent	Mass per Cubic Meter (kg)
Aggregate (20mm)	900
Aggregate (10mm)	400
Sand	480
Cement	380
Water	190

### Testing

**Moisture content of bamboo** – Moisture content tests were done on bamboo samples of approximately 40mm. The moisture content was determined the same day that the bamboo culms were cut and brought to the laboratory.

**Specific gravity of bamboo** - The specific gravity test was carried out immediately after the moisture content test.

**Tensile test on bamboo** - Tensile test on the bamboo specimens was carried out in the timber laboratory using the Hounsfield Tensiometer. A total of 20 specimens were tested, 10 of dry bamboo and 10 of green bamboo. The specimens were cut in the laboratory to relatively uniform thicknesses ranging from 2-3 mm.



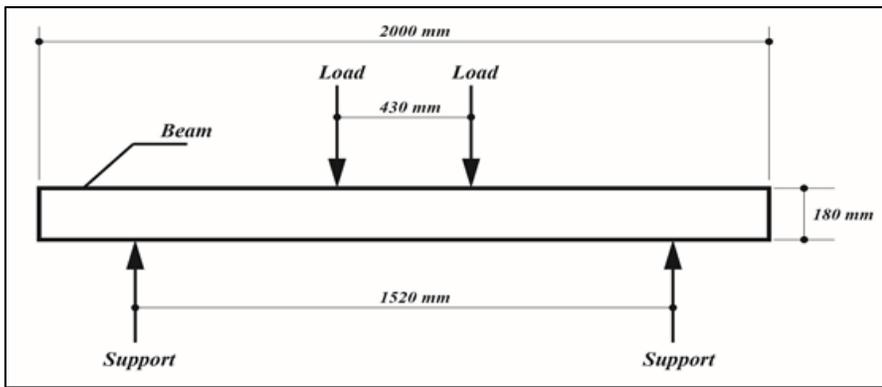
**Figure 2:** Hounsfield tensiometer

**Concrete Slump** - The slump test was done according to BS 1881:102-1983 in order to check the workability of the concrete mix [15].

**Concrete Compaction Factor** - The compaction factor test was done according to BS 1881:103-1993 [16].

**Concrete Mechanical Properties** - The concrete cubes (3 Nos) and cylinders (2 Nos) were tested at the age of 28 days.

**Concrete Beam Test** - Four beam samples were cast, three being for bamboo and one for steel as the control. The load on each beam was gradually applied in increments of 5 KN, recording the deflection at the free end for each load increment. The load value at which the first crack occurred as well as the crack pattern was noted and the failure load for each was recorded.



**Figure 3:** Four point loading beam arrangement

**Pull out test** - Six cube samples were made for this test, that is, for the dry bamboo, green bamboo and for steel; two samples in each case. The reinforcement were placed centrally in the cube and then the concrete was poured around them as shown in Figure 4. The test was carried out after 28 days of curing.



**Figure 4:** Pull out test samples and test setup

**Results and Discussion**

***Moisture content of bamboo***

Moisture content of the bamboo determined as given in Table 3

**Table 3:** Moisture content of the bamboo samples obtained

Bamboo Sample	Average Moisture Content (%)
Green	41.08
Dry	23.87

From these results green bamboo had a much higher moisture content compared to that of dry bamboo. These results are important for the comparison of how the two samples performed when used as reinforcement.

***Specific gravity of bamboo***

Specific gravity of the bamboo were determined as given on Table 4

**Table 4:** Density and specific gravity of the bamboo samples obtained

Bamboo	Average Density	Average specific
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Sample	(g/cm <sup>3</sup> )	gravity
Green	0.71	0.71
Dry	0.52	0.52

From these results it was noted that the average density of green bamboo was higher than that of dry bamboo. This was partly due to the higher moisture content in the green bamboo.

Commonly the density of bamboo is given as 0.3 - 0.4 g/cm<sup>3</sup> [7, 8, 9]. This density is true for bamboo that has been seasoned and dried to reduce the moisture content. However, it was seen that the average density of dry bamboo was 0.52 g/cm<sup>3</sup>. In this case, the sample had not been seasoned though it was dry when it was cut. It was noted then that the density of the sample was not that far off from the one expected, the difference being the slight increase in moisture content.

**Tensile Strength of Bamboo**

It was noted that in the testing of the dry bamboo samples, with the exception of one or two samples which failed at the centre, the rest failed and broke just after one of the grips but still within the gauge length.

Commonly when testing timber for tensile test, failure is supposed to occur at the centre of the gauge length but this is not what occurred in this study. This can be explained by the fact that timber samples are normally machine cut and thus they have a uniform cross-section, however the samples were not machine cut as they were supposed to be very thin and this was not possible to achieve with a machine. They had to be cut to the final dimensions by hand and this led to a variation in the cross-section. Failure thus occurred in the areas with least cross-sectional area. Also failure may have occurred in the areas where the bamboo had imperfections. It is also possible that failure occurred near the grips due to stress concentrations at the grip.

Failure in almost all the green bamboo samples occurred at the centre of the gauge length (distance between the grips). The samples either broke cleanly and separated or snapped at failure but remained as a single piece as shown on Figure 5.



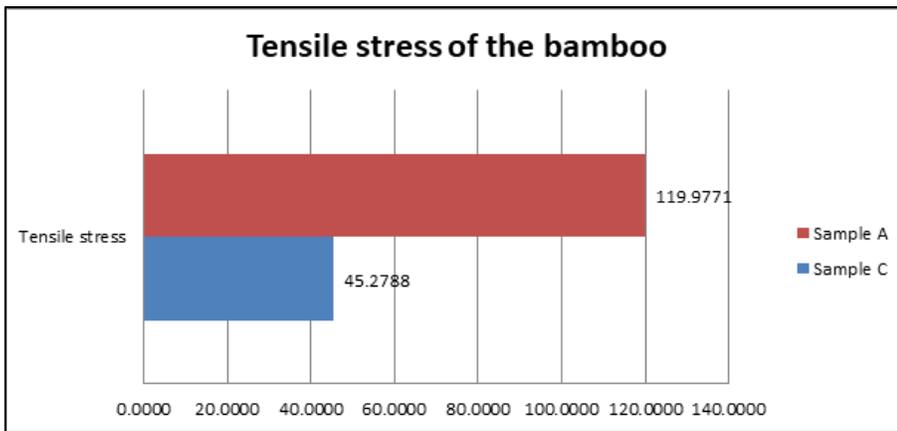
**Figure 5:** Failure mode of the green bamboo samples at the; full breakage, and, centre failure but not separating fully

Failure that occurred just after the grips and off-centre was attributed to the non-uniform cross-section area of the sample or imperfections in the bamboo itself. Table 5 shows the results obtained from the tensile test on the bamboo samples

**Table 5:** Results from the tensile test

Bamboo Sample	Average Tensile stress (N/mm <sup>2</sup> )	Average Strain	Average True extension (mm)
Dry	45.28	0.075	9.7
Green	119.98	0.082	14.7

From Table 5, the average strain for the green bamboo was 9.3% higher than that of the dry bamboo. The true extension was also higher in green bamboo than in dry bamboo (Sample C) and this may be due to the higher moisture content in the green bamboo (Sample A).



**Figure 6:** Tensile stress of the bamboo samples

It is important to note that tensile stress was higher in the green bamboo than in the dry bamboo; more than double the amount in the latter. This was an observation that was unexpected since strength is supposed to increase with decrease in moisture content. However, it was noted that when the dry bamboo was procured there was rot in the upper end of the culm. The sample used for testing was cut below the area of rot and from visual inspection it appeared to be in good condition. This may not have been the case as the rot may have infiltrated into the fibres in areas that could not be seen and caused decrease in the strength of the bamboo. The observed values are comparable to other studies including; 124.2 N/mm<sup>2</sup> [6], 120 N/mm<sup>2</sup> [10], and 121.5 N/mm<sup>2</sup> [11]. Elastic modulus of the tested bamboo samples (Table 5) is presented in Table 6

**Table 6:** Elastic modulus of the bamboo samples

Bamboo Sample	Elastic modulus, E (N/mm <sup>2</sup> )
Dry	603.72
Green	1463.14

Elastic modulus measures the resistance of a material to being deformed elastically when a force is applied to it. From the results above, it was seen that green bamboo had a higher E value than dry bamboo and thus stiffer. With this consideration, it is generally expected that green bamboo reinforced concrete beams will have less deflection than the dry bamboo reinforced concrete beams. Standard deviation for results presented in Tables 5 and 6 are presented in Table 7

**Table 7:** Standard deviation for tensile stress and strain of the bamboo samples

Bamboo Sample	SD for tensile stress	SD for strain
Green	15.9956	0.0187
Dry	10.1756	0.0224

The standard deviation for tensile stress is higher in the green bamboo than in the dry bamboo. This shows that the values of tensile stress in the dry bamboo are closer to the mean and better clustered than those of the green bamboo. The standard deviation for strain for green bamboo was lower than that of dry bamboo meaning that the values for strain for the green bamboo were closer to the mean. However, even if the standard deviation between the two was different, they varied by a small margin and it can be said that they both relatively give values that are close to the mean.

**Concrete Slump**

The slump observed was a true slump of 10mm which indicated low workability. This might have contributed to honey combing observed in the beam samples as presented in later sections of this paper.

**Concrete Compaction Factor**

Observed compaction factor was 0.92, within expected limits for the normal of concrete ie 0.8 – 0.92 [12].

**Concrete Compressive Strength**

Average 28-day Cube Crushing strength was determined as 28.4 N/mm<sup>2</sup>, in line with the targeted compressive strength of 25 N/mm<sup>2</sup>.

**Concrete Tensile Splitting Strength**

The 28-day tensile strength of the concrete was determined as 2.33 N/mm<sup>2</sup>. This was within the expected range of approximately 10% of the compressive strength

**Pull out Test**

Table 8 shows the results obtained from the pull out test

**Table 8:** Pull out test results

	Maximum load (KN)	Average maximum load (KN)	Length pulled out (cm)	Average length pulled out (cm)
<b>Steel</b>	23	23.5	6.5	7.75
	24		9.0	
<b>Green bamboo</b>	1	1	7.0	6.90
	1		6.8	
<b>Dry bamboo</b>	1	1	7.2	7.05
	1		6.9	

The total length embedded in the concrete was 150 mm for all the samples indicated above.

It was noticed that while it took an average force of 23.5 KN to pull out an average length of 7.75 cm of the round steel reinforcement, it only took a force of 1 KN to pull out an average length of 6.9 cm of the green bamboo and 7.05 cm of the dry bamboo. From the tests conducted on the concrete as seen previously, the concrete was shown to have achieved the required strength of class of 25 which was the design mix. This indicated that the observed pull out results were not caused by the concrete itself. Therefore it was concluded that the results from the test showed that the bond between the steel and the concrete was of a greater strength than that of the bamboo and concrete.

As stated earlier the bamboo strips were not coated with anything prior to casting. Bamboo naturally has a smooth surface and this could have led to the poor bonding with the concrete.

The anchorage length of the bamboo therefore needs to be approximately 23.5 times greater in order to prevent slip. This is important to note because the additional length required of the bamboo in order to provide sufficient anchorage length may prove difficult to achieve. It may then be difficult to design using this material in terms of the detailing required especially if the structure is a complex one.

**Concrete Beams**

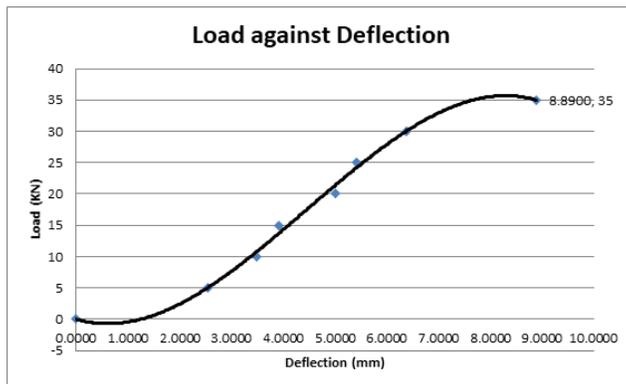
**Control beam (steel reinforcement beam)**

The observed load at first crack was at 15 KN and the testing proceeded until failure. It was noted that at failure, the cracks formed had widths between 1-2 mm and occurred mainly in the area between the loads as shown in Figure 7.



**Figure 7:** Appearance of cracks at failure

Figure 8 shows the load deflection relationship of the control beam

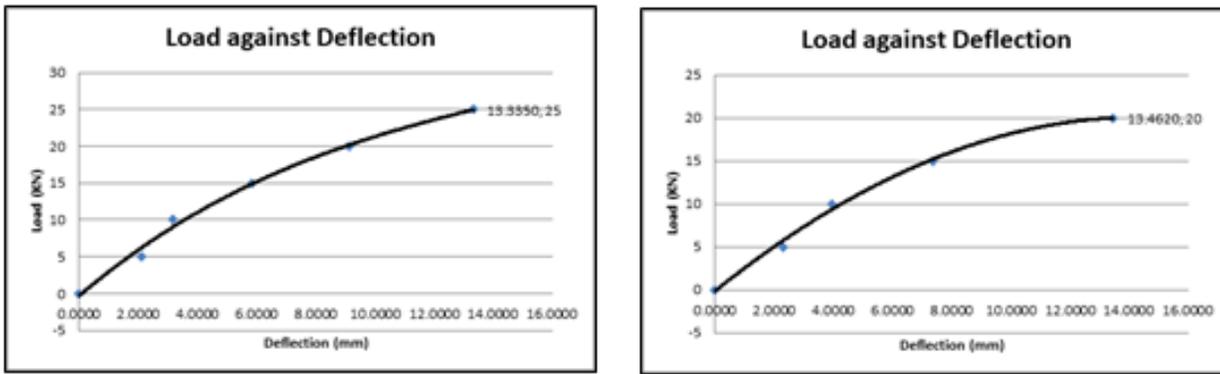


**Figure 8:** Load against Deflection for control beam

The observed maximum load at failure was **38 kN** and the maximum deflection **8.89 mm**. These results line up with what was expected failure load of between 35 and 40 kN and deflection of 8 to 9 mm.

### ***Bamboo Reinforcement Beam (green)***

The average load at first crack was at 5 kN and the final failure load 24.5 kN at an average deflection of 13.4mm. The load deflection curve for this beam is illustrated on Figure 9.



**Figure 9:** Load deflection curves for green bamboo reinforcement beam samples

The average failure load shown above (24.5 kN) is significantly lower than the one obtained from the control beam (38kN); a difference of 13 kN. The average deflection (13.4mm) was higher than the value obtained from the control beam (8.89mm) by a margin of 4.5mm.

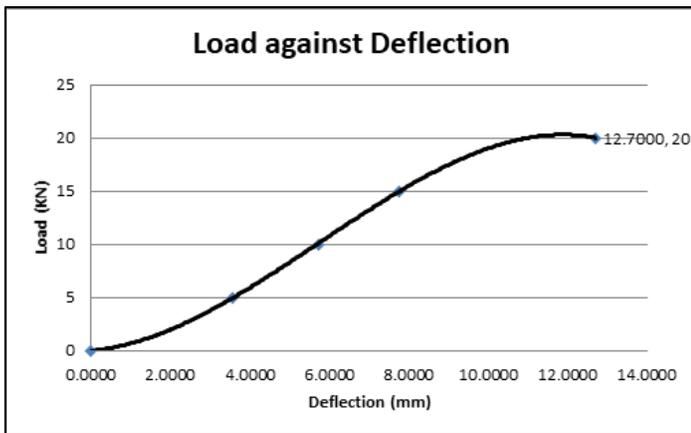
It was noticed (Figure 10) that at failure the cracks on the green bamboo beams were wider and deeper than on the control beam as shown in the figure above. The measured crack widths ranged from 4mm to a maximum of 10mm which was greater than what was obtained from the control beam whose maximum crack width was 2mm. Also it was seen that the depth of the cracks in the green bamboo samples was approximately 170mm deep whereas for the control beam it was 130mm deep. It was noticed that for the green bamboo samples, there was only one major crack that was apparent at failure and this occurred at the point of loading. All this could have been partly caused loss of bond between the bamboo and the concrete.



**Figure 10:** Cracks on the green bamboo reinforced beam sample

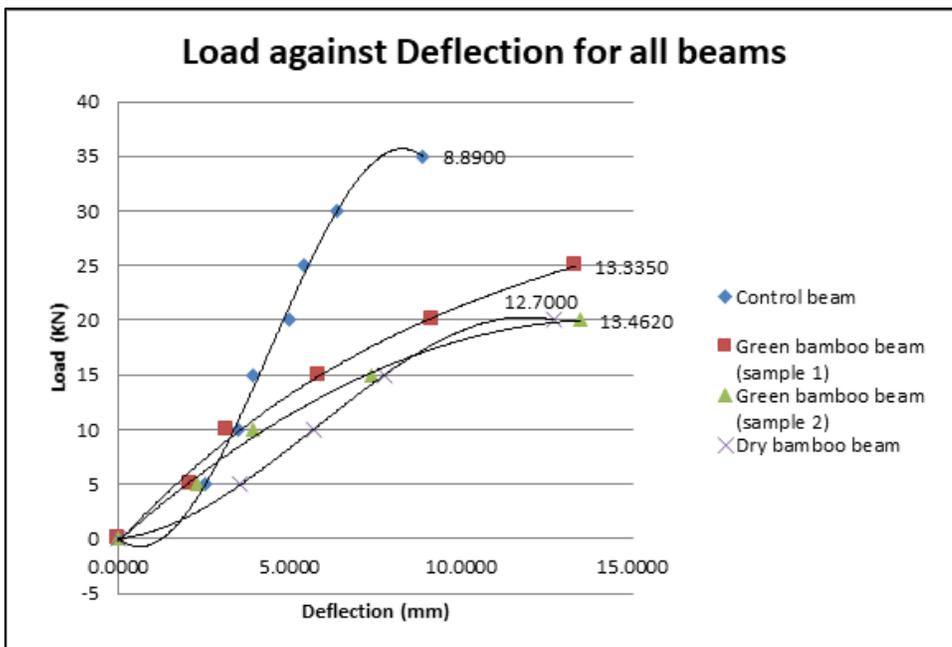
#### ***Bamboo Reinforcement Beam (Dry)***

The load at which first crack occurred was at 5 kN and the final failure at 22 kN, at a deflection of 12.7mm. This failure load was significantly lower than the value obtained from the control beam (38 kN) by a margin of 16 kN whereas the deflection was higher than that of the control beam (8.89mm) by 3.81mm. Figure 11 shows load deflection relationship for the concrete beam reinforced with dry bamboo



**Figure 11:** Load against Deflection for dry bamboo sample

From the concrete results shown previously, the concrete was shown to have achieved the required strength of 25 N/mm<sup>2</sup>. This suggests that the results obtained above, for both the concrete beam reinforced with green bamboo and the one reinforced with dry bamboo, were not due to the effect of the concrete itself.



**Figure 12:** Load against deflection for all beams

Figure 12 shows a comparison of the load deflection curves for the control, the green and dry bamboo reinforced concrete beams. The behaviour pattern of all the beams under loading was similar as they all produced smooth curves.

The known elastic modulus for steel is 205,000 N/mm<sup>2</sup> and the deflection obtained from the control beam was 8.89mm. The calculated elastic modulus of the green bamboo was 1463.14 N/mm<sup>2</sup> and that of dry bamboo was 603.72 N/mm<sup>2</sup>. From this, it was expected that the green bamboo would create less deflection (13.4mm). However, it was seen that it was the dry bamboo (12.7mm) that gave a lower value for deflection. This can be attributed to the fact that a linear relationship was assumed to calculate the value for elastic modulus when this is not the case.

The average value of failure load for the green bamboo samples was higher than that of the dry bamboo sample by 13.6% therefore indicating that the green bamboo performed better in this case. Also less of the green bamboo was used during casting as only 6 strips were used in each beam compared to the 16 strips used for the dry bamboo. Due to the number of reinforcements placed in the dry

bamboo beam sample, the beam ended up having honeycombs due to inability of concrete being able to penetrate in between the reinforcements. This also made it difficult to note the crack pattern.



**Figure 13:** Honeycombs on the dry bamboo beam sample

From the figure above, a change in the concrete is seen where the honeycombs stop. It is at this level where the bamboo reinforcements begin. It was theorized that the bamboo reinforcement acted as a sieve for the concrete and did not allow some of the aggregates to pass through and therefore made the concrete to segregate at this level. Honeycombs expose the reinforcement to the environmental conditions as well as reducing the load bearing capacity and can be very dangerous to the life of the structure. They are therefore to be avoided. Taking into account how all the beams reinforced with bamboo performed, it was concluded that the green bamboo samples performed better in general.

For all the bamboo samples tested, it was seen that the failure load was significantly lower than the one for steel. This could be due to many reasons including (i) lack of homogeneity of the bamboo reinforcements, (ii) No coating was made on the bamboo reinforcements to water proof them, thus making them susceptible to shrinkage and greater loss of bond, (iii) Honeycombing reduced the bending capacity of the beams with dry bamboo reinforcement, (iv) grouping of the bamboo reinforcement could also have caused some of the loss in bending capacity, especially for the dry bamboo reinforced samples

The mode of failure for all samples was by bending. At failure all bamboo reinforced beam samples, the bamboo snapped and broke apart whereas for the control in as much as the steel deformed, it remained in one piece. This points towards a brittle failure for the bamboo reinforced samples, an undesirable property in reinforcement for concrete.

It is essential for safety of structure that the reinforcement be ductile enough to undergo large deformations before fracture. According to BS 4449:1988, the minimum elongation at fracture for mild steel should be 22% [13, 14]. Bamboo seems to be a brittle material as it did not appear to undergo much deformation before it fractured.

## Conclusions

1. The density of bamboo tested ranged from 0.52-0.74 g/cm<sup>3</sup>. This is comparatively low when compared to density of mild steel which is approximately 7.85 g/cm<sup>3</sup>. Thus bamboo can be transported and worked easily compared to steel without use of heavy machinery example cranes.
2. In the tensile test, the green bamboo samples tested turned out to have a higher tensile strength than the dry bamboo samples by a value of 165%.
3. The control beam (steel) failed at a higher load than the beams reinforced with bamboo. However, the beams reinforced with green bamboo performed better than the beam reinforced with dry bamboo by 13.6%.
4. While the mode of failure for the control beam was a ductile failure, the beams reinforced with bamboo underwent a brittle failure.
5. All the beams tested failed due to bending and not due to shear.
6. From the pull out tests conducted, it was concluded that the bond between the bamboo and concrete was very poor compared to the bond between steel and concrete.

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# Assessment of Some Liver Enzymes of Human Immunodeficiency Virus (HIV) And Tuberculosis (TB) Subjects In Parts Of Esan Land, Edo State

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**Abstract:** Tuberculosis and Human Immunodeficiency Virus (HIV) infections are diseases which affect the immune system of the body. The aim of this study is to evaluate the activities of AST, ALT and ALP in Tuberculosis and HIV subjects. A total of one hundred and fifty subjects were recruited for this study which comprised of fifty (50) HIV infected subjects, fifty (50) tuberculosis infected subjects and fifty (50) apparently healthy subjects which served as control. Out of fifty (50) HIV infected subjects, twenty (20) subjects were newly diagnosed, fifteen (15) subjects were on drugs between 0-3 months and fifteen (15) were on drugs between 3-6 months. The same approach was used for recruitment of tuberculosis infected subjects. AST, ALT and ALP were determined using colorimetric method. The result obtain showed a significant increase ( $p < 0.05$ ) in the activities of AST in newly diagnosed HIV infected subjects ( $26.53 \pm 4.95$ u/l) as compared to the controls ( $22.17 \pm 10.34$ u/l). The activities of ALT were significantly increased ( $p < 0.05$ ) in newly diagnosed HIV subjects ( $13.62 \pm 2.20$ u/l) in comparison with the control ( $12.81 \pm 6.67$ u/l). On the same vein, the activities of ALP were significantly increased in the newly diagnosed HIV subjects ( $177.40 \pm 35.12$ u/l) as compared to the controls ( $76.22 \pm 17.55$ u/l). However, there were significant elevations in the activities of AST, ALT and ALP in HIV subjects under therapy within 0-3 months as compared to their respective controls. On the contrary, there was no significant difference in the activities of AST and ALT in HIV subjects under therapy within 3-6 months as compared to their respective controls. Though, there were was significant increase ( $p < 0.05$ ) in the activities of ALP in HIV subjects under therapy within 3-6 months ( $187.93 \pm 36.26$ u/l) as compared to their respective

controls ( $76.22 \pm 17.55$  u/l). The activities of ALP was significantly increase ( $p < 0.05$ ) in newly diagnosed TB infected subjects ( $114.50 \pm 40.29$  u/l) as compared to the controls ( $76.22 \pm 17.55$  u/l) while there was no significant difference observed in the activities of AST and ALT in newly diagnosed TB infected subjects. There was significant increase in the activities of AST, ALT and ALP in tuberculosis subjects under therapy within 0-3 months in comparison with the controls. Furthermore, there was significant increase in the activities of ALP in TB subjects under therapy for 3-6 months ( $103.93 \pm 32.70$  u/l) as compared to the controls ( $76.22 \pm 17.55$  u/l) while there was no significant difference observed for AST and ALT. This study however revealed that there were significant increase in the activities of AST, ALT and ALP which could possibly suggest predisposition liver impairment in these subjects.

**Keywords:** Liver, Enzymes, Immunity, Tuberculosis and Human Immunodeficiency Virus

## INTRODUCTION

Tuberculosis is an infectious disease usually caused by the bacterium *Mycobacterium tuberculosis*. It generally affects the lungs but can also affects other parts of the body such as liver, bone, joint and central nervous system (WHO, 2015). Tuberculosis is spread through the air when people who have active TB in their lungs cough, spit, speak and sneeze (WHO and CDC 2015). Tuberculosis can be of pulmonary or extra-pulmonary. But it mostly occurs of pulmonary origin. The extra-pulmonary occurs outside the lungs (Dorlin *et al.*, 2010). In 90% of pulmonary tuberculosis, the individual usually cough small amount of blood alongside the sputum. And also in rare case, the infection may erode into the pulmonary artery resulting in massive bleeding (Dorlin *et al.*, 2010). Extra-pulmonary Tuberculosis occurs more commonly in immunosuppressed persons and young children. In those with HIV, this occurs in more than 50% of cases (Golden *et al.*, 2005).

Human Immunodeficiency Virus (HIV) is a lentivirus that causes HIV infection and overtime acquired immunodeficiency syndrome (AIDS) (Douck *et al.*, 2009). HIV infects vital cells in the human immune system such as helper T cells (specifically CD<sup>4</sup> T cells), macrophages, and dendritic cells (Cunningham *et al.*, 2010). HIV infection leads to low level of CD<sup>4</sup> T cells through a number of mechanisms, including pyroptosis of abortively infected T cells (Doltsh *et al.*, 2014), apoptosis of uninfected bystander cells (Garg *et al.*, 2012), direct viral killing of infected cells and killing infected CD<sup>4</sup> T cell by CD<sup>8</sup> cytotoxic lymphocytes that recognized infected cells (Kumar and Vinoy, 2012). When CD<sup>4</sup> members decline below a critical level, cell mediated immunity is lost and the body becomes progressively more susceptible to opportunistic infections.

The liver is the largest organ in the human body (Balisteri, 1996) weighing approximately 1.2 -1.5kg in the adult, and located in the right upper quadrant of the abdomen of the abdomen beneath the diaphragm, where it is held in place by ligamentous attachment. It is divided into four lobes which are supplied by the left right braches of the portal vein and the hepatics artery namely the right lobe, which is the largest. The left lobe, the smaller and wedge shape and the quadrant, nearly square in outline and the caudate lobe tail-like in appearance (Nsirim, 1999). The human liver organ performs a number of functions essential for life (Jau-shin, 2005). These functions includes receiving, processing and storage of materials absorbed from the digestive tract such as amino acids, carbohydrate, fatty acid ,cholesterol and vitamins; and it is capable of releasing metabolites of these compound on demand. Other functions include synthesis of plasma proteins, bile acid from cholesterol detoxification and site of metabolic conversion of endogenous and exogenous compounds (Balisteri, 1996).

The effect of TB on liver can be describes in three forms as described by Spiegel and Tuazon, (1984). The most common form is the diffuse hepatic involvement seen along pulmonary or military tuberculosis. The second

form is diffuse hepatic infiltration without recognizable pulmonary involvement. While the third form is much rarer form presents as a focal/local tuberculoma or abscess. At the beginning of the HIV era, liver dysfunction in HIV-infected patients mainly corresponded with opportunistic infections (e.g with cytomegalovirus or mycobacteria and leishmaniasis), tumor (lymphoma and Kaposi sarcoma), drugs related hepatitis (caused by trimetiprim-sulfamethoxazole and other antibiotics). And Human immunodeficiency virus itself infects the liver cells resulting in stimulation of immunological response by hepatic phagocytes against the infection leading to cells damage (Lebovics *et al.*, 1988, Cappell, 1991 and Lefkowitz, 1994). On administration of antiretroviral therapy, liver toxicity increased (Spengler *et al.*, 2002 and Raul *et al.*, 2007).

Various studies done by different researcher have shown that serum liver enzymes are affected in HIV and TB individuals. In a research by Mayne, (1994) reported an increased Transaminase in newly diagnosed HIV infected subjects and administration of ART, Transaminase was further increased. In contrast, Monitoring of the liver function in patients on anti-tuberculosis therapy indicated an increased Alkaline Phosphates serum activity, most frequently occurs during first three months of therapy but not in newly diagnosed. There is a tendency of enzymes values to return to normal irrespective of continuous treatment (Aldrich *et al.*, 2001).

Therefore, this study was carried out to assess serum levels of AST, ALT and ALP on drug naïve and chemotherapy subjects with TB and HIV infections

## METHODOLOGY

### STUDY AREA

This research was carried out in Irrua Specialist Teaching Hospital Edo state, Nigeria. Irrua lies longitudinally at 04°E and 43°E and Latitude 05°44'N and 07°34'N. Its geopolitical location is the South and it has a population of 3.1 million people (World Gazetteer, 2007).

### SAMPLE SIZE

The number of subject sample sizes used in this research was guided by upper limit range to give 95% level of confidence at the expected prevalence of about 11% using the precise formular

$$N = \frac{Z^2 pq}{D^2}$$

Where:

N = The desired sample size (when population is greater than 10,000).

Z = Constant given as 1.96 which corresponds to 95% confidence level.

P = Expected prevalence is 11% (0.11).

q = 1.0 – p.

d = Acceptable error is 5% (Aroaye, 2004).

$$N = \frac{(1.96)^2 \times 0.11(1.0 - 0.11)}{(0.05)^2}$$

$$N = 150.44$$

A minimum of 150 samples was collected for this study.

### RESEARCH PROTOCOL

The research was done to evaluate the serum level of Aspartate transterase (AST), Alanine transferase (ALT) and Alkaline phosphatase (ALP) in 150 subjects (50 HIV subjects, 50 TB subjects and 50 normal individual). The fifty (50) HIV infected subjects and fifty (50) TB infected subjects were compared with 50 controls

(normal subjects). The tuberculosis and HIV patient were grouped into drug naïve and those on drugs for the duration of 0-3 months and 3-6 months. The drug naïve were twenty (20), while those on drugs for 0-3 months were fifteen (15) and those on drugs for 3-6 months were fifteen (15). A validated, quantitative questionnaire was used to obtain their HIV and TB infection knowledge. During this period, HIV-negative and non TB infected volunteers from the same community was recruited for comparison. Ethical approval was given by institution ethical committee, of Irrua Specialist Teaching Hospital, Irrua. Blood samples were collect from these subjects and then centrifuged at 5,000rpm for 5 minutes after which it is then separated into plain container as serum labeled accordingly and kept frozen till the time of analysis. The data was analyzed using SPSS software, version 20.0 (SPSS), and the results will be expressed as mean values and standard deviations. Analysis of variance (ANOVA) was performed to test differences between groups. Differences was considered to be significant if the p- value <0.05.

### **INCLUSION AND EXCLUSION CRITERIA**

Only subjects infected with TB and HIV between the ages of 18-65years of both sexes were sampled for this study. Healthy individuals within the age bracket were also sampled and used as controls. While individuals that are not within the age ranges of 18-65 years, haematological co-morbidities, sickle cell anemia and pregnant women were excluded from the study.

### **SAMPLE COLLECTION**

Blood samples (5mls) were collected by clean venepuncture from the ante-cubital fossa into already labeled lithium heparin bottles, without undue pressure to either the arm or the plunger of the syringe. The samples were mixed by gentle inversion. The samples were centrifuged at 3000 rpm for 5 min to obtain the plasma. The plasma supernatants were separated into sterile bottles and stored frozen until analysis was done at room temperature.

### **BIOCHEMICAL ANALYSIS**

Estimation of the activities of ALT, AST, and ALP was done using Randox Laboratory test kit (Antrim, UK). Specifically, ALT and AST activities were estimated using the method described by Reitman and Frankel (1957), while ALP was done using the methods described by Deutshe (1972)

### **STATISTICAL ANALYSIS**

Statistical Package for Social Science (SPSS) version 20.0 software (SPSS Inc., Chicago, IL USA) windows was used and  $P < 0.05$  was considered as statistically significant using student t-test and ANOVA method of analysis.

### **RESULT**

The results on socio demographic profile revealed that out of the total 50 HIV subjects enrolled for this study, 20 subjects were naïve (newly diagnosed), 15 subjects were on drugs between 0-3 months and 15 subjects were on drugs between 3-6 months. Out of the 20 HIV subjects naïve, 10 (50%) subjects were male and 10 (50%) subjects were female. Of out the 15 HIV subjects on drug for 0-3 months, 7 (46.7%) subjects were male and 8 (53.3%) were female. Out of the 15 HIV subjects on drugs for 3-6 months, 7 (46.7%) subjects were male and 8 (53.3%) subjects were female. A total of 50 Tuberculosis (TB) infected subject were enrolled in which 20 subjects were newly diagnosed (naïve), 15 subjects were on drugs for 0-3 months and 15 subjects were on drugs for 3-6 months. Out of 20 newly diagnosed TB subjects, 10(50%) subjects were male and 10(50%) were female. Out of the 15 TB subjects on drugs for 0-3 months, 7(46.7%) subjects were male and 8(53.3%) were

female. And out of the 15 TB subjects on drugs for 3-6 months, 7(46.7%) subjects were male and 8(53.3%) were female (Table 1).

The results revealed a significant increase ( $p < 0.05$ ) in the activities of AST of HIV subjects ( $24.93 \pm 15.02$ ) as compared to the controls ( $22.17 \pm 10.34$  U/L). There was significant increase ( $p < 0.05$ ) in the activities of ALP of HIV subjects ( $197.70 \pm 66.42$ ) as compared to the controls ( $76.22 \pm 17.55$ ). There was no significant difference ( $p > 0.05$ ) when the activities of ALT in HIV subjects were compared with the controls (Table 2). Furthermore, there was a significant increase ( $p < 0.05$ ) in the activities of AST of TB subjects ( $36.32 \pm 21.21$ ) as compared to the controls ( $22.17 \pm 10.34$  U/L). There was significant increase ( $p < 0.05$ ) in the activities of ALP of TB subjects ( $128.70 \pm 39.60$ ) as compared to the controls ( $76.22 \pm 17.55$ ). There was no significant difference ( $p > 0.05$ ) when the activities of ALT in TB subjects were compared with the controls (Table 2)

The results obtained for liver enzyme activities of HIV subjects at different stages of infection revealed a significant increase ( $p < 0.05$ ) in the activities of AST in newly diagnosed HIV infected subjects ( $26.53 \pm 4.95$ u/l) as compared to the controls ( $22.17 \pm 10.34$ u/l). The activities of ALT were significantly increased ( $p < 0.05$ ) in newly diagnosed HIV subjects ( $13.62 \pm 2.20$ u/l) in comparison with the control ( $12.81 \pm 6.67$ u/l). On the same vein, the activities of ALP were significantly increased in the newly diagnosed HIV subjects ( $177.40 \pm 35.12$ u/l) as compared to the controls ( $76.22 \pm 17.55$ u/l). However, there were significant elevations in the activities of AST, ALT and ALP in HIV subjects under therapy within 0-3 months as compared to their respective controls. On the contrary, there was no significant difference in the activities of AST and ALT in HIV subjects under therapy within 3-6 months as compared to their respective controls. Though, there were was significant increase ( $p < 0.05$ ) in the activities of ALP in HIV subjects under therapy within 3-6 months ( $187.93 \pm 36.26$ u/l) as compared to their respective controls ( $76.22 \pm 17.55$ u/l) (Table 3).

The results obtained for liver enzyme activities of TB subjects at different stages of infection revealed that the activities of ALP was significantly increased ( $p < 0.05$ ) in newly diagnosed TB infected subjects ( $114.50 \pm 40.29$ u/l) as compared to the controls ( $76.22 \pm 17.55$ u/l) while there was no significant difference observed in the activities of AST and ALT in newly diagnosed TB infected subjects. There was significant increase ( $p < 0.05$ ) in the activities of AST, ALT and ALP in tuberculosis subjects under therapy within 0-3 months in comparison with the controls. Furthermore, there was significant increase in the activities of ALP in TB subjects under therapy for 3-6 months ( $103.93 \pm 32.70$ u/l) as compared to the controls ( $76.22 \pm 17.55$ u/l) while there was no significant difference observed for AST and ALT (Table 4).

The classification of the HIV subjects based on the stages of infection revealed that out of 20 naïve HIV subject, 6(30%) subjects were on stage I, 10(50%) subjects were on stage II and 4 (20%) subjects were on stage III. Out of the 15 HIV subjects on drugs for 0-3 months, 6(40%) subjects were on stage I, 9(60%) subjects were on stage II and none were on stage III. And out of the 15 HIV subjects on drugs for 3-6months, 10(66.7%) subjects were on stage I, 5(33.3%) subjects were on stage II and none were on stage III (Table 5).

**Table 1: Sex Distribution of HIV and TB Subjects**

Sex	Control	HIV naïve	HIV 0-3 months	HIV 3-6 months	TB naïve	TB 0-3 months	TB 3-6 months
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<b>Male</b>	25(50%)	10(50%)	7(46.7%)	7(46.7%)	10(50%)	7(46.7%)	7(46.7%)
<b>Female</b>	25(50%)	10(50%)	8(53.3%)	8(53.3%)	10(50%)	8(53.3%)	8(53.3%)
<b>Total</b>	50	20	15	15	20	15	15

**Table 2: Liver Enzymes Activities of HIV and TB Subjects**

Parameters	Control (n=50)	HIV (n=50)	t-value	p-value	TB (n=50)	t-value	P-value
AST	22.17±10.34	24.93±15.02	10.44	0.006	36.32±21.21	50.56	0.000
ALT	12.81±6.67	18.27±14.80	8.44	0.327	15.04±13.85	12.10	0.308
ALP	76.22±17.55	197.70±66.42	36.25	0.000	128.70±39.6	42.74	0.000

**KEY: P<0.05-Significant; P>0.05-Non significant; ALP-AlkalinePhosphatase; AST- Aspartate Aminotransferase; ALT-Alanine Aminotransferase.**

**Table 3: Liver Enzymes Activities of HIV Subjects at Different Stages of Drug Therapy**

Parameters	Controls (n=50)	Naïve (n=10)	0-3 months (n=15)	3-6 months (n=15)	F-value	P-value
AST	22.17±10.34	26.53±4.95*	22.21±9.87*	23.52±23.33**	7.882	0.037
ALT	12.81±6.67	13.62±2.20*	19.88±4.34*	8.64±7.26**	20.104	0.028
ALP	76.22±17.55	177.40±35.12*	234.53±101.53*	187.93±36.26*	156.3	0.000

**KEY: \*-Significant; \*\*-Not Significant; P<0.05-Significant; P>0.05-Non significant; ALP- AlkalinePhosphatase; AST- Aspartate Aminotransferase; ALT-Alanine Aminotransferase.**

**Table 4: Liver Enzymes Activities of TB Subjects at Different Stages of Drug Therapy**

Parameters	Controls (n=50)	Naïve (n=10)	0-3 months (n=15)	3-6 months (n=15)	F-value	P-value
AST	22.17±10.34	30.10±19.51**	46.93±21.71*	34.00±20.12**	17.976	0.000
ALT	12.81±6.67	14.30±13.29**	17.60±4.80*	12.80±4.00**	1.050	0.000
ALP	76.22±17.55	114.50±40.2*	132.40±40.89*	103.93±32.70*	73.395	0.000

**KEY: \*-Significant; \*\*-Not Significant; P<0.05-Significant; P>0.05-Non significant; ALP- AlkalinePhosphatase; AST- Aspartate Aminotransferase; ALT-Alanine Aminotransferase.**

**Table 5: CD<sup>4</sup> Count Distribution Frequency among HIV Infected Subjects**

**CD<sup>4</sup> count reference range: 548-1068**

HIV	Total	HIV stage 1 (548-1068)	HIV stage 11 (200-499)	AIDS stage III (0-199)
Naïve	20	6(30%)	10(50%)	4(20%)
0-3	15	6(40%)	9(60%)	0
3-6	15	10(66.7%)	5(33.3%)	0

## DISCUSSION

Various studies done by different researcher have shown that serum liver enzymes were affected in HIV and TB subjects. In a research carried out by Mayne, (1994), there was report in increased Transaminase activities in newly diagnosed HIV infected subjects and on administration of ART, Tranaminases were further increased. In addition, monitoring of the liver function in patients on anti-tuberculosis therapy indicated an increased Alkaline Phosphatase serum activity most frequently during the first three months of therapy but not in newly diagnosed. There is a tendency of the enzymes values to return to normal irrespective of continuous treatment (Aldrich *et al.*, 2001).

In this study, a significant increase in the activities of AST, ALT and ALP were observed in newly diagnosed HIV subjects when compared with the control. This correlated with the research by carried out Abubakar *et al.*, (2014). This could be attributed to the fact that HIV virus infects a wide range of non-hemaetopoietic cell including cells in the liver. This serve as a reason for the elevated liver enzymes observed in the newly diagnosed HIV subjects (Lebovies *et al.*, 1988, Cappell, 1991 and Lefkowitz, 1994).

Results of liver enzymes level obtain from HIV infected subjects on antiretroviral therapy (ART) between 0-3 months showed a significant increase of AST, ALT and ALP level when compared to the control. This result agrees with the report of Abubakar *et al.*, (2014). This may be due to hepatotoxicity caused by antiretroviral drug side effect (Sulkowski *et al.*, 2000; Gisolf *et al.*, 2000, Resier *et al.*, 2001). The mechanism by which ART cause liver related toxicity particularly, NRTIs is through direct mitochondrial toxicity leading to abnormal liver function (Murphy *et al.*, 2010), while NNRTIs may cause direct cell stress and distribution in lipid or sugar metabolism associated to protease inhibitor (Nunez, 2010).

After 3-6 month duration on ART, only ALP remained significantly increased when compared to control. But reduced when compare to newly diagnosed HIV subjects and HIV subjects on ART between 0-3 months. While AST and ALT were non-significant when compare to the control. This result is in contrast with the research by Ayelagbe *et al.*, (2014). However, this partially correlates with the study of Abubakar *et al.*, (2014) where they reported that this reduction in serum level of Alkaline Phosphatase (ALP) might be due to absent of factors that were responsible for liver toxicity apart from ART. These factors include Alcohol, illicit drugs or medication abuse, other disease conditions that affect the liver such as HBC or HCV, abnormal metabolic syndrome and HIV virus liver inflammation. In addition, in the absence of all these factors and ability of ART to reduced viral load or HIV virus liver inflammation, the liver enzymes activities gradually return to normal.

The CD<sup>4</sup> count in newly diagnosed HIV subjects was decreased when compared to reference range. This agrees to research by Alimont *et al.*, (2003) where they reported that HIV virus has negative effect on CD<sup>4</sup> Lymphocyte cells which is the cause of decreased CD<sup>4</sup> count in naïve HIV subjects. The CD<sup>4</sup> count increases on initiation of ART treatment.

This study also showed that ALP was significantly increased when compare to control while there were no significant changes in the activities of AST and ALT when compare to control in newly diagnosed TB infected Subject. This could be aligned with the fact that *Mycobacterium tuberculosis* which causes pulmonary tuberculosis might have diffused into other organs such as bone, pleural and liver (Extra-pulmonary tuberculosis); therefore leading to increased concentration of ALP (Anantnaryan and Panikar, 2013).

It was also observed that there was significant increase in the activities of AST, ALT and ALP in TB subjects on therapy between 0-3 months. This increase could be attributed to the fact that on initiation of Antituberculosis Therapy, ATT (Isoniazid, Rifampicin, Ethambutol and Pyrazinamide), hepatotoxicity occur leading to an increased AST,ALT and ALP level (Preeti *et al.*, 2013). Isoniazid first undergoes acetylation and get converted into acetyl isoniazid which further hydrolyzed into two products acetyl hydrazine and isoniotoxic acid. Some part is converted into hydrazine. Hydrazine is responsible for hepatotoxicity that led to the increased in liver enzymes activities (Preeti *et al.*, 2013).

Only ALP was significantly increased while there was no significant change in the activities of AST and ALT in TB subjects under therapy between 3-6 months. This is in line with the study of Dinesh and Rao, (2005) where they reported that the combination of Rifampicin and Ethambutol have potent activities against *Mycobacterium tuberculosis* but along with that it induced hazardous side effects on patient liver like hepatitis and jaundice.

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# Biocontrol Activity Of Lactic Acid Bacteria Metabolites Against Bacteria Associated With Contamination And Spoilage Of Fruits And Vegetables

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## Abstract

Lactic acid bacteria (LAB) strains were isolated from fermented cassava tubers and the activities of the resultant secondary metabolites assessed as biocontrol agents against two bacterial pathogens (*Escherichia coli* O157:H7 and *Erwinia carotovora*) associated with contamination and spoilage of fresh fruits and vegetables. Twenty (20) LAB isolates were identified according to standard morphological and biochemical methods and ten were further subjected to phenotypic and genotypic identification. The LAB isolates were identified as *Lactobacillus pentosus* strains PIS23 and Reyan20, *Lactobacillus plantarum* strains PON10014, CTBRBL268 and N3114, *Lactobacillus brevis* strain NS25, *Lactobacillus delbrueckii* strain NS9, *Lactobacillus fermentum* strain NS9, *Lactococcus lactis* strain NS32 and *Leuconostoc mesenteroides* strain NS73. The metabolites were tested for their anti-bacterial activity using agar-well diffusion method. The LAB metabolites were ascertained to contain bacteriocin, lactic acid, diacetyl and hydrogen peroxide, and showed strong inhibitory activity against the target bacteria. The largest zone of inhibition was 23mm (23±0.289<sup>d</sup>) produced by metabolites of *Lactobacillus plantarum* against *Erwinia carotovora*. Preliminary study of applying the LAB metabolites on fresh fruits and vegetables for inhibition of the growth of the target bacteria was performed using the metabolites as sanitizer and biocontrol agent. This study demonstrates that metabolites from lactic acid bacteria have the potential to be used as biocontrol agent against various bacterial pathogens associated with spoilage and contamination of fresh fruits and vegetables as alternative to chemical application.

**Key words:** Biocontrol, *Escherichia coli* O157:H7, *Erwinia carotovora*, lactic acid bacteria, and secondary metabolites.

## I. INTRODUCTION

Food safety is one of the major concerns in public health due to outbreaks of food-borne diseases. Consumers and food industries are concerned about the safety of synthetic/chemical preservatives used in food products. As a result, there is increasing demand for natural products that can be used as alternative food preservatives, and lactic acid bacteria (LAB) metabolite is one of such chemical alternatives which can be safely used as food preservative agent (Awah, *et al*, 2018). Contamination and spoilage of ready-to-eat fruits and vegetables by pathogenic microorganisms have been linked to food-borne disease outbreaks globally. The presence of pathogenic bacteria such as *Escherichia coli* O157:H7 and *Erwinia carotovora* in fresh fruits and vegetables is deemed a serious microbial and postharvest hazard (Espigol *et al.*, 2018).

LAB has long history of application in food production such as their use as starter cultures in vegetable fermentation, bakery, dairy and meat production due to their beneficial influence on nutritional, organoleptic, and shelf-life characteristics (Pinar and Yalçin 2015). The biocontrol effect of LAB has been attributed to the production of one or more active secondary metabolites, such as organic acids (lactic, acetic, formic, propionic acids), that intensify their action by reducing the pH of the media, other substances include fatty acids, acetoin, hydrogen peroxide, diacetyl, antifungal compounds (propionate, phenyl-lactate, hydroxyphenyl-lactate, cyclic dipeptides and 3-hydroxy fatty acids), bacteriocins (nisin, reuterin, reutericyclin, pediocin, lacticin, enterocin and others) and bacteriocin-like inhibitory substances-BLIS (Favaro *et al.*, 2015).

*Erwinia carotovora* is one of the most important food spoilage bacteria in the food industry which causes soft rot of fruits and vegetables in the field as well as those stored at ambient temperatures. *Escherichia coli* O157:H7 has been classified as one of the most important food contaminants and have been implicated in many cases of food contamination across the world. *E. coli* O157:H7 infections are of particular concern due to the potential severity of symptoms leading to several cases of illness, hospitalization and death. *E. coli* O157:H7 has been recorded as being more transmissible than other *E. coli* serotypes due to its high tolerance to acid, which allows it to easily survive the acidic conditions of the stomach. It also produces shiga toxins, which are heat stable, and

therefore unaffected by conventional food pasteurization methods, thus may cause infection to humans even when they are present in foods in little dose (Rabya *et al.*, 2017).

## II. MATERIALS AND METHODS

Location of study:

The study was carried out at the International Institute of Tropical Agriculture (IITA) Ibadan Nigeria.

### Collection of samples:

Cassava samples, *Manihot esculenta* (White and yellow tubers) were obtained from the Cassava Programme of the International Institute of Tropical Agriculture, (IITA) Ibadan Nigeria. Suspected diseased samples of fruits and vegetables which include; Pineapples, Avocado pears, Tomatoes, and Cucumbers were randomly purchased from Oje fruits market in Ibadan, Nigeria. Samples were transported immediately to Germplasm Health Import Laboratory of IITA Ibadan for microbiological analysis.

Sample treatment and fermentation:

The cassava samples were peeled, washed and cut into small bits. 500 g of each of the samples was soaked in 750ml of water and allowed to ferment spontaneously for 120 hours.

Isolation, characterization and identification of lactic acid bacteria:

According to (N.C.C.L.S 2004) procedure, 10ml of steep water from the fermenting cassava samples was aseptically taken from each of the fermenting vessel for ten-fold serial dilution at 24hours, 48hours, 72hours, 96hours, and 120hours respectively, and were plated out in the MRS medium (deMann-Rogosa-Sharpe, Oxoid Ltd, Basingstoke, Hampshire, UK), and incubated at 37 °C for 48 hours using anaerocult gas pack system (Merck, damstadt, Germany). Initial characterization of the isolates included colony and cell morphology, gram staining, KOH reaction, and catalase reaction. Gram positive rods or cocci, KOH positive, catalase negative, oxidase negative and non-motile cells were presumptively identified as LAB. Other biochemical tests such as carbohydrate fermentation, indole and casein hydrolysis test were also carried out. Pure cultures of LAB isolates were stored on slants at 4 °C for further analysis.

Genomic DNA extraction of the LAB isolates:

Procedure given by Ventura and Zink 2007 was followed, single LAB colonies grown on MRS media were transferred to 1.5 ml of MRS broth, and the cultures were grown on a shaker for 48 hours at 28 °C. The cultures were centrifuged at 10000 X g for 5 min. The resulting pellets were resuspended in 520µl of TE buffer (10 mM Tris-HCl, 1 mM EDTA, pH 8.0), while the supernatants were discarded. Fifteen microliters of 20 % SDS and 3 µl of Proteinase K (20 mg/ml) were added and the mixture was incubated for 1 hour at 37 °C. Then 100 µl of 5 M NaCl and 80 µl of a 10% CTAB solution in 0.7 M NaCl were added and mixed. The suspension was incubated for 10 min at 65<sup>0</sup> C and kept on ice for 15 min. An equal volume of chloroform: isoamyl alcohol (24:1) was added, followed by incubation on ice for 5 minutes and centrifugation at 7200 x g for 20min. The aqueous phase was transferred to a new tube, isopropanol (1: 0.6) was added and DNA was precipitated at -20 °C for 16 hours. The DNA of the LAB isolates were collected by centrifugation at 7200 x g for 10 minutes, washed with 500µl of 70% ethanol, air-dried at room temperature for approximately 3 hours and finally dissolved in 50µl of TE buffer.

Polymerase chain reaction (PCR):

Twenty-five microliter (25µl) of each dATP, dCTP, dGTP and dTTP was mixed from a 100mM stock. The final concentration of each dNTP in this mixture was 25 mM. Then 0.508g of MgCl<sub>2</sub>.6H<sub>2</sub>O was dissolved in 100 ml of distilled water, sterilized by autoclaving and stored at -20 °C for further use (Awah *et al.*, 2018).

Primers used:

27F	AGAGTTTGATCMTGGCTCAG
1525r	AAGGAGGTGWTCCARCC

PCR Conditions: 1 cycle of 94 °C (2 min); 29 cycles of 94 °C (30s), 50 °C (1 min), 72 °C (1.5 min); 1 cycle of 72 °C (3 min); 4 °C. Separation of the LAB DNA was carried out in 1% agarose gel.

Preparation secondary metabolite:

The LAB isolates were inoculated into conical flasks containing 100ml MRS broth covered with sterile cotton wool and aluminum foil and clipped unto a wrist action shaker (Burrell Scientific Pittsburgh, P.A. U.S.A) and gently shook for 48 hours at 30 °C. The secondary metabolite was obtained by centrifuging the broth at 7,000 rpm/rcf for 10 minutes and the supernatant of each isolate was filtrated using sterile filter paper (0.45µm-pore-size filter, Millipore).

#### Bacterial pathogens:

The two bacterial pathogens (*Erwinia carotovora* and *E. coli* O157:H7) used for this research were obtained from the culture collection unit of the germplasm health import/export laboratory of IITA, Ibadan Nigeria.

#### Pathogenicity test:

Pathogenicity test was carried out to determine if the organisms responsible for contamination and spoilage were host specific to the fruits and vegetables used for this research. The procedure described by Agrios (2005) was followed.

#### Quantitative estimation of diacetyl:

Diacetyl production was determined by transferring 25ml of broth cultures of test organisms into 100ml flasks. Hydroxylamine solution (7.5 ml) of 1 molar was added to the flask and to a similar flask for residual titration. Both flasks were titrated with 0.1 M HCL to a greenish yellow end point using bromothymol blue as indicator. The equivalence factor of HCL to diacetyl is 21.52 mg. The concentration of diacetyl produced was calculated using the A.O.A.C. (2000) procedure.

#### AK- (B-S) (100E)

W

Where AK = % of diacetyl

B- S = volume of HCL used

E = equivalence factor (21.52/mg)

W = volume of broth 100 = constant

#### Quantitative estimation of hydrogen peroxide:

Hydrogen peroxide production was determined by measuring 25ml of broth cultures of the test organisms into a 100ml flask and to this was added 25ml of freshly prepared 0.1M H<sub>2</sub>SO<sub>4</sub>. It was then titrated with 0.1M potassium permanganate (KMnO<sub>4</sub>). (Each milliliter of 0.1 N KMnO<sub>4</sub> is equivalent to 1.701 mg of H<sub>2</sub>O<sub>2</sub>). A de-colorization of the sample showed the end point. The volume of H<sub>2</sub>O<sub>2</sub> produced was then calculated (A.O.A.C 2000).

$$\text{H}_2\text{O}_2 \text{ produced} = \frac{\text{ml KMnO}_4 \times \text{NKMnO}_4 \times \text{M.E}}{\text{ml H}_2\text{SO}_4 \times \text{volume of sample}} \times 100$$

Where ML KMnO<sub>4</sub> = volume of KMnO<sub>4</sub>

NKMnO<sub>4</sub> = Normality of KMnO<sub>4</sub>

ml H<sub>2</sub>SO<sub>4</sub> = Volume of H<sub>2</sub>SO<sub>4</sub> used

M.E = Equivalence factor (1.701/mg)

#### Quantitative estimation of lactic acid:

The quantity of lactic acid produced by antimicrobial producing LAB isolates was determined by transferring 25ml of broth cultures of test organisms into 100 ml flasks. This was titrated with 0.1M NaOH and 1 ml of phenolphthalein indicator (0.5 % in 5 % alcohol). The titratable acidity was calculated as lactic acid (% w/v). Each milliliter of 1 N NaOH is equivalent to 90.08 mg of lactic acid. The titratable acidity was then calculated as stated in A.O.A.C (2000).

$$\% \text{ acidity} = \frac{\text{ml NaOH} \times \text{MNaOH} \times \text{M.E}}{\text{Volume of sample used}} \times 100$$

Where; ml NaOH = volume of NaOH used

M NaOH = molarity of NaOH

M.E = equivalence factor (90.08/mg)

#### Production of crude bacteriocin from LAB isolates:

Lactic acid bacteria isolates were propagated in 1000 ml MRS broth (pH 7.0, glucose, 0.25% w/v, peptone, 0.5% w/v) for 48 hrs at 28 ± 2 °C under microaerophilic conditions. For extraction of bacteriocin, a cell-free solution was obtained by centrifuging cultures which had been placed in the freezer for one hour at 4,000 rpm for 20 minutes. The culture was adjusted to pH 7.0 followed by filtration of the supernatant with whatman filter paper no1. The supernatant was dialysed for 24 hours at 4 °C (Schillinger and Lucke, 2009).

#### Antibacterial assay:

Determination of inhibitory activity of LAB metabolites on target bacteria using the agar-well diffusion method:

Nutrient agar and EMB agar were prepared, autoclaved at 121 °C for 15 minutes, allowed to cool to 45 °C and poured into sterile petri dishes and allowed to solidify. Using a plastic spreader, the target bacteria: *E. coli* O157:H7 and *Erwinia carotovora* were spread over the surface of the plates, and two wells of 8mm per plate were made using cork borer, then 250µl, 500µl and 1000 µl of the metabolites respectively were added to each well in duplicates and the plates incubated at 27 °C for 48 hours. For control, sterile distilled water was dispensed into the wells. The zones of inhibition were measured using a standard meter rule (Hamadan and Mikolaccik 2004).

#### Statistical analysis:

The data collected were analyzed using the SAS scientific comprehensive statistical package (SAS/STAT® Software Version 20.0, 2013).

### III. RESULTS

A total number of twenty strains of lactic acid bacteria were isolated from fermented cassava samples in this study; ten strains were further characterized and identified. The species identification was authenticated by partial 16S rRNA gene sequencing. The LAB isolates were identified as *L. Pentosus* strains PIS23 and Reyan20, *L. Plantarum* strains PON10014, CTBRBL268 and N3114, *L. Brevis* strain NS25, *L. delbrueckii* strain NS9, *L. Fermentum* strain NS9, *L. lactis* strain NS32 and *L. Mesenteroides* strain NS73. The cultural, morphological and biochemical characterization of the isolates is shown in Table 1a. All the isolates were Gram positive rods and catalase positive. They all hydrolysed casein and were indole positive while motility test was negative. The LAB isolates showed high variability in growth patterns under different concentrations of NaCl. Fifty percent of the isolates tolerated growth in 4.4% and 4.5% NaCl while 60% of the isolates grew in 6.5% NaCl and 80% in 6.6% NaCl concentrations and only 20% of the isolates were able to grow at all the levels of NaCl concentrations. Most of the isolates preferred growth at higher concentrations (6.5 - 6.6%) of NaCl at varying pH of 3.9, 4.0, 4.4, 4.6, 5.5, and 6.2 while none tolerated the pH of 9.6 as their growth was inhibited at this level. The carbohydrate fermentation test is recorded in Table 1b which showed that all the LAB isolates used in this study fermented glucose, lactose, fructose, maltose, salicin and xylose. For growth at different temperatures, most of the isolates tolerated temperatures of 15 °C, 25 °C, 37 °C and 45 °C as the best growth was recorded at 37 °C while none tolerated the temperatures of 4 °C, 10 °C and 60 °C respectively as also recorded in our previous study (Awah *et al.*, 2018).

**Table 1a:** Identification of the lactic acid bacterial strains isolated from the cassava samples

LAB I.D	Source	Gram reaction	Shape	Catalase Test	Casein hydrolysis	Indole Test	Motility Test	4.4% NaCl	4.5% NaCl	6.5% NaCl	6.6% NaCl	Probable identity
1	WC	+	R	-	+	+	-	-	-	+	-	<i>L. pentosus</i>
2	WC	+	R	-	+	+	-	-	-	+	-	<i>L. lactis</i>
3	YC	+	R	-	+	+	-	+	+	+	+	<i>L. fermentum</i>
4	YC	+	R	-	+	+	-	+	-	+	+	<i>L. plantarum</i>
5	YC	+	R	-	+	+	-	+	+	+	+	<i>L. lactis</i>
6	WC	+	R	-	+	+	-	-	+	+	+	<i>L. delbrueckii</i>
7	WC	+	R	-	+	+	-	+	+	-	+	<i>L. brevis</i>
8	YC	+	R	-	+	+	-	-	+	-	+	<i>L. plantarum</i>
9	YC	+	R	-	+	+	-	+	-	+	+	<i>L. pentosus</i>
10	YC	+	R	-	+	+	-	-	-	-	+	<i>L. mesenteroides</i>

Key: WC= White cassava, YC= Yellow cassava, NaCl= Sodium chloride, + = Positive, - = Negative, Shape →R= Rod.

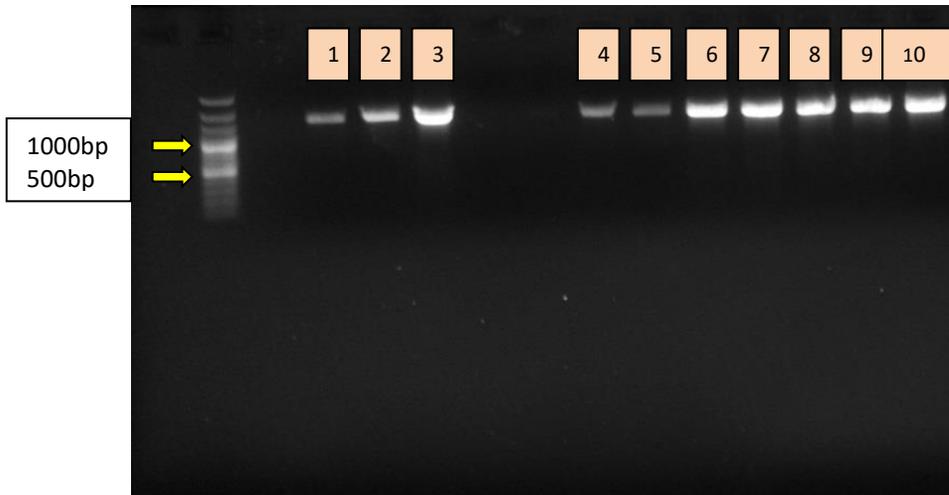
**Table 1b:** Identification of the lactic acid bacterial strains isolated from the cassava samples

LAB I.D	Source	Carbohydrate fermentation										Growth at different temperatures (°C)							Growth at different pH							Probable identity	
		glu	fru	Suc	man	mal	so	gal	lac	sal	xyl	4	10	15	25	37	45	60	3.9	4.0	4.4	4.6	5.5	6.2	7.0		9.6
1	WC	+	+	-	+	+	-	+	+	+	+	-	-	+	+	+	+	-	+	+	+	+	+	+	-	-	<i>L. pentosus</i>
2	WC	+	+	-	-	+	-	+	+	+	+	-	-	+	+	+	+	-	+	+	+	+	+	+	-	-	<i>L. lactis</i>
3	YC	+	+	+	+	+	+	+	-	+	+	-	-	+	+	+	+	-	+	+	+	+	+	+	+	-	<i>L. fermentum</i>
4	YC	+	+	+	+	+	+	+	+	+	+	-	-	+	+	+	+	-	+	+	+	+	+	+	+	-	<i>L. plantarum</i>
5	YC	+	+	+	+	+	+	+	+	+	+	-	-	+	+	+	+	-	+	+	+	+	+	+	-	-	<i>L. lactis</i>
6	WC	+	+	+	+	+	+	+	+	+	+	-	-	+	+	+	+	-	+	+	+	+	+	+	-	-	<i>L. delbrueckii</i>
7	WC	+	+	+	+	+	-	+	+	+	+	-	-	+	+	+	+	-	+	+	+	+	+	+	-	-	<i>L. brevis</i>
8	YC	+	+	+	-	+	+	+	+	+	+	-	-	+	+	+	+	-	+	+	+	+	+	+	-	-	<i>L. plantarum</i>
9	YC	+	+	+	+	+	+	+	+	+	+	-	-	+	+	+	+	-	+	+	+	+	+	+	-	-	<i>L. pentosus</i>
10	YC	+	+	+	-	+	+	+	+	+	+	-	-	+	+	+	+	-	+	+	+	+	+	+	-	-	<i>L. mesenteroides</i>

Sugars: glu=glucose, fru=fructose, suc=sucrose, man=mannitol, sor=sorbitol, gal=galactose, lac=lactose, sal=salicin, xyl=xylose, + = Positive, - = Negative.

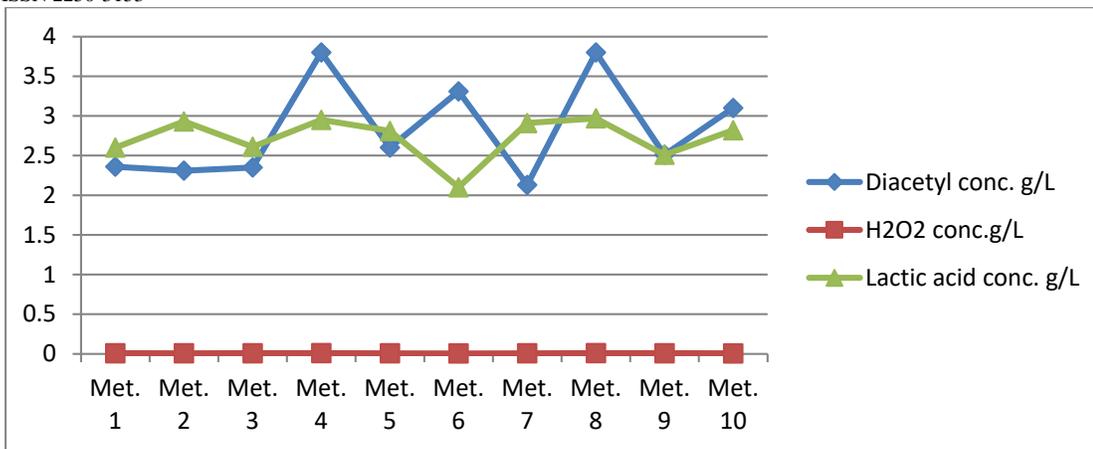
Probable identity of the LAB isolates based on the overall biochemical reaction and carbohydrate fermentation tests showed the presence of *Lactobacillus pentosus*, *L. lactis*, *L. fermentum*, *L. plantarum*, *L. delbrueckii*, *L. brevis* and *L. mesenteroides*. Six suspected isolates showed very clear bands (lanes 3, 6-10) in the gel electrophoresis of the DNA samples using 1500 base pairs ladder as indicated in figure 1. The band in lane 2 was slightly clear while those in lanes 1, 4 and 5 had faint bands. All the bands were above 1000 base pairs hence their selection for further identification. For genotypic identification, the 16S rRNA gene sequences of all the selected isolates were matched with the GenBank Database of NCBI via BLAST and identified as *L. pentosus* strains PIS23 and Reyan20, *L. Plantarum* strains PON10014, CTBRBL268 and N3114, *L. Brevis* strain NS25, *L. delbrueckii* strain NS9, *L. fermentum* strain NS9, *L. lactis* strain NS32 and *L. mesenteroides* strain NS73 as also confirmed from our previous studies (Awah *et al.*, 2018).

The diacetyl, hydrogen peroxide and lactic acid concentration of the LAB metabolites are shown in figure 2. *L. plantarum* recorded the highest diacetyl concentration at 3.80 g/L, while *L. brevis* had the lowest at 2.13g/L. *L. plantarum* also recorded the highest hydrogen peroxide and lactic acid concentration at 0.009 g/L and 2.97 g/L respectively, while *L. delbrueckii* recorded the lowest hydrogen peroxide concentration and lactic acid concentration at 0.005 g/L and 2.10 g/L respectively. All the isolates were able to produce crude bacteriocin at different levels (figure: 3). *L. lactis* strain NS32 produced the highest amount of crude bacteriocin at 21.45(IU/ml), while *L. brevis* strain NS25 produced the lowest amount at 15.21(IU/ml).



**Fig: 1.** Gel electrophoresis of the lactic acid bacteria DNA extracts

1. *Lactococcus lactis*
2. *Lactobacillus fermentum*
3. *Lactobacillus Plantarum*
4. *Lactobacillus brevis*
5. *Lactobacillus pentosus*
6. *LactobacillusPlantarum*
7. *LactobacillusPlantarum*
8. *Lactococcus lactis*
9. *Lactobacillus delbrueckii*
10. *Leuconostoc mesenteroides*

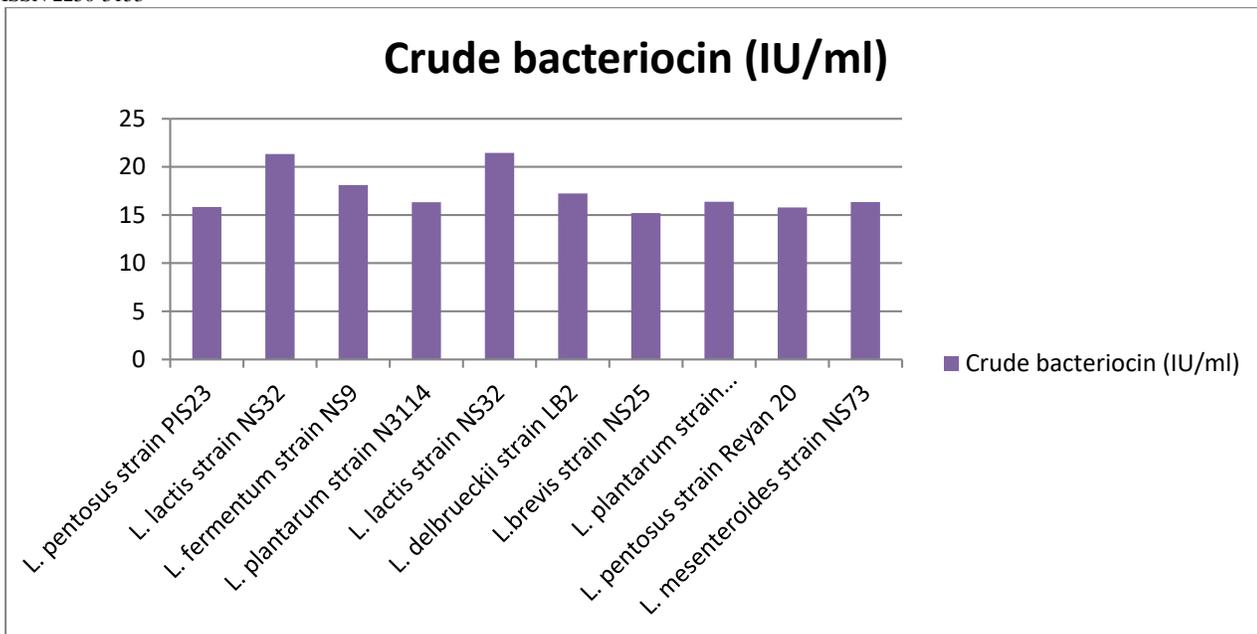


**Fig.2.** Determination and

quantification of diacetyl, hydrogen peroxide and lactic acid concentration in the LAB metabolites.

Sample I.D	Source	LAB species
Met. 1	WC	<i>L. pentosus</i> strain PIS23
Met. 2	WC	<i>L. lactis</i> strain NS32
Met. 3	YC	<i>L. fermentum</i> strain NS9
Met. 4	YC	<i>L. plantarum</i> strain N3114
Met. 5	YC	<i>L. lactis</i> strain NS32
Met. 6	WC	<i>L. delbrueckii</i> strain LB2
Met. 7	WC	<i>L. brevis</i> strain NS25
Met. 8	YC	<i>L. plantarum</i> strain PON10014
Met. 9	YC	<i>L. pentosus</i> strain Reyan 20
Met. 10	YC	<i>L. mesenteroides</i> strain NS73

**Met. 1-10** = LAB metabolites, YC= Yellow Cassava, WC= White Cassava.



**Fig. 3:** Quantitative estimation of the amount of crude bacteriocin produced by the LAB isolates.

Table 2 shows the effect of the ten LAB metabolites on the growth and survival of *E. coli* O157:H7. Varying degrees of inhibition was recorded for all concentrations of the metabolites at 24 and 48 hours respectively, while the controls had no zone of inhibition all through the 48 hours of incubation. The recorded zone of inhibition was between 2 mm - 3 mm ( $2 \pm 0.289^a$  -  $3 \pm 0.289^b$ ) at 250µl concentration of the LAB metabolites, 4 mm - 8 mm ( $4 \pm 0.289^a$  -  $8 \pm 0.289^d$ ) at 500µl concentration and 16 mm - 22 mm ( $16 \pm 0.289^a$  -  $22 \pm 0.289^f$ ) at 1000µl concentration. The statistical analysis shows that the inhibitions vary significantly at different levels: \*\*\* = significant at  $P = 0.01$ , \*\* = significant at  $P = 0.05$  and ns = not significant.

Table 3 shows the effect of the ten LAB metabolites on the growth and survival of *E. carotovora*. Varying degrees of inhibition was also recorded for all concentrations of the metabolites at 24 and 48 hours respectively, while the controls had no zone of inhibition all through the 48 hours of incubation. The recorded zone of inhibition was between 2 mm - 5 mm ( $2 \pm 0.289^a$  -  $5 \pm 0.289^d$ ) at 250µl concentration of the LAB metabolites, 9 mm - 12 mm ( $9 \pm 0.289^a$  -  $12 \pm 0.289^d$ ) at 500µl concentration and 16 mm - 23 mm ( $16 \pm 0.289^a$  -  $23 \pm 0.289^d$ ) at 1000µl concentration. The statistical analysis shows that the inhibitions vary significantly at different levels: \*\*\* = significant at  $P = 0.01$ , \*\* = significant at  $P = 0.05$  and ns = not significant.

**Table 2:** Effect of LAB metabolites (250µl, 500µl and 1000µl respectively) on the growth of *E. coli* O157:H7 on EMB agar incubated at 27 °C for 48 hours.

Hours	Dilutions (Microliter)	Lactic acid bacteria metabolites										ANOVA F-Statistic	
		1	2	3	4	5	6	7	8	9	10		
24	250µl	2±0.289 <sup>a</sup>	3±0.289 <sup>b</sup>	2±0.289 <sup>a</sup>	2±0.289 <sup>a</sup>	2.5±0.289 <sup>ab</sup>	2±0.289 <sup>a</sup>	2±0.289 <sup>a</sup>	2±0.289 <sup>a</sup>	2±0.289 <sup>a</sup>	2±0.289 <sup>a</sup>	2±0.289 <sup>a</sup>	1.517 <sup>ns</sup>
	500µl	4±0.289 <sup>a</sup>	5±0.289 <sup>b</sup>	5±0.289 <sup>b</sup>	6±0.289 <sup>c</sup>	7±0.289 <sup>d</sup>	8±0.289 <sup>c</sup>	5±0.289 <sup>b</sup>	6±0.289 <sup>c</sup>	4±0.289 <sup>a</sup>	4±0.289 <sup>a</sup>	12.80 <sup>***</sup>	
	1000µl	16±0.289 <sup>a</sup>	16±0.289 <sup>a</sup>	16±0.289 <sup>a</sup>	16±0.289 <sup>a</sup>	19±0.289 <sup>c</sup>	18±0.289 <sup>b</sup>	19±0.289 <sup>c</sup>	21±0.289 <sup>e</sup>	20±0.289 <sup>d</sup>	20±0.289 <sup>d</sup>	45.380 <sup>***</sup>	
48	Control	0	0	0	0	0	0	0	0	0	0	.000 <sup>ns</sup>	
	250µl	3±0.289 <sup>b</sup>	3±0.289 <sup>b</sup>	2±0.289 <sup>a</sup>	2±0.289 <sup>a</sup>	3±0.289 <sup>b</sup>	2±0.289 <sup>a</sup>	2±0.289 <sup>a</sup>	2±0.289 <sup>a</sup>	2±0.289 <sup>a</sup>	2.5±0.289 <sup>ab</sup>	2.997 <sup>**</sup>	
	500µl	5±0.289 <sup>a</sup>	5±0.289 <sup>a</sup>	5±0.289 <sup>a</sup>	7±0.289 <sup>c</sup>	8±0.289 <sup>d</sup>	6±0.289 <sup>b</sup>	5±0.289 <sup>a</sup>	7±0.289 <sup>c</sup>	5±0.289 <sup>a</sup>	5±0.289 <sup>a</sup>	15.467 <sup>***</sup>	
	1000µl	16±0.289 <sup>a</sup>	17±0.289 <sup>b</sup>	17±0.289 <sup>b</sup>	16±0.289 <sup>a</sup>	20±0.289 <sup>d</sup>	19±0.289 <sup>c</sup>	19±0.289 <sup>c</sup>	22±0.289 <sup>f</sup>	21±0.289 <sup>e</sup>	21±0.289 <sup>e</sup>	58.133 <sup>***</sup>	
	Control	0	0	0	0	0	0	0	0	0	0	.000 <sup>ns</sup>	

1-10 = Ten LAB metabolites.

Results are means± standard error of means of three replicates. Values in each row followed by different superscripts within same row are significantly different. \*\*\* = significant at P = 0.01 and \*\* = significant at P = 0.05, ns = not significant.

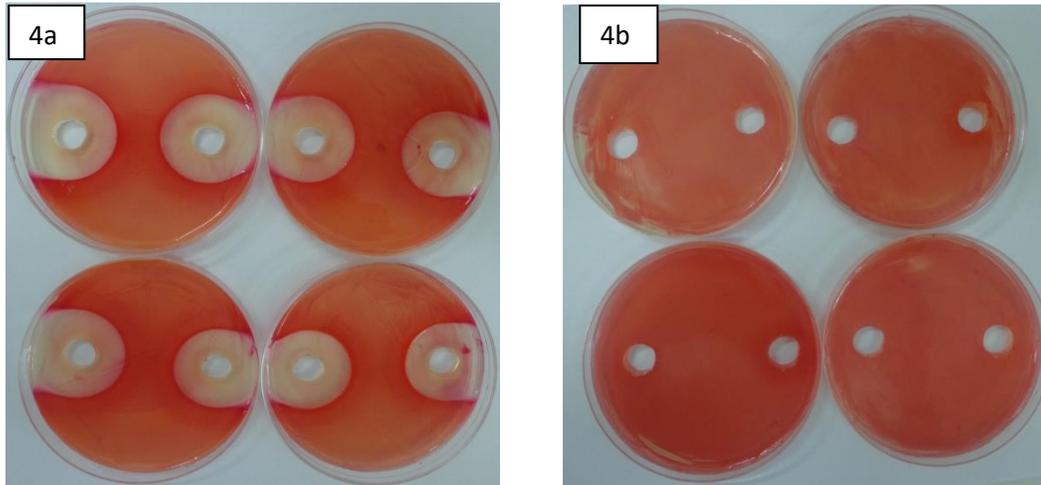
**Table 3:** Effect of LAB metabolites (250µl, 500µl and 1000µl respectively) on the growth of *E. carotovora* on nutrient agar incubated at 27 °C for 48 hours.

Hours	Dilutions (Microliter)	LACTIC ACID BACTERIA METABOLITES										ANOVA F-Statistic
		1	2	3	4	5	6	7	8	9	10	
24	250µl	2±0.289 <sup>a</sup>	2±0.289 <sup>a</sup>	3±0.289 <sup>b</sup>	3±0.289 <sup>b</sup>	4±0.289 <sup>c</sup>	2±0.289 <sup>a</sup>	2±0.289 <sup>a</sup>	5±0.289 <sup>d</sup>	4±0.289 <sup>c</sup>	5±0.289 <sup>d</sup>	18.133 <sup>***</sup>
	500µl	10±0.289 <sup>b</sup>	10±0.289 <sup>b</sup>	11±0.289 <sup>c</sup>	10±0.289 <sup>b</sup>	11±0.289 <sup>c</sup>	9±0.289 <sup>a</sup>	9±0.289 <sup>a</sup>	12±0.289 <sup>d</sup>	11±0.289 <sup>c</sup>	10±0.289 <sup>b</sup>	10.800 <sup>***</sup>
	1000µl	17±0.289 <sup>b</sup>	16±0.289 <sup>a</sup>	20±0.289 <sup>d</sup>	20±0.289 <sup>d</sup>	23±0.289 <sup>f</sup>	20±0.289 <sup>d</sup>	20±0.289 <sup>d</sup>	23±0.289 <sup>f</sup>	22±0.289 <sup>e</sup>	18±0.289 <sup>c</sup>	67.867 <sup>***</sup>
	Control	0	0	0	0	0	0	0	0	0	0	.000 <sup>ns</sup>
48	250µl	2±0.289 <sup>a</sup>	2±0.289 <sup>a</sup>	3±0.289 <sup>b</sup>	3±0.289 <sup>b</sup>	5±0.289 <sup>d</sup>	2±0.289 <sup>a</sup>	3±0.289 <sup>b</sup>	5±0.289 <sup>d</sup>	4±0.289 <sup>c</sup>	5±0.289 <sup>d</sup>	19.200 <sup>***</sup>
	500µl	11±0.289 <sup>c</sup>	10±0.289 <sup>b</sup>	11±0.289 <sup>c</sup>	10±0.289 <sup>b</sup>	11±0.289 <sup>c</sup>	10±0.289 <sup>b</sup>	9±0.289 <sup>a</sup>	12±0.289 <sup>d</sup>	12±0.289 <sup>d</sup>	10±0.289 <sup>b</sup>	11.200 <sup>***</sup>
	1000µl	17±0.289 <sup>a</sup>	17±0.289 <sup>a</sup>	21±0.289 <sup>c</sup>	21±0.289 <sup>c</sup>	23±0.289 <sup>d</sup>	20±0.289 <sup>b</sup>	21±0.289 <sup>c</sup>	23±0.289 <sup>d</sup>	23±0.289 <sup>d</sup>	20±0.289 <sup>b</sup>	59.200 <sup>***</sup>
	Control	0	0	0	0	0	0	0	0	0	0	.000 <sup>ns</sup>

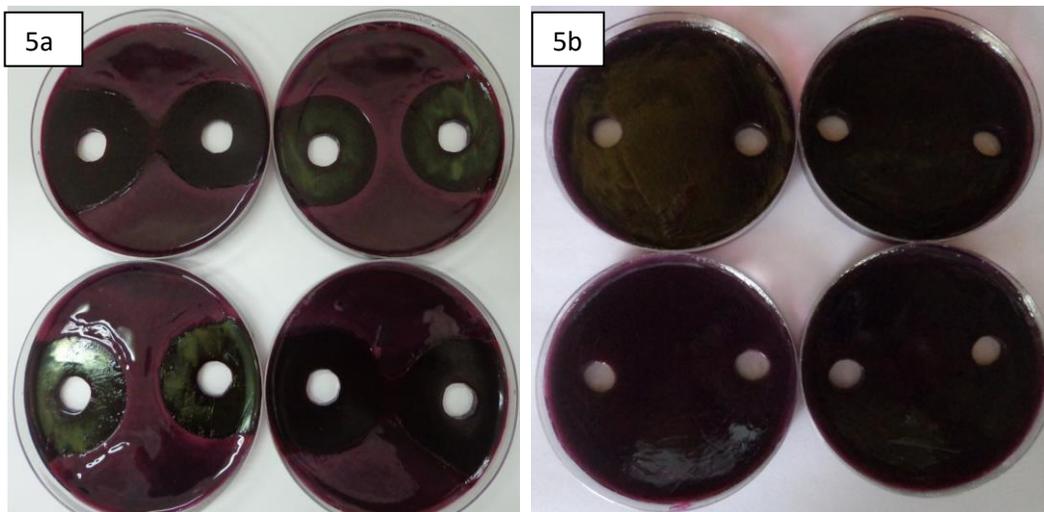
1-10 = Ten LAB metabolites.

Results are means $\pm$  standard error of means of three replicates. Values in each row followed by different superscript within same row are significantly different. \*\*\* = significant at P = 0.01. ns = not significant.

Figures 4 and 5 show the inhibitory activities of the LAB metabolites against the growth of *Erwinia carotovora* via the agar-well diffusion test on nutrient agar incubated at 27 °C for 48 hours and *E.coli* O157:H7 on EMB agar incubated at 27 °C for 48 hours with their respective controls.



**Fig. 4a:** Zones of inhibition of LAB metabolites against *E. carotovora* on nutrient agar incubated at 27 °C for 48 hours. **Fig. 4b:** (Control).



**Fig. 5a:** Zones of inhibition of LAB metabolites against *E.coli* O157:H7 on EMB agar incubated at 27 °C for 48 hours. **Fig. 5b:** (Control).

Figures 6 and 7 below show the preliminary study of directly applying the LAB metabolites on fresh fruits and vegetables for inhibition of the growth or appearance of bacterial pathogens. At the sixth day, the fruits and vegetables without the LAB metabolite treatment started showing signs of bacterial growth while those treated with LAB metabolites showed no sign of bacterial appearance or growth. At the fourteenth day there was full evidence of the presence of the bacterial pathogens on the samples without the LAB metabolite treatment while those treated with the metabolites started showing signs of bacterial growth at the twentieth (20th) day.



**Fig. 6a:** LAB metabolite-treated and non-treated tomatoes at the 10<sup>th</sup> day of preliminary test.

**Fig. 6b:** Non-treated tomatoes at the 14<sup>th</sup> day of preliminary test (Control).



**Fig. 7a.** LAB metabolite-treated avocado pears at 20<sup>th</sup> day of the preliminary test.

**Fig. 7b.** Non-treated avocado pears at 20<sup>th</sup> day of the preliminary test (control).

#### IV. DISCUSSION

Bacterial spoilage and contamination of fresh fruits and vegetables constitute major agricultural and health concerns to both producers and consumers worldwide. Lactic acid bacteria and their secondary metabolites have been employed for centuries in the preservation of food and milk products and thus generally recognized as safe for human consumption. Twenty LAB isolates were obtained from the fermented cassava samples used in this study and ten were further characterized and identified. The species identification was authenticated by partial 16S rRNA gene sequencing. The LAB isolates were identified as *L. Pentosus* strains PIS23 and Reyan20, *L. Plantarum* strains PON10014, CTBRBL268 and N3114, *L. Brevis* strain NS25, *L. delbrueckii* strain NS9, *L. Fermentum* strain NS9, *L. lactis* strain NS32 and *L. Mesenteroides* strain NS73. Molecular identification of the lactic acid bacterial strains which produced the metabolites used in this study demonstrated the dominance of *L. Pentosus*, *L. Plantarum*, *L. brevis*, *L. delbrueckii*, *L. fermentum*, *L. lactis* and *L. mesenteroides* in fermented cassava. These identified LAB strains were in accordance with those earlier identified from similar traditional fermented food products (Adeyemo *et al.*, 2018; Monika *et al.*, 2017; Omemu, and Faniran, 2011).

The LAB isolates used in this study produced different antimicrobial compounds which include: lactic acid, hydrogen peroxide, diacetyl and crude bacteriocin. The production of antimicrobial compounds by these LAB strains confers on them the potential ability to be used as biocontrol agents and sanitizers in the food industry. The growth and survival of the two target bacteria: *E.coli* O157:H7 and *Erwinia carotovora* used in this study were strongly inhibited by seven out of the ten LAB metabolites at varying degrees which include met 1, 2, 3, 5, 7, 8 and 9 produced by *L. pentosus* strain PIS 23, *L. Lactis* strain NS 32, *L. fermentum* strain NS9, *L. brevis* strain NS 25, *L. plantarum* strain PON10014 and *L. pentosus* strain Reyan 20. Similar to this finding, Adeyemo *et al.*, (2018) observed varying degrees of inhibition on the growth of various food borne pathogens by secondary metabolites of lactic acid bacteria. Awojobi *et al.*, (2016) reported the inhibition of the growth of pathogenic and spoilage microorganisms in fresh pineapple juice by direct inoculation of lactic acid bacteria isolates. Antimicrobial compounds have the ability to antagonize the growth of some spoilage

and pathogenic bacteria in foods and food products and have been explored in the control of most unwanted microorganisms (Garcha and Rani 2018). Lactic acid bacteria are known to produce secondary metabolites such as lactic acids which exert their antimicrobial effect by interfering with cell membrane activity, reducing intracellular pH and inhibiting various metabolic functions in the cell of microbes, therefore each antimicrobial compound produced during fermentation of foods provides an additional hurdle for food-spoilage and other pathogenic bacteria to overcome before they can survive or proliferate in such foods (Şanlıbaba and Güçer 2015).

All the isolates were able to produce crude bacteriocin at different levels. Many lactic acid bacteria strains isolated from various fermented foods have been shown to be producers of bacteriocins and are capable of inhibiting the growth of spoilage bacteria and food borne pathogens such as *Listeria monocytogenes*, *E. carotovora*, *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Salmonella typhimoremum*, and *E. coli* O157:H7 (Islam *et al.*, 2020; Garcha and Rani 2018; Adeyemo *et al.*, 2018).

The Pathogenicity test showed that each infected fruit and vegetable used in this study gave the initial organism that caused their contamination and spoilage. Amongst the two target bacteria used in this study, *E. coli* O157:H7 was highly pathogenic leading to rapid disintegration of the infected fruits and vegetables in 3-5 days while *E. Carotovora* was moderately pathogenic but also caused soft rot on the infected fruits and vegetables. However, the results obtained from the study on applying the LAB metabolites on fresh fruits and vegetables for inhibition of growth or appearance of the target bacterial pathogens showed that the metabolites have the capacity to inhibit the growth and survival of these bacteria. A common strategy for preservation of foods that are eaten raw or without further cooking such as fruits and vegetables is the application of edible films or coatings containing antimicrobial substances. The incorporation of antimicrobial compounds such as bacteriocins, nisin, lactic acid, diacetyl etc is an interesting alternative for ensuring the control of pathogenic microorganisms in fresh and raw food products (Valdés *et al.*, 2017).

## V. CONCLUSION

The rise in food borne diseases as a result of the consumption of fresh fruits and vegetables contaminated by pathogenic bacteria is a big health concern in developing countries. However, the growth of pathogenic bacteria in the fruits and vegetables used for this study were inhibited by the LAB metabolites, which also played significant role in extending the shelf life thus, secondary metabolites isolated from lactic acid bacteria can be employed as sanitizers and biocontrol agents in food processing to serve as alternative to chemical preservatives or additives used in food preservation.

### Conflicts of Interest:

The authors hereby declare no potential conflicts of interest with respect to this research work.

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# Survey On Stock Market Forecast Using Machine Learning And Text Mining With Cloud's CaaS

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## ABSTRACT

The big data techniques in conjunction with data mining are rapidly increasing its domination in the data analysis paradigm. These techniques can be effective when combined with the robust applications of cloud computing which can be used in the forecasting of volatile share market. The current existing process of share market predictions uses various existing algorithms but does not take into account the hidden variables that could affect the share market. Our proposed system, uses multi-agent module which can handle multitude of scenarios in which the investment can be favourable. This system is deployed in the cloud platform which can provide high performance computing as well as secured data service. Initially, the system collects the data of the company from social media like twitter and facebook through REST API and performs text mining to retrieve the data that are in correlation with the financial market. After the correlation analysis, the system uses diverged quantitative trading algorithms and performs forecasting analysis. The probability of buying or selling of the stocks are calculated based on the values acquired through forecasting analysis. The reliability factor associated with the quantitative algorithms and the social media posts is modified based on the probability of success in the process of back testing and live share market. Thus the prediction of stock price with company related posts from social media and the quantitative trading algorithms reduces the risk of investment in the volatile share market.

**Index-Terms:** Stock Market, Data Mining, Cloud Computing, Big Data, Trading Algorithms, Investment Recommendation System, survey of stock market prediction, Cloud Container Service.

## I. INTRODUCTION

The stock market is a platform where the stocks of the public companies are enlisted. The stocks defines the ownership of the client over the public company. The market trends depends on the supply and demand of stocks for target

companies. The Stock market price prediction has always been an area for research and development. Its mainly due to the fact that the market is non-linear, volatile, dynamic and unpredictable. In the past few decades, the researchers had proposed multiple techniques that could be viable in the astute prediction of the moment to buy/sell the stocks and attain a profit or minimize the loss. Some of the most common techniques suggested by the researchers are technical analysis on the market trend namely mean average, momentum, oscillators based on the historical data. Most of the techniques does not provide an astute result of the market trend. In the recent years, the trending technology named machine learning and deep neural networks has been proposed for analysis of the market trends. These machine learning algorithms in combination with the traditional techniques has proved to be efficient in the prediction of stock prices. Having said that, the financial news and social media namely twitter, facebook are also playing a vital role in the prediction of market trend. The social media being the fastest platform in transmission of information provides an insight in developing the business. Based on these information we have developed a system in which we will combine the best features of machine learning, traditional techniques, social media and the financial statements of the target company and assist the achieving profit or minimize the loss. This system is to be deployed in the light weight containers of cloud computing to achieve maximum efficiency and performance.

## II. LITERATURE SURVEY

During the literature Survey, we have collected the following information for the stock market price prediction using machine learning, social media, traditional techniques and cloud computing.

**1. Using Structural Events to predict stock price movement:**

The need for stock market prediction has been deliberately increasing in the past few years. The technique of analysing the stock price using multitude traditional algorithms and graphs has not always generated the astute results. So it is necessary to algorithms for accurate prediction. It has been proved that the stock price movements are influenced by the news. The news has served to be a prime factor in the investment decisions. The traditional finance news analysis was carried out by identifying the noun phrases, named entities which does not properly capture the entity-relation of the events. The technique that was employed in this paper is Open IE Technology that enables the extraction of the structured entity-relation between the words in the news. The Linear and Non-Linear models were used to investigate the complex relationships between the events and the news of the corresponding event. This method can outperform the bag-of-words based methodologies and has a potential to increase the stock price prediction[1].

**2. Deep Learning for Event-Driven Stock Prediction:**

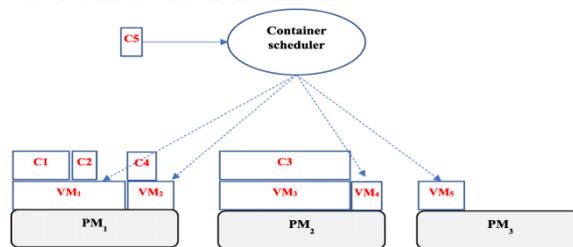
The use of deep learning in the prediction of the stock prices has been trending in the past few years. Several researchers are involved in improving the accuracy of the deep learning algorithms. The paper extracts the news title from a particular financial news source (Bloomberg) represented as dense vectors and trained using novel neural tensor networks. This methodology is followed for the prediction of the stock prices for both short and long term. The extraction of the news data from a single source does not always provide an astute result. Moreover, In this cited paper the news is analysed based on the title which could sometimes be misleading. There are always other factors besides the news that provides a significant contribution to the stock price of the company which has not been taken into account in this cited paper [2].

**3. Leverage Financial news to predict stock price movements using Word Embedding and Deep Neural Network.**

The financial news provides us some useful information about the public companies and the stock

market trend. The most popular word embedding techniques and deep neural networks are used for leveraging the financial news to predict stock price movements in the market. The neural network model is trained using the historical price data of the target company over a period of 5 days. The financial news feature is extracted using the bag of keywords technique and the polarity score of the relation between the keyword and the stock price of the company is calculated. In order to uncover the impact of the specific events on the stock price, the events are classified into various categories. Some of the category tags include events related to new-product release, acquisition, price-rise, law-suit, fiscal-report, government, analyst highlights. The neural network model is tested on training set and it has proved to be providing valid results under supervised environments [3].

**4. Placement architecture for a container as a service in cloud environment:**



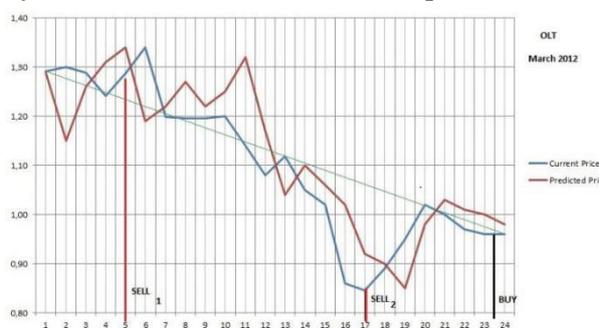
**Figure 1: Container Architecture**

The Cloud Computing techniques has vividly contributed to the evolution of server side deployment of management of files. However inorder to improve the services provided by the cloud, the technique of using containers has been proposed. Unlike the traditional VM, a container is an emerging VM technique that encapsulates the tasks and the library dependencies for execution. The traditional cloud computing approaches leads to the over utilization of the hypervisor or under utilization of the PM. This paper uses the placement techniques like best fit, Max Fit which evaluates the wasted resources in the VM and in the PM. The optimal allocation of application in the containers has let to the increased and efficient utilization of the resources [4].

**5. A Survey on Stock Market Prediction Using SVM:**

In the recent studies it has been proved that the regression algorithms are inefficient due to parameter instability and model uncertainty. The studies has provided considerable evidences that the traditional strategies used in the prediction of the market trend does not assure to solve the problem of accurate prediction. The Support Vector Machine consists of a kernel, decision function and sparsity of the solution. It has been evident that the SVM has provided better and accurate results than the traditional methodologies and regression algorithms. The Interconnection between the stock price and the market index is calculated using correlation analysis [5].

### 6. Stock Market Multi-Agent Recommendation System Based on Elliott Wave Principle:



**Figure 2: Market prediction using Elliott Wave Principle.**

This paper provides a hybrid stock recommendation system by combining the traditional trading techniques with Elliott wave principle. The multi-agent architecture improves the profitability in short and long term investments. Considering that ,The stock market patterns reflects the behaviour of the human, The Elliot wave principle defines two waves namely impulse and corrective wave. The impulse wave is a five wave sequence whereas the corrective wave is a three wave sequence in the direction opposite to the impulse wave. These waves are used in the prediction of the prices for both short and long term. This multi-agent system combines the best features of Fibonacci Series and Elliott wave principle along with some special technical analysis methods (such as Gap Analysis, Breakout System) and Deep Neural Networks. This incorporation of multiple algorithms has proved to be efficient in the forecasting of the stock market [6].

### 7. Indian stock market prediction using artificial neural networks in tick data:

The Stock market is a platform that is driven by supply and demand. The Stock market is one of the arising field. The market trend is evaluated using three techniques namely technical analysis, traditional time series forecasting and machine learning method.

In the premature stages of stock market the classical regression algorithms like Linear Regression, polynomial regression were used to predict the trend of the market. In addition to that, the traditional trading models such as moving average, smoothing and ARIMA were used to predict the prices. However, the current prediction techniques uses support vector machine and artificial neural networks. These models are trained with historical data and then tested on the testing data. The models allocate adaptive weights based on its training on the historical data. The models perform cross validation of the data and calculates the correlation between the stock price and the market. These models yield astute results up to a time period of 15 minutes. The SVM and the artificial neural network are proved to be efficient in prediction of the prices for a certain time period. However, these models does not take into account the external factors that affect the stock price of the target company [7].

### 8. Extracting Semantic Knowledge from Twitter:

In the last 10 years, the social media has been playing a vital role and every business sector. As of now, it has been recorded that about 140 million tweets are posted on an average each day. The tweets are messages with a character limit of 140 which expresses the opinions of the individuals over a particular event. The twitter has been acting as a hidden factor in the business performance. This cited paper focuses on performing semantic analysis on the tweets and analyse the emerging topics. The NLP, machine learning and statistics plays a major role in the semantic analysis. The twitter analysis has resulted in improving the business [8].

#### Disadvantages of the Existing System:

1. The stock prices are unpredictable using the traditional classifiers.
2. The current system reports astute prediction of the stock prices in confined environments(Time period)

3. The current system does not take into account the reliability of the information source.
4. Multiple data sources are not exploited.
5. The current system leads to over utilization of the hypervisor or under-utilization of the physical machine.
6. The traditional semantic analysis does not provide deeper insights in entity relationship.

### III. PROPOSED SYSTEM

The existing methodology has its own advantages and limitations. In this paper we propose to use the linear and non-linear models of machine learning that can be used in the prediction of stock prices. The ensemble algorithms of machine learning is to be combined with the feature of text mining of financial news in twitter and face book, analysis of financial statement and balance sheets of the target company to predict the price of the stocks. This system is deployed in Cloud's Container Service to provide enhanced and seamless performance (storage and speed). By analysing the target company in every perspective our proposed system reduces the risk involved in investing in Stock Market.

### IV. CONCLUSION

To conclude, though there exists various methodologies for analysing the stock market movement, each of those has its own dominance and limitations. The currently followed technical analysis methods proves to provide the results with better accuracy. The libraries of machine learning, text mining has a great developer community and its always being updated with latest patches. Though the fundamental analysis of stock market provides an insight about the price movement, when combined with the technical and new analysis the accuracy in prediction of stock price of the target company increases deliberately, thus reducing the risks involved in stock investments.

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# The Impact Of External Debt On Economic Growth In Nigeria.

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**Abstract-** This study empirically investigated the impact of external debt on economic growth in Nigeria between 1981 and 2018 using ARDL estimation technique. The variables used in the study were tested for stationarity using the Augmented Dickey Fuller. The result revealed that EDS, DDS, FDI and GOVE were stationary at first differencing while GDPGR was stationary at level. The study revealed that external debt and foreign direct investment positively affect economic growth while domestic debt and government expenditure hinders economic growth in Nigeria. The error correction model coefficient which is -0.969 means that nearly 96.9 percent of any disequilibrium in economic growth is corrected by the external debt, domestic debt, foreign direct investment and government expenditure within one period (one year). The study recommends that the country can borrow from external sources when the need arise, however, caution should be taken to avoid putting the country into debt crises. Also, government should reconsider her spending structure to favour infrastructure development which would motivate both local and foreign investors to invest and in turn enhance economic growth. Lastly, government and policy makers should formulate policies that would attract foreign investors and provide enabling environment vis-à-vis security of lives and properties.

**Index Terms-** external debt, dual gap, economic growth, ARDL

**JEL Classification:** H62, H50, O40

## I. INTRODUCTION

One of the characteristic of developing countries Nigeria inclusive is insufficient domestic funds (revenue) needed for investment that would propel economic growth and development. In Nigeria, the inability to diversify her revenue sources coupled with corruption and mismanagement compels Nigeria to have inadequate fund for growth and developmental projects such as roads, electricity pipe borne water and so on (Udeh, Ugwu and Onwuka 2016). In order to overcome this financial shortage, Nigeria resorted into external borrowing. Udoffia and Akpanah (2016) defined external debt as packages that consist of a combination of financial, technical vis-a-vis managerial requirements emanating from outside the country, aimed at supporting economic growth and development and are repayable at determined future date in foreign currency. External borrowing sourced from other countries are called bilateral loan while loans from multinational countries like World Bank, International Monetary Fund, Africa Development Bank, London Club, Paris

Club etc. are called multilateral loan. Soludo (2003), opined that countries borrow for two main broad reasons namely: (1) macroeconomics reason which is either to finance higher investment, to finance higher consumption or to finance transitory balance of payment deficit in order to lower nominal interest rates abroad lack of domestic long term credit (2) to circumvent hand budget constraint. This implies that countries borrow in order to enhance economic growth and development as well as reduce poverty. The rate of external borrowing in Nigeria has been on steady increase, rising from \$28 million in 1958 to over \$30 billion in 2005 before debt relieve thereafter the loan keep increasing again, however, the economic growth has not been on a steady increase and the government is planning to borrow more. It is important to state that when more emphasis is on the negative impact of debt it will lead to morbid fear of debt which would result into debt avoidance when it would have promote the economy by bringing in the much needed capital for investment and economic growth, so this study would investigate to determine if external debt promotes economic growth or otherwise in Nigeria and appropriate recommendation would be made to the government. Also, there is conflicting empirical evidence among researchers on the impact of external debt on economic growth scholars like Sulaiman and Azeez (2012), Odubuasi, Uzoka and Anichebe (2018), Ndubuisi (2017) and Elwasila (2018) all found that external debt had positive impact on economic growth, while reserachers like Ajayi and Oke (2012), Forgha, Mbella, and Ngangnchi (2014) and Onakoya and Ogunade (2017) found that external debt had negative impact on economic growth. Also, Inna and Viktoriia (2018) found that external debt has no impact on economic growth. Given such contradiction, the debate on the impact of external debt on economic growth remains inconclusive so the need to investigate further.

The history of external borrowing in Nigeria can be traced to 1958 when the country borrowed \$28 million from World Bank for the construction of railway, throughout the decade and the subsequent one the Nigeria external borrowing was kept low. The oil boom of 1971's and the desire to rebuild the country after the civil war vis-à-vis implementation of the first and second economic plan propelled the country into huge borrowing with the believe of repayment from the revenue generated from oil. However, in 1982, oil prices crashed and this made the country not to be able to pay off the loans it borrowed, as a result Interest payments spiked, penalties rose, then loan crisis began. This does not stop Nigeria government from sourcing for loans despite of the huge debt it owed so the debt crises keep rising which then started

causing financial burden on the economy and crowding out investment (DMO, 2005). This pattern continued to the point that as at December 31, 2004 Nigeria owed a total of US\$35.994 billion, Nigeria's debt to GDP was about 58%, almost double the recommended level of 30%, debt to total government revenue amounts to 412%, and debt/export ratio stood at 152%, these all indicated that the country cannot develop with the serious debt crises. During this period Nigeria spends more on interest payments than it does on health care and education. In solving this crises Nigeria sought for debt relief and the effort yielded result on June 29, 2005, when the Paris Club and Nigeria agreed on an US\$18 billion debt relief package. The relief helped the country as the resources that would have been used to service the debt were used to fund critical priority sectors such as health, basic education, water, power, road networks and other infrastructure to stimulate the economy.

Due to the inadequacy of government revenue to finance the critical sector successive government started borrowing again and the debt started rising again. As at 2018 the country owed over 21.5 trillion naira and pays over 2.3 trillion naira to service the debt only in 2018. The ratio of debt services to total expenditure is 29.8855%, this implies that almost 30% of government expenditure is expended on debt services which would crowd out investment, retard economic growth.

## II. LITERATURE REVIEW

Onakoya and Ogunade (2017), investigated the impact of external debt on economic growth in Nigeria between 1981 and 2014, the study used Autoregressive Bounds testing method Distributed Lag (ARDL) and Ordinary Least Squares technique. The study revealed that external debt had negative impact on economic growth.

Ekperiware and S. I. Oladeji (2012), analyzed the structural break relationship between external debt and economic growth between 1980 and 2009 on economic growth in Nigeria. The result revealed that the 2005 external debt relief caused a structural break economic growth relationship with external debt in Nigeria and that the external debt relief did make available resources for economic growth in Nigeria.

Ajayi and Oke (2012), examined the effect of the external debt on economic growth in Nigeria. The study employed OLS regression analysis and it was revealed that external debt burden had negative impact on the nation income and per capital income of the nation, also, huge external debt led to continuous industrial strike and poor educational system, increase in retrenchment of workers and devaluation of the nation currency.

Forgha, Mbella, and Ngangnchi (2014), investigated the impact of External Debt and Domestic Investment on Economic Growth in Cameroon between 1980 and 2013. The study made use of two Stage Least Squares estimation technique. The study revealed that domestic investment positively affect economic growth while external debt had negative affect economic growth. Sulaiman and Azeez (2012), investigated the effect of external debt on the economic growth of Nigeria between 1970 and 2010 using Johansen Co-integration estimation technique, the study revealed that there is a long run relationship among the variables and external debt had positive impact on economic growth.

Ndubuisi (2017), examined the impact of external debt on economic growth of Nigeria between 1985 and 2015 using Johansen Co-integration and error correction estimation technique. The Findings showed that debt service payment had an adverse and insignificant impact on economic growth while external debt stock had positive impact on economic growth, also, the causality test revealed that there is unidirectional causality running from external debt to GDP.

Odubuasi, Uzoka and Anichebe (2018), analysed the effect of external debt on the economic growth of Nigeria from 1981 to 2017 using Granger Causality and Johansen Co-integration estimation technique. The study revealed that external debt stock and government capital expenditure have positive on Nigeria's economic growth while external debt service had no significant impact on economic growth.

Inna and Viktoriia (2018), investigated the nexus between external debt and economic growth in emerging economies between 2006 and 2016 and made use of ADL model and correlation analysis. The study revealed that external debt had no impact on the economic growth of the countries that were examined.

Amassoma (2011), analysed the nexus between external debt, domestic debt and economic growth in Nigeria from 1970 to 2009 using a Vector Autoregressive (VAR) and a Vector Error Correction (VEC) estimation technique. The VAR result revealed that there is a bi-directional causality between domestic debt and economic growth while that of the VEC model revealed a unidirectional causality from economic growth to external debt in Nigeria.

Elwasila (2018), investigated the effect of external debt on economic growth of Sudan from 1969 to 2015 and made use of Johansen cointegration method and the Vector Error Correction Method (VECM) estimation technique. The study showed that external debt had had positive impact on economic growth of Sudan whereas exchange rate and foreign direct investment had adverse effects on the economy.

### 2.1. Theoretical framework

#### Dual gap model

The model was propounded by (Chenery, 1966) and it is an extension of Harrod-Domar growth model. Harrod-Domar model deal with a close economy while Dual gap model is applicable in an open economy. Two gap model stated that development of less developed countries is constrained due to presence of two gaps namely: (1) gap between domestic savings and investment, where domestic savings are inadequate to support the level of growth. (2) Gap between export revenues and imports, or foreign exchange gap, where import purchasing power (value of imports + capital transfers) is inadequate to support the level of growth.

This model is generally been used to analyse the requirements of foreign aid or foreign borrowing of capital in bridging the two gaps that prevail in the less developed and developing countries. If the gap is reduced it becomes easier for the economics to reach the stage of take-off as postulated by Rostow in his theory, Stages of economic development.

Harrod -Domar model defines growth as:

$$g=s/k$$

(1)

where g= growth rate

s =savings rate  
 k= capital-output ratio  
 Two-gap model defines growth rate as:  
 $g=s/k+f/k$  (2)

where f is foreign capital inflow ratio.

### III. METHODS

#### 3.1 Model specification

Guided by empirical finding reviewed in this study and sequent to its logical structure as observed in the theoretical framework, the model specification therefore followed the models of Pattillo, Ricci, and Poirson (2001) with modifications.

$$GDPGR = (\text{EDS}, \text{DDS}, \text{FDI}, \text{GOVE}) \quad 3$$

Where: EDS means external debt stock  
 DDS means domestic debt stock  
 FDI means foreign direct investment  
 GOVE means government expenditure  
 GDPGR means gross domestic product growth rate been proxy for economic growth.  
 Linearizing equation (3) becomes:

$$GDPGR_t = \beta_0 + \beta_1 EDS_t + \beta_2 DDS_t + \beta_3 FDI_t + \beta_4 GOVE_t + \epsilon_t \quad 4$$

For an appropriate coefficient for the GDPGR with respect to the explanatory variables to be produce I would transform the model equation (4) on log-linear econometrics form as seen below. Variable with negative value cannot be log so RGDPGR was not log which made the model to be log-linear.

$$GDPGR_t = \beta_0 + \ln\beta_1 EDS_t + \ln\beta_2 DDS_t + \ln\beta_3 FDI_t + \ln\beta_4 GOVE_t + \epsilon_t \quad 5$$

#### 3.2 Data and source

The study employs annual data covering the period 1981-2018. Data for the work were sourced from Debt Management Office (DMO), from Central Bank of Nigeria (CBN) statistical Bulletins and World Bank Data Base.

### IV. RESULT AND DISCUSSION

#### 4.1. Results of the Unit Root Test

Unit root test is used to test for statistical property of variables. Most time series data are often non-stationary, therefore there is need to test for its stationarity to avoid spurious result. This study employed Augmented Dickey-Fuller (ADF) test to check for the unit root in the data and the result is presented below.

#### 4.1 UNIT ROOT TEST TABLE

VARIABLE	AT LEVELS			1ST DIFFERENCE			LEVEL OF INTEGRATION
	ADF-Test	1% C.V	5% C.V	ADF-Test	1% C.V	5% C.V	
LOG(DDS)	-1.464	-3.627	-2.946	-4.453	-3.627	-2.946	I(1)
LOG(EDS)	-1.664	-3.627	-2.946	-4.654	-3.627	-2.946	I(1)
LOG(FDI)	-1.744	-3.621	-2.943	-10.967	-3.627	-2.946	I(1)
GDPGR	-4.106	-3.621	-2.943	-9.932	-3.627	-2.946	I(0)
GOVE	-1.484	-3.627	-2.946	-1.921	-3.646	-2.954	I(1)

Augmented Dickey-Fuller (ADF) results of the test at both levels and first difference are shown in the table above. The null hypothesis is that there is a unit root in each of the series that is each variable is non stationary. At 5% critical value the result showed that variables like DDS, EDS, FDI and GOVE are integrated of order I(1), GDPGR is stationary at level

#### 4.2 Co-integration test

Co-integration test is used to test for long-run equilibrium relationship between or among series. Based on the Unit root test result, the most appropriate estimation technique is ARDL – Bound testing method of co-integration analysis because it allows combination of different orders of integration. The Bounds Cointegration test result is provided thus:

Table 2: ARDL Bounds Test

Test Statistic	Value	k
F-statistic	12.75425	4
Critical Value Bounds		

Significance	I0 Bound	I1 Bound
10%	2.2	3.09
5%	2.56	3.49
2.50%	2.88	4.37
1%	3.29	4.37

Since the result shows that the value of F-statistic is greater than both the lower bound I(0) and upper bound I(1) at 5% significant level therefore there is existence of long-run relationship among the variables.

#### 4.3 ARDL Analysis

This subsection presents the result obtained from estimating the ARDL unrestricted error correction (short run or dynamic) model and the ARDL long-run (static) model in equation. Following this result, this study examines and estimates both short-run dynamics and the long-run relationships between external debt, domestic debt stock, foreign direct investment and government expenditure

**Table 3**  
**long run multiplier coefficient of ARDL**

Variables	Coefficient	Std. Error	t-Statistic	Variables
LOG(EDS)	2.931	0.898	3.262	LOG(EDS)
LOG(DDS)	-9.759	2.101	-4.644	LOG(DDS)
LOG(FDI)	5.499	1.954	2.814	LOG(FDI)
LOG(GOVE)	4.639	2.360	1.966	LOG(GOVE)
C	-90.825	37.003	-2.455	C

**Long-Run ARDL Model analysis**

The result from the above table revealed that EDS, FDI and GOVE had positive relationship with GDPGR, while DDS had an adverse effect on GDPGR. Also, all the variables were significant. The co integration equation is:  
 $GDPGR = -90.825 + 2.931LOG(EDS) - 9.759LOG(DDS) + 5.499LOG(FDI) + 4.639LOG(GOVE).$

**4.4 ARDLECM**

Sequent to the existence of cointegration relationships among the variables as shown in the ARDL Bound test, Auto-Regressive Distributed Lag Error Correction Model estimation technique is the appropriate technique to be used to determine the short-run behavior of the variables. The below table shows the result of the short run dynamics of equation.

**Table 4: ARDLECM TABLE**  
**Table 4: ARDLECM TABLE**

Variables	Coefficient	Std. Error	t-Statistic	Prob.*
DLOG(DDS)	-6.096	2.664	-2.289	0.032
DLOG(FDI)	1.436	0.832	1.726	0.098
DLOG(EDS)	6.467	2.175	-4.826	0.001
DLOG(GOVE)	-10.424	2.325	-4.483	0.002
CointEq(-1)*	-0.969	0.100	-9.652	0.000
R-squared	0.796	Mean dependent var		0.367
Adjusted R-squared	0.753	S.D. dependent var		4.185
S.E. of regression	2.395	Akaike info criterion		4.762
Sum squared resid	160.628	Schwarz criterion		5.073
Log likelihood	-76.328	Hannan-Quinn criter.		4.869
Durbin-Watson stat	2.145			

**Short-Run (Dynamic) ARDL Model analysis**

The result revealed that FDI and EDS had positive relationship with GDPGR while DDS and GOVE had negative effect on GDPGR.

The study shows that foreign direct investment had a positive significant effect on economy growth. This implies that as more foreign direct investment flows to the country the economy grows further. This conform to the apriori expectation.

In the same vein, External debt stock was found to have a positive and significant relationship with economic growth rate at 10% significant level. The result implies that as more fund are been borrowed from external sources the economy grows. This conform to the apriori expectation. This could be because most of external debt are tagged to projects and are more supervised by the creditor thereby minimizing diversion.

However, domestic debt stock was found to have negative significant effect on economic growth. The result implies that as more fund are been borrowed from domestic sources the country's

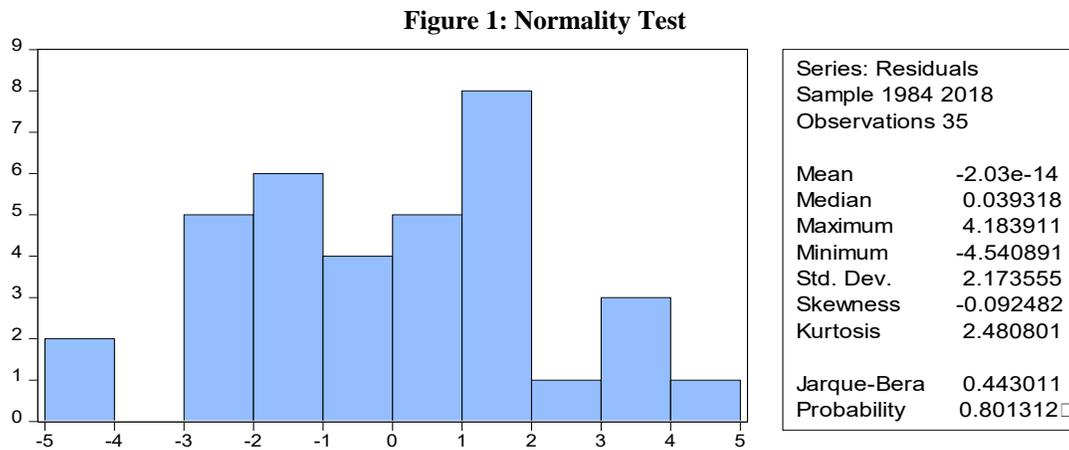
economy decline. This does not conform to the apriori expectation.

Government expenditure showed that it had a negative significant relationship with economic growth. The result implies that as government spending increases the country's economy decline. This does not conform to the apriori expectation.

ECM coefficient which is an important coefficient in short run analysis. ECM term is well defined, that is negative and statistically significant at 5% level. The coefficient is -0.968586 which indicates approximately 96.86 percent of the previous year's disequilibrium in economic growth is been corrected by EDS, DDS, FDI and GOVE. This also showed the speed at which the model converges to equilibrium. The magnitude of this coefficient implies that nearly 96.86 percent of any disequilibrium in economic growth is corrected by the some of the selected variable within one period (one year). The implication is that the present value of economic growth will adjust to changes in EDS, DDS, FDI and GOVE.

Also, some diagnostic tests (such as normality and heteroscedastic ARCH tests) were carried out to ascertain the validity of the regression estimates. The result of the normality test on figure 1 shows that the probability value of the Jarque-Bera statistics is greater than 5%, indicating that the residuals from the

estimates are normally distributed. The heteroskedasticity (ARCH test) also showed (see tables 5) the absence of serial correlation in the estimates, this is because the probability value is greater than 0.05. The results of the diagnostic tests showed the appropriateness of the regression estimates.



**Table 5: Heteroskedasticity Test: ARCH**

F-Statistics	0.920363	Prob. F(1,31)	0.4139
Obs*R-squared	2.820636	Prob. Chi-Square(1)	0.2441

## V. CONCLUSION AND RECOMMENDATIONS

### 5.1 Conclusion

This paper examined the impact of external debt on Nigeria economic growth between 1981 and 2018. Based on the result obtained, it was revealed that there is both long-run and short-run relationship between Nigeria economic growth on one hand and external debt stock, domestic debt stock, foreign direct investment and government expenditure on the other hand.

It is also concluded from the result that, foreign direct investment and external debt stock have positive and statistically significant impact on economic growth. The result also found that domestic debt stock and government spending have negative and statistically significant impact on economic growth. Moreover, it is concluded that Bound test confirmed that the variables cointegrated.

### 5.2 Recommendations

Based on the findings of this study, the following recommendations were made:

The study revealed that external debt contributes more to economic growth therefore, the government should can borrow when the need arise however, caution should be taken to avoid putting the country into debt crises.

Since foreign direct investment positively affect the economic growth, government and policy makers should formulate policies that would attract foreign investors and provide enabling environment vis-à-vis security of lives and properties.

The study revealed that domestic borrowing hinders economic growth, therefore government should ensure proper utilization of domestic fund as most of the country’s debt is locally

sourced. Also government should frequent and prompt payment of debt services to avoid accumulating more debt.

Since government expenditure inhibit economic growth, government should reconsider her spending structure to favour infrastructure development which would motivate both local and foreign investors to invest and in turn enhance economic growth.

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# Determinants Of Nurse-Midwives Related Factors On Computer Technology Utilization In Nursing Practice Among Nurse - Midwives In Kwale County, Kenya

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**Abstract-** The purpose of this study was to determine Nurse-midwives related factors in the utilization of computer technology in nursing practice amongst Nurse-midwives in Kwale County. **Method** used was institution based descriptive cross-sectional design which was done in Kwale County and the targeted population were the nurse-midwives working at Msambweni, Kwale and Kinango Hospitals with a sample size of 141. **Results** Nurse- midwife related factors as my independent variable the study showed that self-rated computer knowledge significantly affected utilization of computer technology ( $\chi^2$  (1, N=141) =26.338,  $p=<0.001$ ). Attitude significantly influenced utilization of computer technology ( $\chi^2$  (1, N=141) =4.098,  $p=0.043$ ). On **conclusion** Majority of the nurse-midwives had negative attitude towards utilization of computer technology. The researcher gave his **recommendation** as per his research objective on **determining nurse-midwives related factors** The County health committee in conjunction with Nurse Managers and supervisors should address the issue of negative attitude amongst the nurses through supportive supervision, provision of technical infrastructure and on job training. The Kwale County Director of nursing services should involve the Nurse Managers and supervisors in policy making at the higher level of management. Nurse managers/supervisors should take an initiative of passing the knowledge of computer technology utilization to their juniors through on job training and create room for them to train in computer application

## I. INTRODUCTION

**B**ackground information. Good training and practice coupled with positive attitude towards new technology application by nurses-midwives make use of computer technology which will assist them promote standardised and well informed patient care delivery; and this will actively encourage proficient practice and secured care. (Newbold, Klein & Douglas J. V. 2015). It is expected that all nurses around the globe be abreast with information communication and technology (ICT) for their empowerment when it comes to making the right interventions in the provision of nursing care to patients or clients (Newbold, et al 2015). Thus there is need to dedicate all the resource towards computer technology application across the board. Provision of health services is confronted by prominent disease condition every other time and the only way out to cab this menace is indulging in utilization of computer technology which is in cooperated in information, communication and technology. It

is a fact that nursing plays a major role in any healthcare delivery system, and therefore it should be appreciated that nursing profession is faced by all the challenges that come together with all the disease conditions (Smedley, 2015). There is always resistance in bringing change to any professional discipline and it is necessary to consider before the introduction of the change as positivity or negativity will dictate the success of that change. Introduction of ICT can be followed by actively utilization of the service if there is positive response as opposed to negative perception where users may shy away from using the technology (Bond, 2013). According to free dictionary by Farlex, (2012) the definition of computer technology is the activity of designing, constructing and programming computers. However for the purpose of this research the operational definition will be a scientific strategy put in place through the use of a computer to simply work or activities by designing, manipulating and programming a computer to meet the desired objectives of a person or a certain

entity. During 1990s any health system in Japan that was eager to adopt electronic medical records (EMRs) was given incentives by the Japanese government to encourage the efforts; this is according to a study which was conducted by Kuroda and others (Kuroda, Kashiwagi, Hayashi, Nakayama, Oda, Yamase, Nakaki, 2017). In a study which was done by USA department of health and human services it was realised that to boost the morale of the health workers; USA had to give rewards to health facilities that practiced EHRs (USA Department of Health and Human Services 2013).

In order to ensure uptake of computer utilization the national and state government in Australia allocated a lot of money in health information systems; this is according to a study done by Eley, Soar, Buikstra, Fallon, & Hegney (2013).

All these efforts by these governments were aimed at bringing uniformity and compatibility of health service delivery and all nurses should be able to embrace this development for them to stay relevant in the healthy delivery systems.

In Kenya utilization of computers is not a common practice in the nursing activities especially in the public health institutions though there is some evidence of utilization of computers in private (non- governmental) and few GOK facilities.

Nursing informatics in healthcare service delivery gives opportunity to the nurse-midwives to determine and do away with nursing practices that are not maximising on productivity and better patient care. Electronic records can be adopted from the normal paper recordings to coming up with clinical decision support systems, thus promoting health service to the recipient of care, leading to standardised care, acceleration of decision-making, which further promotes harmonization of actions (Seidlitz, Blatz, Jennings, La Rocca, 2013).

In a study conducted in Canadian hospitals, where triangulation paradigm methodology was applied it was shown that the use of IT, by means of palmtops, enhanced quality of life in Job places and care of patients, enabling the application of scientific evidence in patient care and nursing practice (Health Metrics Network, 2014)

## II. LITERATURE REVIEW

### 2.2 Nurse-midwives related factors on utilization of computer technology

#### 2.2.1. The resistance to change-attitude of nurse-midwives towards utilization of computer technology.

Worldwide studies have shown that Nurse-midwives' resistance to change to new information technology is expected; that was revealed in study done by Mehdi, Iahouei, Hassan Baba Mohhame on Nurses' attitudes towards the benefits of utilizing computer technology in Iran (Mehdi Kahouei, Hassan Baba Mohhamed, Hasamedin Askari majdadi 2014). A Module of Electronic Medical Record for Patient Care in Two University Hospitals of Iran they revealed that resistance to upcoming technology among Nurse-midwives is seen as a normal response. Determining the likely obstacles early enough can be utilized in coming up with methods that help in developing computer programme on Nurses' willingness to change (Mehdi et al, 2014). They concluded that to adopt a new technology, involvement of the users in the initial stages in order to get their opinions was of paramount importance. (Mehdi et al, 2014). Nursing informatics which is embedded in computer technology essentially dates back to the days of Florence Nightingale, who realised not only the importance of data and its relationship to patient outcomes and quality nursing care, but also how data could promote innovation in health service delivery (McBride, 2016). In the late 1980s it came into its own as a discipline of nursing that intended to address the better use of data and information for the improvement of patient care. (Weaver, Delaney, Weber and Carr RL Eds 2016). The Australian nursing body revealed that by 2017 more than 85% nurse-midwives utilized computer technology in their nursing practice (Australian Nursing Federation, 2017). Utilization of computer technology is not solely the province of informatics specialists, it is high time that all nurses embrace computer technology for better health care delivery and to be relevant to the current trends in healthcare demands. (Cooper, Hamer 2014). Evidence-based practice will become the order of the day in nursing practice and will replace the routine ways of doing things. In Africa a study which was done in Ebonyi state in Nigeria revealed that the introduction of new technology is affected by the response of the user of the technology which may be positive or negative. Many Nurse-midwives in Ebonyi state, like every other citizens, resisted the introduction of new technological developments because they felt it would jeopardise their job or profession (Wachter, 2016). It should be appreciated that new innovations and know how should be in line with imparting the right skills to the workers to apply the new innovations. Service providers believe that introduction of new technology is accompanied by new ways of

doing things and added reward and in the other hand any system that is bringing the new technology on board has high hopes that some staff will be rendered redundant which will lead to decreased operational costs. To reverse this trend therefore, there is need to train the nurse-midwives to cope with the change rather than declaring them redundant.

**2.2.3 Inadequate Trained Nurse-midwives on Computer technology**

All around the globe it has been found that the best way to motivate nurse-midwives to embrace utilization of computer technology is by imparting the right knowledge to the service provider through the formal channels and putting the knowledge acquired into practice (Lee, 2015). Studies have revealed that empowering nurse-midwives by providing the necessary logistics at their disposal enables them to put their knowledge in practice. (Tennet, Becker, & Kehoe. 2015).

In a study by Tennent and others (2015), they found that, there is need for nursing educators to be literate in utilization of computer technology for them to pass the same to their learners and instil confidence in them. (Tennent, Becker & Kehoe, 2015; Warren & Connors, 2017).

In Africa it is believed that literate work force in computer technology is very crucial in ensuring attainment of the required progress as far as computer technology is concerned. Currently the trained nursing informaticians are few and they are sporadically distributed (Hersh, Margolis, Quiros, Otero, 2013). In an e-Capacity meeting which was conducted in Bellagio in 2008 it was concluded that there was need to come up with a general model of empowering nurse-midwives in computer technology application to increase the number of trained workforce in computer technology. (The Rockefeller Foundation, 2013).

**III. MATERIALS AND METHODOLOGY**

**3.1 Research Design**

It was a cross-sectional descriptive study design which employed quantitative parameter which was done at Kwale County and specifically in Kinango sub county Hospital, Kwale sub county Hospital and Msambweni County referral hospital amongst nurse – midwives which aimed at establishing the determinants of computer technology utilization among nurse-midwives in nursing practice.

Equation;

$$n = \frac{N}{1+N(e)^2}$$

N was the sample size of my target population in the 3 hospitals which was 187 and was an equivalent to the number of Nurse-midwives in those Hospitals.

e was the level of precision at 95% confidence level e = 0.05

Where n was the sample size to be determined

$$n = 187/1+187(0.05)^2 = 127.42759 = 128$$

10% margin error 10% of 128 = 12.9 = 13

Sample size was 128 + 13 = 141

**3.9 Data Collection Tool**

A self-administered objective questionnaire was developed and used for the study. It was in English language as the service providers were conversant with that language and there was no need for translation to another language. The questionnaire included computer attitudes statements that were rated on a five-point Likert scale ranging from ‘1’ (Completely object) to ‘5’ (Completely concur). The scale was informed by published literature (Kaya N, 2014) and took the rural African settings into account. (Boonstra A, Broekhuis M. 2013) Among the computer attitudes statements some were negatively and others were positively phrased however to avoid prejudice when it came to giving response, the flow of the questions were framed in a random manner.

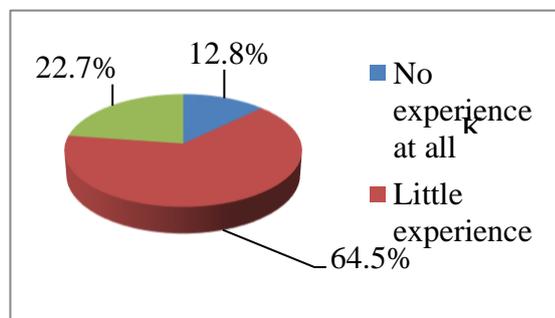
**3.13 Ethical Considerations**

Approval to conduct the study was obtained from Mount Kenya University Ethical Committee; further consent was sorted at, Kwale county ethics committee. Authority was also be sorted from (NACOSTI). The sole purpose of the research was to improve nursing practice and fulfillment of academic requirement thus the respondents were informed that there would be no payment for their participation and that was why it was conducted during their normal working hours. The participants’ were reassured that their dignity, anonymity was upheld and no names appeared on the questionnaires.

**IV. RESULTS AND DISCUSSION**

**4.4 :Determinants of Nurse- midwives related factors on utilization of computer technology**

**4.4.1 Knowledge and computer technology utilization**



**Figure 4. 1: Self-rating of computer knowledge by respondents**

Figure 4.4 above shows that 18 (12.8%) had no computer experience at all, 91(64.5%) had little experience and 32(22.7%) were experienced. Computer knowledge was cross-tabulated against utilization of computer technology.

**Table 4. 1: Association between knowledge and utilization of computer technology**

Count		What is your level of computer knowledge?		Total
		Experienced	Little or no experience	
Utilization	Utilization	27	36	63
vs non-utilization	Non-utilization	5	73	78
Total		32	109	141

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	26.388 <sup>a</sup>	1	.000		
Continuity Correction <sup>b</sup>	24.351	1	.000		
Likelihood Ratio	27.838	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	26.200	1	.000		
N of Valid Cases	141				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 14.30.  
b. Computed only for a 2x2 table

**Risk Estimate**

	Value	95% Confidence Interval	
		Lower	Upper
Odds Ratio for Utilization vs non-utilization (utilization / non-utilization)	10.950	3.892	30.806
For cohort What is your level of computer knowledge? = Experienced	6.686	2.733	16.356
For cohort What is your level of computer knowledge? = Little or no experience	.611	.489	.762
N of Valid Cases	141		

Table 4.18 above shows that the self-rated computer knowledge significantly influenced utilization of computer technology ( $\chi^2 (1, N=141) = 26.338, p < 0.001$ ) whereby, those who rated themselves as being experienced were 11 times likely to utilize computer technology.

This revelation tallies very well with a study which was conducted by Hersh et al, in Ghana which showed that experienced computer users who are best called Informaticians stand a better chance in application of computer technology utilization than those who have little knowledge in computer operations.(Hersh, Margolis, Quiros, Otero, 2013).

**4.4.2 Attitude and utilization of computer technology**

Respondents' attitudes towards computer technology, was assessed using a set of 10 likert form statements, against which they were to respond as follows: Completely Object (CO), Object (O), Whichever (W), Concur (C) or Completely Concur (CC). These responses were coded as 1,2,3,4 & 5 respectively to facilitate mathematical operations. Statements 3, 5, 7 & 9 were negatively phrased and were therefore reverse coded before analysis. Those who completely objected, objected or said "whichever," were considered as having a negative attitude, while those who concurred or completely concurred were considered to have a positive attitude.

This is illustrated below on page 60.

**Table 4. 2: Overall attitudes towards computer technology utilization**

Likert statement	CO (%)	O (%)	W (%)	C (%)	CC (%)
Computer training should be included in basic nursing training	5.7	2.1	2.1	34.8	55.3
Use of computers will make documentation easier for nurses	7.1	6.4	3.5	73	9.9
Use of IT in health care by nurses increase workload( <i>reverse-coded</i> )	10.6	22.7	3.5	42.6	20.6
Quality of health care will improve with computerization	7.1	5.7	6.4	43.3	37.6
Only computer department staff should be assigned to handle computers( <i>reverse-coded</i> )	2.1	15.6	5.7	39	37.6
Use of IT in nursing practice increases nursing professional status	6.4	12.1	3.5	43.3	34.8
Cost of computer use in nursing is too expensive( <i>reverse-coded</i> )	3.5	22.7	1.4	47.5	24.8
Nurses should be encouraged to specialize in computer studies	10.6	12.1	7.8	58.9	10.6
Computerizing nursing practice will alienate nurses from clients( <i>reverse-coded</i> )	6.4	10.6	2.1	53.9	27
Computer application knowledge should be a criteria in nurse promotion	27	29.1	7.1	24.8	12.1

Table 4.19 above shows that, over 50% of the responses either concurred or completely concurred, which was generally indicative of a positive attitude.

To determine the attitudes of individual respondents, the researcher computed a variable known as “attitude score”, by summing up all

the numerical codes assigned to the various responses. Those who scored at least 40 out of 50 were presumed to have a positive attitude, because, most of their responses must have been “concur” which had code 4(4×10=40). On the other hand, those who scored below 40 were presumed to have a negative attitude.

**Figure 4. 2: Respondents’ attitudes towards computer technology**

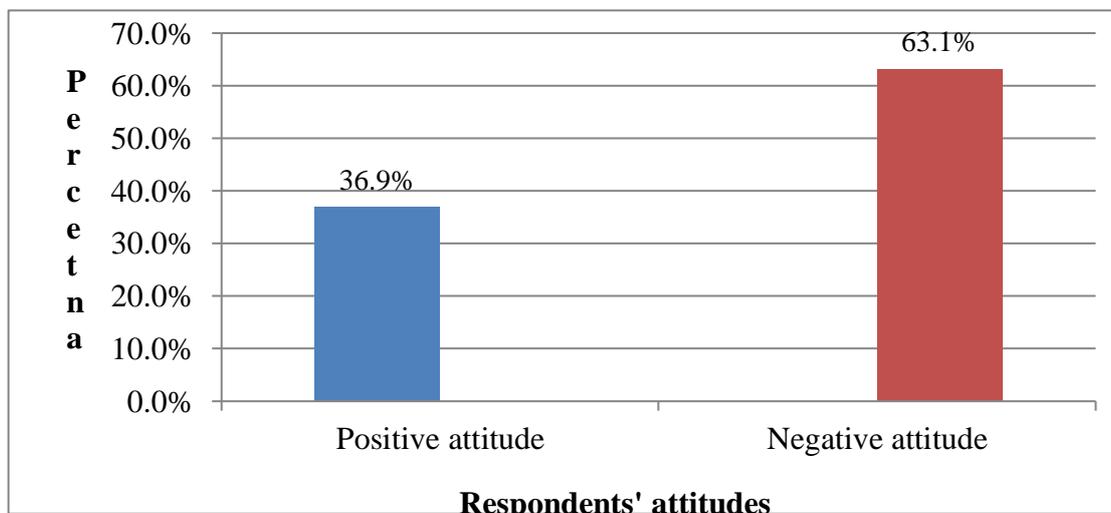


Figure 4.5 above shows that, 52(36.9%) of the respondents had a positive attitude, while majority of the respondents 89(63.1%) had a negative attitude towards computer technology. This demonstration agrees with a study conducted in Iran by Hassan Baba Mohhamed et al where they were investigating Nurses' attitudes towards the benefits of utilizing

computer technology in Iran, which showed that Nurse-midwives' resistance to change to new information technology is expected and negativity always outweighs positivity on the same but to them they described it as normal response (Hassan Baba Mohhamed, Hasamedin Askari majdadi 2014).

**Table 4. 3: Association between attitude and utilization of computer technology**

Count		Positive vs negative attitude		Total
		Positive attitude	Negative attitude	
Utilization vs non-utilization	Utilization	29	34	63
	Non-utilization	23	55	78
Total		52	89	141

**Chi-Square Tests**

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4.098 <sup>a</sup>	1	.043		
Continuity Correction <sup>b</sup>	3.418	1	.064		
Likelihood Ratio	4.097	1	.043		
Fisher's Exact Test				.054	.032
Linear-by-Linear Association	4.069	1	.044		
N of Valid Cases	141				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 23.23.

b. Computed only for a 2x2 table

**Risk Estimate**

	Value	95% Confidence Interval	
		Lower	Upper
Odds Ratio for Utilization vs non-utilization (utilization / non-utilization)	2.040	1.018	4.085
For cohort positive vs negative attitude = Positive attitude	1.561	1.010	2.412
For cohort positive vs negative attitude = Negative attitude	.765	.585	1.002
N of Valid Cases	141		

Table 4.20 above shows that, respondents' attitudes significantly influenced computer technology utilization ( $\chi^2$  (1, N=141) =4.098, p=0.043) whereby, those with positive attitude were 2 times likely to utilize computer technology. This scenario goes in line with a study which was done in Australian by Cooper

which demonstrated that nurses who had positive attitude towards emerging information technology had an uptake rate of 85% compared to those who had negative attitude. (Cooper, Hamer 2014).

Attitude score was correlated against utilization score which demonstrated a positive correlation

**Table 4. 4: Correlation between attitude and utilization of computer technology**

		Attitude score	Utilization score
Attitude score	Pearson Correlation	1	.272**
	Sig. (2-tailed)		.001
	N	141	141
Utilization score	Pearson Correlation	.272**	1
	Sig. (2-tailed)	.001	
	N	141	141

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Table 4.21 above shows that there was a significant positive relationship between

attitude scores and utilization scores (r (139) =.272, p=0.001)

**4.3.8 Previous computer training and utilization of computer technology**

Majority of the respondents i.e. 85(60.3%) had previous computer training while 56 (39.7%) had no previous computer training. This was

cross-tabulated against utilization and chi squared tests of associations were performed.

**Table 4. 5: Association between previous computer training and utilization of computer technology**

Count		Do you have previous computer training?		Total
		Yes	No	
Utilization vs non-utilization	Utilization	52	11	63
	Non-utilization	33	45	78
Total		85	56	141

**Chi-Square Tests**

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	23.561 <sup>a</sup>	1	.000		
Continuity Correction <sup>b</sup>	21.910	1	.000		
Likelihood Ratio	24.831	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	23.394	1	.000		
N of Valid Cases	141				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 25.02.

b. Computed only for a 2x2 table

**Risk Estimate**

	Value	95% Confidence Interval	
		Lower	Upper
Odds Ratio for Utilization vs non-utilization (utilization / non-utilization)	6.446	2.924	14.211
For cohort previous computer training = yes	1.951	1.470	2.589
For cohort previous computer training = no	.303	.171	.535
N of Valid Cases	141		

Table 4.15 on page 55 shows that previous computer training significantly affected computer technology utilization ( $\chi^2$  (1, N=141) =23561,  $p$ =<0.001) whereby, those who had previous computer training were 6.5 times likely to utilize computer technology.

After identifying the nurse-midwives related factors that were significantly associated with

utilization of computer technology (p values of <0.05), the researcher performed multiple regression analysis (binary logistic regression) to identify the nurse -midwives related factors that contributed significantly to the overall change in the dependent variable (utilization of technology). Variables were entered using forward selection method.

**Table 4. 6: Regression analysis of socio-demographic characteristics influencing computer technology utilization**

**Variables in the Equation**

	B	S.E.	Wald	Df	Sig.	Exp(B)	
Step 1 <sup>a</sup>	Training	1.864	.403	21.348	1	.000	6.446
	Constant	-2.318	.558	17.266	1	.000	.098
	Department collapsed	1.872	.719	6.770	1	.009	6.499
Step 2 <sup>b</sup>	Training	1.863	.419	19.783	1	.000	6.446
	Constant	-5.870	1.549	14.350	1	.000	.003
	Age collapsed	1.118	.495	5.102	1	.024	3.059
Step 3 <sup>c</sup>	Department collapsed	2.190	.754	8.437	1	.004	8.935
	Training	1.692	.430	15.509	1	.000	5.428
	Constant	-7.642	1.818	17.672	1	.000	.000

a. Variable(s) entered on step 1: training.

b. Variable(s) entered on step 2: department collapsed.

c. Variable(s) entered on step 3: age collapsed.

Table 4.17 above shows that, previous training (wald=15.509, df=1, p=<0.001, Exp (B)=5.428), departments that respondents were working in (wald=8.437, df=1, p=0.004, Exp (B)=8.94) and ages of the respondents (wald=5.102, df=1, p=0.024, Exp (B)=3.06) all contributed significantly to the overall change in the utilization of computer technology.

This demonstration in this study agrees in totality with the study which was done in Wales UK by Tennent et al, they found that, there is need for nursing educators to be literate in utilization of computer technology through proper training for them to pass the same to their learners and instil confidence in them. (Tennent, Becker & Kehoe, 2015; Warren & Connors, 2017).

## V. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

### 5.1 Summary of major findings

Focussing on impact of nurse- midwives related factors, majority 64.5% had little experience with regard to self-rated computer knowledge. Self-rated computer knowledge significantly affected utilization of computer technology ( $\chi^2$  (1, N=141) =26.338,  $p$ =<0.001). Most respondents 63.1% had a negative attitude towards computer technology. Attitude significantly influenced utilization of computer technology ( $\chi^2$  (1, N=141) =4.098,  $p$ =0.043). There was a significant positive correlation between attitude and utilization of computer technology ( $r$  (139) =.272,  $p$ =0.001)

### 5.2 Conclusions

1. Most of the nurse-midwives had negative attitude towards utilization of computer technology.
2. Majority of the nurse- midwives had little experience in computer operating skills
3. Nurse-midwives who had previous training in computer application skills demonstrated a better knowledge on computer operation skills.

### 5.3. Recommendations.

The researcher gave his recommendation as per his research objective

#### **To determine the impact nurse-midwives related factors in utilization of computer technology in Kwale County, Kenya.**

1. The County health committee in conjunction with Nurse Managers and supervisors should address the issue of negative attitude amongst the nurses through supportive supervision, provision of technical infrastructure and on job training.
2. The Kwale County Chief Nursing Officer (County Director of nursing services) should involve the Nurse Managers and supervisors in policy making at the higher level of management.
3. The Kwale County Chief Nursing Officer (County Director of Nursing services) through the Nurse managers/supervisors should take an initiative of passing the knowledge of computer technology utilization to their juniors through on job training and create room for them to train in computer applications.
4. Nurse Managers should encourage the nurse-midwives to undertake computer training to boost their knowledge in computer application skills.

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# Education of Children and Youth with Disabilities in the Ethiopian School System

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**Abstract-** The government of Ethiopia has been concerned to make education accessible for all irrespective of their disability, gender, language, socio-economic status, religion, and other differences. This concern is manifested through the moves and efforts made to realize the principle of education for all in the country. A major factor influencing the movement towards education for all in Ethiopia is the adoption of various international legal and policy frameworks, conventions, declarations, framework of actions, and forums. Following the adoptions of international treaties, education has been considered as a human right approach within the country's policy, strategy, program and plan documents. In those documents, due emphasis is given to the education of children and youth with disabilities with the intention of creating equal access. The focus of this study is to review extant literature and empirical studies accumulated in relation to the educational experiences of children and youth with disabilities in the Ethiopian school system. Its' intention is to identify existing practices and gaps in contributing to policy, practice, and research in the field. The study begins with an overview of policy framework documents of the country which ranges from 1994 to 2019. These include Constitution, Education and Training Policy, Higher Education Proclamation, Education Sector Development Programs, Growth and Transformation Plans, National Plan of Action of Persons with Disabilities, Master Plan for Inclusive Education, Education Statistics Annual Abstract, and allied strategies and guidelines. Then, different journal articles have been reviewed. All of these journal articles were conducted across pre-primary, primary, secondary and tertiary schools levels in Ethiopia. They mainly cover the period from 2009 to 2018 and were studied by employing both qualitative and quantitative methods. The articles have been accessed using various websites. The comprehensive analysis of this study showed that the government of Ethiopia has shown its willingness to create accessible education for all people in its pertinent documents; however, there is a huge gap between policies and their implementation. The study also proved that a number of variables deterred the promotion of access, equity, inclusion, and quality in the education system. Those variables include lack of adaptive educational materials, facilities, qualified teachers, flexible curriculum, awareness, collaborative effort, and commitment. Besides, it revealed that enrollment of children and youth with disabilities to schools was found extremely low. And, those few enrolled have been experiencing barriers in learning. Implication of this study

indicated that the practical realization of accessible inclusive school setting which accommodates all learners at all level of the education system is crucially essential. This necessitates the true implementation of policy frameworks into action.

**Index Terms-** Disability, Education, Learners with Disabilities, Inclusion

## I. INTRODUCTION

Children and youth with disabilities have traditionally been marginalized within or excluded from schools globally. Even though many of them were able to attend schools without any program modification; they may be educated in residential schools, separate classes, and/or regular classes with support service providers of special needs teachers because of their disabilities (Taylor, 2007). However, the adoption of United Nations Educational, Scientific and Cultural Organization (UNESCO), Salamanca Statement and Framework for Action on Special Needs Education in 1994 has resulted in inclusion of all children in educational settings becoming a primary service option throughout the world (Chireshe, 2013). With social justice at the forefront of educational agendas, the inclusion of all children in education has propelled a worldwide political and philosophical movement (Peebles & Mendaglio, 2014). This movement has been gradually building (Pantic & Florian, 2015) and its principle that has piqued the interest of educators, legislators and parents at the beginning, has now been placed firmly on the social change agenda in order to ensure participation of all regardless of the individual differences and to eliminate exclusion in the society (Cologon, 2013).

Nowadays, education systems are going through major reforms and changes in the developed and developing world towards inclusion of all in education (Malak, 2013). Many countries have become committed to recognize the learning needs of children and youth with disabilities within their education systems (Suleymanov, 2015). Over a period of time, therefore, the number of children with diverse unique needs, particularly children and youth with disabilities who are included and being educated in regular classrooms is significantly increasing in several countries (Pantic & Florian, 2015; Adoyo & Odeny, 2015).

In alignment with the international world, the government of Ethiopia has been developed and adopted legal and policies frameworks, which strongly support the education of all regardless of their disability, gender, language, socio-economic status, religion, and other differences (Ministry of Education [MoE], 2017a; MoE, 2015a; MoE, 2012a; MoE, 2010; MoE, 2006; MoE, 1994). This indicated that the country has been working for the realization of the right to education. As the government of Ethiopia strive to ensure inclusive and equitable quality education and lifelong learning opportunities for all (MoE, 2017a), it is important to study whether the learning needs of children and youth with disabilities are addressed in the school system of the country and they are benefited from the education sector or not.

The overall objective of this study is, therefore, to investigate the educational experiences of children and youth with disabilities in the Ethiopian school system. In particular, it tries to identify:

- Existing practices and opportunities in place for the learning of children and youth with disabilities
- Major gaps and factors that hinder the involvement and achievement of children and youth with disabilities from schooling

Hence, this study is anticipated to be significant to schools, individuals, stakeholders, organizations, institutions, and government in Ethiopia and elsewhere with respect to policy, practice and research in the field. Also, the implications derived from this study could serve as inputs to make informed decisions in reforming schooling practice for children and youth with disabilities.

## II. METHODOLOGY

Systematic review of extant literature and empirical studies accumulated in relation to the educational experiences of children and youth with disabilities in the Ethiopian school system was conducted. Accordingly, relevant legal and policy framework documents of the country have been assessed. The documents are range from the year 1994 to 2019. These are Education Statistics Annual Abstract (MoE, 2019), Master Plan for Inclusive Education (MoE, 2017a), General Education Quality Improvement Program (World Bank, 2017); Growth and Transformation Plan II (National Planning Commission, 2016); Education Sector Development Program V (MoE, 2015a); Guideline for Establishing and Managing Inclusive Education Resource Centers (MoE, 2015b); National Plan of Action of Persons with Disabilities (Ministry of Labor and Social Affairs, 2012); Special Needs/Inclusive Education Strategy (MoE, 2012a); National School Health and Nutrition Strategy (MoE, 2012b); Special Needs Education Guide for Technical and Vocational Education and Training (MoE, 2012c); National Policy Framework for Early Childhood Care and Education in Ethiopia (Ministry of Education, Ministry of Health & Ministry of Women's Affairs, 2010); Growth and Transformation Plan I (Ministry of Finance and Economic

Development, 2010); Education Sector Development Program IV (MoE, 2010); Higher Education Proclamation (FDRE, 2009); Education Sector Development Program III (MoE, 2005); Special Needs Education Program Strategy (MoE, 2006); Constitution (FDRE, 1995); and Education and Training Policy (MoE, 1994).

Furthermore, 14 journal articles have been reviewed in this study, all regarding the educational experiences of children and youth with disabilities. These journal articles were conducted across pre-primary, primary, secondary and tertiary school levels of the Ethiopian school context. They mainly cover the period from 2009 to 2018 and were studied by employing both qualitative and quantitative methods. Almost the scopes of all the journal articles were schools in different regions of the country which are included children and youth with disabilities. The journal articles result reflects more on barriers and gaps that need to be addressed. Twelve journal article authors' were based in Ethiopia, while the remaining 2 were co-authored by Ethiopian and non-Ethiopians who reside inside the country and abroad. With the exception of 1 journal article published locally, the rest of them were published in foreign-based professional journals. The articles have been accessed using various websites and were selected based on their congruence with the objective of this study. They were compiled from International Journal of Special Education; International Journal of Physical Education, Sports and Health; International Journal of Scientific and Research Publications; International Journal of Early Childhood Special Education; Journal of Education and Practice; Journal of Teacher Education and Educators; American Journal of Sports Science; Asian Journal of Humanity, Art and Literature; Global Journal of Human Social Science; International Journal of Child, Youth and Family Studies; The Ethiopian Journal of Education; Research in Pedagogy; and Sociology and Anthropology.

### 1. LEGAL AND POLICY FRAMEWORKS RELATED TO EDUCATION OF CHILDREN AND YOUTH WITH DISABILITIES

The government of Ethiopia has been committed to creating equal educational opportunities for all following the philosophy of inclusive education. This commitment is manifested in ratifying and adapting various international legal and policy frameworks, conventions, declarations, framework of actions, and forums in relation to inclusive education. These include, for example, the Universal Declaration of Human Rights (1948); the Declaration on the Rights of Disabled Persons (1975); the Standard Rules on the Equalization of Opportunities for Person with Disabilities (1983); the Convention on the Rights of the Child (1989); the World Declaration on Education For All (1990); the Salamanca Statement and Framework for Action on Special Needs Education (1994); the World Education Forum (2000); the Convention on the Rights of Persons with Disabilities (2006); the Millennium Development Goals (2000); and the Sustainable Development Goals (2015). Thus, these

international treaties influenced the country to recognize education as a fundamental human right that should be accessible to all citizens.

Moreover, the country's policy, strategy, program and plan documents (MoE, 2017a; MoE, 2015a; MoE, 2012a; MoE, 2010; MoE, 2006; MoE, 1994) considered human right approach to education. Consequently, inclusion of all, particularly the inclusion of children and youth with disabilities to education is vividly articulated in the legal and policy framework documents of the country. The following presents this fact.

### 1.1. Constitution

The Constitution of the Federal Democratic Republic of Ethiopia (FDRE) is a supreme law of the country. It declared that all international agreements ratified by the country are an integral part of the law of the land. All legislative, executive and judicial organs have the responsibility to respect and enforce the law in conformity with human rights considerations. The Constitution clearly ensured the right to equal access to publicly funded social services including the education sector. Also, it affirmed that the State has the obligation to allocate ever-increasing resources to provide education and other social services for people with disabilities, orphan children, and the aged (FDRE, 1995).

Hence, the Ethiopian Constitution mandated the universal right to education and the availability of equal educational access for all people. Also, it strongly agreed on the idea of ensuring equity in the education system and the commitment of support provision to accommodate the needs of children and youth with disabilities. Since Ethiopia has ratified numerous international and regional treaties, education has been considered as a human right approach within the country's policy, strategy, program, and plan documents.

### 1.2. Policy

The Education and Training Policy of Ethiopia forwarded the highest and general policy direction of the education sector. It stipulated the expansion of basic education and training for all people; and the development of physical and mental potential and problem-solving capacity of individuals including children and youth with disabilities in accordance with their potential needs. The policy has shown its commitment to address the needs of all children by appreciating diversity. It also confirmed that special education and training will be provided for children and youth with disabilities. Besides, it emphasized the importance of the preparation and utilization of support inputs for special needs education (MoE, 1994).

In general, the Education and Training Policy has laid the ground for the development of the education sector in the country as a whole. In particular, it recognized that the realization of basic education is both a necessity and a fundamental human right for all. In addition, it addressed on

expanding access to educational opportunities, and it recognized the right of children and youth with disabilities and gifted learners to education so as to enable them based on their learning pace.

### 1.3. Proclamation

Since the stage of development of the country's higher education required legal direction and guidance to enable it to become efficacious to ensure and promote its positive contributions through relevant and quality education; the government of Ethiopia has declared Higher Education Proclamation No. 650/2009. This proclamation indicated necessary and feasible academic assistance and guidance to be provided for all learners. Also, it assured that support through sign language, amenable facilities and programs, relocated classes and accessible environments, alternative testing procedures, and educational auxiliary aids shall be provided to the learners with disabilities (FDRE, 2009). Hence, the Proclamation has considered the needs and learning interests of all learners at the higher education instruction level.

### 1.4. Programs

The Government of Ethiopia embarked in 1997 on a 20-year program of education reform called 'Education Sector Development Programme (ESDP)'. Due attention was given to the expansion of educational opportunities for children and youth with disabilities from ESDP III (2005/06–2010/11). ESDP III emphasized the expansion of educational opportunities for children and youth with disabilities in order to achieve the Education For All goals. It considered special needs education as a cross-cutting issue in the education system. It also focused on the need for special needs education to be included in planning, budgeting and reporting from federal to school level (MoE, 2005). Hence, ESDP III has created a way for the start of the inclusion of all children in the education system.

ESDP IV (2010/11–2014/15) clearly indicated special needs education as providing services for the individual child; and inclusive education as a change of the whole system and of the school environment to the need of the individual child. It focused on enhancing the number of special needs educators; increasing enrollment of learners with disabilities; and improving the institutional capacity of schools in addressing the academic and social needs of the learners (MoE, 2010). ESDP IV, therefore, contributed its share to ensure access and quality education for children and youth with disabilities.

ESDP V (2015/16–2019/20) ensured that special needs and inclusive education will be fully mainstreamed under cross-cutting issues within the priority programs to ensure joint responsibility of all implementing bodies. It assigned a priority equal opportunities and participation for all children with special attention to disadvantaged groups; and the delivery of quality education that meets the diverse learning needs of all children, youth and adults. It also stated clear targets to the

establishment of special needs and inclusive education support systems to include children and youth with disabilities (MoE, 2015a). This indicates that ESDP V directs implementation and development towards inclusive education for all people.

Since 2009, the government of Ethiopia has started designing and implementing a program called “General Education Quality Improvement Program” in collaboration with multiple donors to strengthen the education system and to realize it for all people. Particularly, the 2017–2022 General Education Quality Improvement Program introduced equity as one of its main result areas. The equity result area aimed to move more holistic and programmatic planning and implementation of inclusive education across the country. The program envisaged supporting the creation of adequate learning conditions for all learners through allocating school grants for the establishment of inclusive education resource centers in the country. The allocated grants have planned to be used to organize awareness-raising and training events; purchase reference materials on special needs, equipment for assessing needs, and educational resources for children with special needs; and ensure accessible learning environment (World Bank, 2017). So, this program targeted to reduce barriers in schools and to create a welcoming school environment for the benefit of children and youth with disabilities.

#### 1.5. Plans

There are a number of plans in Ethiopia which are designed by the government to support the education sector. For example, Growth and Transformation Plan I (2010/11–2014/15) is a national five-year developmental plan which was designed to improve the country's economic well-being and work towards eradicating poverty. This plan intended to ensure the quality of education and achieve Millennium Development Goals in the social sectors. It placed an important priority on the quality, equity, and efficiency of education at all levels. Also, it clearly stated that an education strategy would be implemented to meet the learning needs of children and youth with disabilities (Ministry of Finance and Economic Development, 2010). Growth and Transformation Plan II (2015/16–2019/20) is a continued plan of I. The plan has aimed to give special attention and assistance to children and youth with disabilities to help them start and continue schooling. Its goal is to take measures to minimize barriers to the movement of children and youth with disabilities at schools (National planning Commission, 2016). Hence, the Growth and Transformation Plans have dedicated to transforming the education sector as one of the directions, and this implies that children and youth with disabilities considered to be benefited.

Also, the National Plan of Action of Persons with Disabilities (2012–2021) has designed to create an inclusive Ethiopian society in which people with disabilities are accepted, valued, recognized, and protected. It addressed the needs of people with disabilities in the country for a comprehensive rehabilitation services, equal opportunities for education, skills training and work, and full participation in the life of their

families, communities and the nation. In particular, it focused on how to provide the best possible education and vocational skills training available to children and youth with disabilities (Ministry of Labour and Social Affairs, 2012). It is clear that the plan has shown its intention noticeably to avoid discrimination from education.

In 2016, the Ministry of Education of Ethiopia has introduced a ten years plan called “Master Plan for Special Needs Education/Inclusive Education in Ethiopia (2016–2025)”. The plan is a complete policy to guide the provision of special needs and inclusive education. It aimed to give more visibility to special needs and inclusive education; and strengthen the structures and environment enabling inclusive education. It is built on six major strategic pillars which form the basis for inclusive education until 2025 in the country (MoE, 2017a). The preparation of this plan indicates the commitment of the country for the move towards the development of inclusive education to actualize lifelong learning opportunities for all.

#### 1.6. Strategies

Although the special needs education program has been tried to be implemented in Ethiopia until 2005, it was conducted in a fragmented and arbitrary manner. This was primarily due to the absence of a nationally governing strategy for the program. By way of addressing this problem, the Ministry of Education of Ethiopia has been launched the first Special Needs Education Program Strategy in 2006 based on the country's Constitution and Education and Training Policy (MoE, 2012a). The strategy was focused on the promotion of inclusive education to meet the Millennium Development and Education For All goals. Also, it was aimed at an education system open to all children; and stated that all children can learn and many of them needed some form of support in learning (MoE, 2006). Hence, this strategy clearly indicated the future directions of special needs education in Ethiopia, which have been targeted until 2011. Besides, the strategy triggered major development of special needs education in the country.

In 2012 another strategy document called “Special Needs/Inclusive Education Strategy” has been introduced in the country that encompassed more on the philosophy of inclusive education. This strategy acknowledged education as a human right, accepted in the principle of Universal Primary Education and Education For All goals by 2015 to which Ethiopia was committed. Its overall objective was to build an inclusive education system that would provide quality, relevant and equitable education and training to all children, youth and adults with special needs and ultimately enable them to fully participate in the socio-economic development of the country (MoE, 2012a). This strategy has been instrumental in mainstreaming inclusive education issues at all levels of the education system.

In the same year, the Ministry of Education of Ethiopia has introduced a new strategy document called “National School Health and Nutrition Strategy”. It recognized that all children

have a right to education. It stated that systems shall be put in place to provide a conducive, fully accessible, and inclusive environment for all children. Appropriate mechanisms shall be put in place for ensuring the safety and security of physically and mentally ill children; and teachers shall receive adequate training and acquire skills (MoE, 2012b). The document comprised ideal strategies to provide support for children and youth with disabilities in education.

### 1.7. Guidelines and frameworks

A lot of guidelines and framework documents have been prepared by the government of Ethiopia to realize the issue of education for all people. For instance, in 2010, the National Policy Framework for Early Childhood Care and Education has been launched. Its intention is to ensure and safeguard the rights and welfare of all children. Also, it aimed at promotion and support development of accessible, equitable, and quality educational services for all children particularly for children and youth with disabilities, vulnerable and marginalized people (Ministry of Education, Ministry of Health & Ministry of Women’s Affairs, 2010). In the same year, Special Needs Education Guide for Technical and Vocational Education and Training has been introduced. It focused to enhance the development of inclusive education in technical and vocational education and training institutions. And, it showed an effort to translate into practice of the human right aspects and improvement of education and training (MoE, 2012c). Moreover, in 2015, Guideline for Establishing and Managing Inclusive Education Resource Centers has been commenced. Its goal is to establish and manage functional inclusive education resource centers across the country so as to give support for children and youth with disabilities to increase

access for them and reduce dropout and repetition rates (MoE, 2015b). All the above guidelines and framework documents have highly concerned about the expansion of educational opportunities for all learners in the education system.

## 2. ENROLMENT OF CHILDREN AND YOUTH WITH DISABILITIES

Though the government of Ethiopia shows commitment to inclusion of all people to education, ensuring enrolment of children and youth with disabilities is a big question for the education sector so far. It is clear that actualizing inclusive education should not be limited to establishing legal and policy frameworks alone rather it requires strong commitment and action. In Ethiopia, however, the enrolment of children and youth with disabilities to school is enormously low (Fantahun, 2018). This is because of legal and policy frameworks’ implementation gaps (Dano, 2018; Malle, Pirttimaa & Saloviita, 2015) and school-related barriers (Temesgen, 2018b; Kassaw, Abir, Ejigu & Mesfin, 2017). Also, there are lots of misconceptions about disability in the families and communities that keep children and youth with disabilities away from schools (Tefera, Admas & Mulatie, 2015). In addition to the reviewed journal articles, recently (October 2019) published Education Statistics Annual Abstract of Ethiopia confirmed that the majority of school-age children with disabilities are left behind from the education service (MoE, 2019). The following table clearly shows this fact.

Table 1: Enrolment of school-age children with disabilities in 2019

School Level	Population of school-age children with disabilities			Age	Enrolment of school-age children with disabilities			Gross enrolment ratio (%) of school-age children with disabilities		
	Male	Female	Total		Male	Female	Total	Male	Female	Total
Pre-primary	600,546	583,728	1,184,274	4-6	9,081	6,863	15,944	1.5	1.2	1.3
Primary (Grade 1-8)	1,453,828	1,419,780	2,873,608	7-14	178,535	137,736	316,271	12.3	9.7	11.0
Secondary (Grade, 9-12)	669,263	651,631	1,320,894	15-18	21,545	15,923	37,468	3.2	2.4	2.8

### 2.1. Pre-primary level

According to the Education Statistics Annual Abstract, the population of school-age children with disabilities of 4 to 6 year-olds is 1,184,274 (600,546 male and 583,728 female). Out of them, 15,944 (9,081 male and 6,863 female) are being enrolled in the pre-primary school level. The gross enrolment ratio is 1.3% (1.5% male and 1.2% female). This indicates that 98.7% (98.5% male and 98.8% female) of school-age children with disabilities are out of pre-primary school.

### 2.2. Primary level

The Education Statistics Annual Abstract showed that the population of school-age children with disabilities of 7 to 14 year-olds is 2,873,608 (1,453,828 male and 1,419,780 female). Out of them, 316,271 (178,535 male and 137,736 female) are being enrolled at the primary school level. The gross enrolment ratio is 11.0% (12.3% male and 9.7% female). Hence, this confirms that 89.0% (87.7% male and 90.3% female) of school-age children with disabilities are out of primary school.

### 2.3. Secondary level

Based on the Education Statistics Annual Abstract, the population of school-age children with disabilities of 15 to 18 year-olds is 1,320,894 (669,263 male and 651,631 female). Out of them, 37,468 (21,545 male and 15,923 female) are being enrolled at the secondary school level. The gross enrolment ratio is 2.8% (3.2% male and 2.4% female). This proves that 97.2% (96.8% male and 97.6% female) of school-age children with disabilities are out of secondary school.

### 2.4. Tertiary level

These days, the number of higher education institutions is being increased in Ethiopia. Consequently, the enrolment of students is also increasing from time to time. Nevertheless, study results revealed that the number of learners with disabilities in the higher education institutions level is still very low (Temesgen, 2018b; Zelelew, 2018). Those who joined have experienced challenges of different types ranging from academic to social (Mulugeta & Mekuriaw, 2017; Malle, Pirttimaa & Saloviita, 2015). At the national level, there is no exact and clear data that show the enrolment of learners with disabilities at technical and vocational education and training institutions and universities level.

## 3. IDENTIFICATION AND ASSESSMENT OF CHILDREN AND YOUTH WITH DISABILITIES

It is understandable that prior to educational support provision, identification and assessment should take place for learners. For this reason, there is a need for a valid and reliable tool. In the Ethiopian school system, there are an assessment and support toolkits prepared for learners with special educational needs at pre-primary and primary level. The purpose of these toolkits is to empower teachers in identifying learners' strengths and learning needs so that learners with special needs get the opportunity for appropriate education and become successful. Overall, the toolkits premeditated to contribute to high-quality educational provision, increase attendance and participation, and decrease dropout and repetition of learners with special needs in education (MoE, 2017b; MoE, 2017c).

In Ethiopia, however, schools have a lack of ability in identifying and assessing learners with disabilities for educational support (Hankebo, 2018). There is no multidisciplinary team organized for this purpose at the school level (Mitiku, Alemu & Mengsitu, 2014). There are no process engaged identifications and special assessment procedures for learners with disabilities (Tefera, Admas & Mulatie, 2015). In general, there is no comprehensive assessment trend to address the needs, identify the abilities, and design educational support procedures (Admas, 2009). Most of the time, simple disability-related observation used to identify learners at schools (MoE, 2017a). Hence, learners with disabilities cannot be recognized and supported as per their learning needs properly by their teachers.

## 4. THE PRACTICE OF SCHOOLING FOR CHILDREN AND YOUTH WITH DISABILITIES

In the Ethiopian school system, there are three types of schooling practices for children and youth with disabilities. These are special schools, special units, and regular schools. Special schools are schools specialized in one particular type of disability and most of the time they provide educational service for a similar group of learners with disabilities at primary school level. These schools are called special schools for the blind and special schools for the deaf (MoE, 2017a). These schools admit a little number of children and youth with disabilities because the number of schools is very limited in the country. Usually, children and youth with disabilities who have got a chance to be admitted to these schools obliged to leave their parents and villages because the schools are based in a few towns. The schools admit children and youth with disabilities in the form of boarding or non-boarding. Study result shows that special schools in Ethiopia are often overcrowded, ill-equipped with insufficient human and material resources, and generally concentrated in urban areas (Tefera, Admas & Mulatie, 2015).

The other schooling practice for children and youth with disabilities in Ethiopia is special units. These units are attached to regular primary schools, and few classrooms or blocks are reserved for learners with disabilities. Most of the time, some students with severe physical disability, intellectual disability, deaf-blindness, autism spectrum disorder, and others are considered for educational intervention (MoE, 2017a). Though special units are found in regular primary schools, all of the regular primary schools in the country do not contain special units. As a result, the number of special units is limited. Study result reveals that learners with disabilities have been experiencing segregation in the special units. Also, they are not benefited well from the education system because of school-related and attitudinal barriers (Temesgen, Z, 2018b).

Regular schools are also other types of schooling practices for children and youth with disabilities focus at pre-primary, primary, and secondary levels. In these schools learners with and without disabilities learn together in the same classrooms (MoE, 2017a). Even though regular schools are numerous in the country, study results indicate that the majority of them do not provide appropriate educational support that suites the learning pace and ability of learners with disabilities. Consequently, a lot of learners with disabilities have been experiencing barriers in learning (Mulugeta & Mekuriaw, 2017; Mitiku, Alemu & Mengsitu, 2014).

On the other hand, in order to enhance the capacity of the schools in addressing the needs of learners with disabilities, the Ministry of Education has recognized that schools should be equipped with specific educational materials and assistive devices, as well as staffed with professionals. This schools' capacity building activity called establishing an inclusive education resource center (MoE, 2012a). Accordingly, these

schools are expected to offer educational opportunities and support for learners with disabilities to reach their full academic potential and to develop into independent citizens, valued in their communities. Besides, the schools are anticipated to support learners with disabilities to get into, stay and achieve successfully (MoE, 2015b). A study result which conducted by the Ministry of Education shows that schools those who considered establishing inclusive education resource centers in their compound have been practicing inclusion of learners with disabilities better than other schools that do not establish (MoE, 2017d).

## 5. PROMISING PROGRESS RELATED WITH THE EDUCATION OF CHILDREN AND YOUTH WITH DISABILITIES

Since the education system is going through major reforms in the world towards the inclusion of all, achievements are also expected with regard to the education of children and youth with disabilities. In Ethiopia, there is some promising progress in the school system albeit it is going very slow. Schools have little opportunities and these opportunities did not pave the way to effectively succeed the education of children and youth with disabilities (Mitiku, Alemu & Mengsitu, 2014). Consequently, achievements have been limited (Tefera, Admas & Mulatie, 2015). The result of majorities of the reviewed journal articles in this study have noticeably showed barriers rather than achievements in relation to the education children and youth with disabilities (Dano, 2018; Zelelew, 2018; Temesgen, 2018a; Temesgen, 2018b; Tefera, Schippers, Engen & Klink, 2018; Hankebo, 2018; Bekele, 2017; Mulugeta & Mekuriaw, 2017; Kassaw, Abir, Ejigu & Mesfin, 2017; Malle, Pirttimaa & Saloviita, 2015). Though this is the actual fact the following points could be mentioned as promising progress.

### 5.1. Promoting various legal and policy frameworks

The government of Ethiopia has been committed to realize education for all since education is a universally recognized fundamental human right. In view of this fact, the Ethiopian Constitution accepts the international conventions, declarations, framework of actions, forums, statements, and resolutions; and declares education as a human right. Also, legally, the country has shown commitment to the Millennium Development Goals, Education For All Goals, and Sustainable Development Goals (Tefera, Admas & Mulatie, 2015). The national policy, strategy, program, and plan documents vividly articulated the inclusion of all to education; and clearly accentuated to learn in accordance with their full potentials and needs (Zelelew, 2018; Mitiku, Alemu & Mengsitu, 2014). Hence, the legal and policy frameworks and all the prevailing efforts arising from them have attributed to equal educational opportunities for all with emphasizing to children and youth with disabilities, even though their effective implementation is another issue.

### 5.2. Mainstreaming issues related to inclusive education in school improvement programs

As educating children and youth with disabilities requires reforming the schools' environment, inclusive education related issues have been mainstreaming in school improvement programs in the Ethiopian school system. For instance, inclusive education resource centers are being established at schools level (Hankebo, 2018); support directions for children and youth with disabilities are being included in the schools plans (Zelelew, 2018; Kassaw, Abir, Ejigu & Mesfin, 2017); and some capacity building programs aimed at addressing the issue of inclusion are being provided for school communities (Dano, 2018; Admas, 2009). Besides, a more recent approach to the education of children and youth with disabilities that increasingly made its appearance in the stock of educational vocabulary in the country is the term inclusive education (Tefera, Admas & Mulatie, 2015).

### 5.3. Encouraging children and youth with disabilities to learn

Inclusion of all to education relies on widespread acceptance of the rights of children and youth with disabilities to be educated in regular classrooms and to receive equitable support services. This approach is being practiced in the Ethiopian school system although the pace is slow. For example, tutorial classes have been organized (Hankebo, 2018); guidance and counseling services have been given (Zelelew, 2018); and teachers' approach and interaction in the classrooms have been stimulating for children and youth with disabilities (Dano, 2018). Furthermore, schools have been networked with non-governmental organizations and educational stakeholders to meet the learning needs of children and youth with disabilities (Fantahun, 2018).

## 6. CHALLENGES HINDER EDUCATION OF CHILDREN AND YOUTH WITH DISABILITIES

Even though the government of Ethiopia has shown its commitment to making education accessible for all citizens in its legal, policy, strategy, program and plan documents; there is still a huge gap in terms of actualizing into reality. All of the reviewed journal articles result indicated that a number of variables deterred promotion of access, equity, inclusion, and quality in the education system. Those variables include lack of adaptive educational materials, facilities, qualified teachers, flexible curriculum, awareness, collaborative effort, and commitment. Hence, the variables limit the full participation of children and youth with disabilities in pre-primary, primary, secondary, and tertiary schools.

### 6.1. Lack of adaptive educational materials

Successful inclusion of children and youth with disabilities depends on the availability of adequate teaching-learning materials at the school level. However, in Ethiopia lack of adaptive educational materials are among the frontiers of the challenge to include and provide educational support for

learners with disabilities. For instance, textbooks and reference materials are not available in Braille (Tefera, Admas & Mulatie, 2015). Wheelchair, crutches, slates, stylus, cane, tape/voice recorder, hearing aid, and related assistive devices are not adequate at schools (Tefera, Schippers, Engen & Klink, 2018; Mitiku, Alemu & Mengsitu, 2014). Computer-supported learning materials are not obtainable (Hankebo, 2018). Classrooms are not aesthetically pleasing and materials in the classrooms are not arranged to meet the learning needs of the learners (Dano, 2018). Also, there is a shortage of sport equipment and those few available are highly uncomfortable. So, learners with disabilities are almost out of physical education practical classes (Bekele, 2017; Kassaw, Abir, Ejigu & Mesfin, 2017). In addition, the non-availability of adaptive training technology and machinery limited the participation of learners with disabilities in technical and vocational education and training (Malle, Pirttimaa & Saloviita, 2015).

### 6.2. Lack of facilities and friendly school environment

In Ethiopia, the lack of accessible facilities and a friendly school environment has affected the participation and achievement of children and youth with disabilities in education. The majority of pre-primary, primary, secondary and tertiary schools are poorly designed and not well equipped to meet the learning needs of all learners (Bekele, 2017; Mitiku, Alemu & Mengsitu, 2014). The outdoor and indoor environments of schools are not conducive and friendly enough (Dano, 2018). Facilities such as modified toilets, modified seats, adequate space for wheelchairs, ramps, signage, water supply, and playgrounds are inaccessible (Tefera, Admas & Mulatie, 2015). Most pathways are cliffy, ridge, and sloppy (Temesgen, 2018b). Classrooms are narrow with a high number of learners (Fentahun, 2018) and with a lack of adequate light (Hankebo, 2018). Hence, this has a significant impact to accommodate and benefit all learners in the teaching-learning process.

### 6.3. Insufficient qualified teachers

Though teachers are considered the primary recourses in supporting inclusion of all learners in the classroom activities, they have found it difficult to accommodate and support the learners' needs because of their inadequate preparation in pre-service and/or in-service programs. Some of the pedagogical challenges facing teachers who are teaching within the regular classrooms are, for instance, they have no adequate knowledge and skills to make teaching individualized and interesting (Hankebo, 2018). They dominantly use rigid lesson plans and teaching methods; rigid curricula and inappropriate teaching strategies; and teacher-centered classroom methods. As a result, individualized teaching is not in the picture at all (Tefera, Admas & Mulatie, 2015). Besides, they have no trends and practices to prepare to individualize educational plans for learners with special educational needs, and also, they have no consideration of differentiated educational support for the learners' needs (Mitiku, Alemu, & Mengsitu, 2014). Physical education teachers do not give much attention

to explaining and demonstrating practical activities for learners with different disabilities (Kassaw, Abir, Ejigu, & Mesfin, 2017). Furthermore, there is an extreme shortage of special educators and assistance professionals in pre-primary, primary and secondary schools (Dano, 2018; Temesgen, 2018a).

### 6.4. Lack of flexible curriculum

Even though the curriculum must take into consideration the need and different abilities of all learners, the teaching-learning process is characterized by a highly rigid curriculum in Ethiopia. Because of its rigidity nature, teachers have difficulty to modify it (Mitiku, Alemu, & Mengsitu, 2014). For example, lack of adjustment and adaptation to instructional strategies and assessment are found to be a major challenge for teachers in regular classrooms (Zezelew, 2018:7). Consequently, it has become very challenging for teachers to welcome and to accommodate all learners in accordance with their learning potential and need (Dano, 2018). Hence, the rigidity of the school curriculum is one of the main factors that have hamstrung the learners' progress in learning (Zezelew, 2018).

### 6.5. Lack of awareness

One of the determinant factors that affect the inclusion of learners with disabilities in Ethiopian schools is a lack of awareness of the school community towards disability and inclusion. The majority of the pre-primary, primary, secondary and tertiary school teachers and principals lack awareness and competence in how to deal with instruction of learners with disabilities (Mulugeta & Mekuriaw, 2017; Mitiku, Alemu & Mengsitu, 2014; Admas, 2009). The attitude of the schools' community is not changed about the education of learners with disabilities resulted in the negative expectations of parents, teachers, and their peers about the benefit and academic achievement they can gain from education (Hankebo, 2018). Also, the existing understanding and reaction of university instructors' towards the inclusion of learners with disabilities are informed by the philosophy of the medical model rather than the social model of disability (Zezelew, 2018). In general, the effort made to create positive attitude on the education of children and youth with disabilities is so limited that widespread misconceptions are still prevalent at all educational levels, among stakeholders and the society at large (Temesgen, 2018a; Temesgen, 2018b; Tefera, Admas & Mulatie, 2015).

### 6.6. Lack of collaboration

In order to include children and youth with disabilities and make them benefited from education, collaborative effort among educational stakeholders is one of the essential actions. Nevertheless, lack of collaboration among stakeholders in education, such as teachers, school administrators and community members as a whole obstructed the inclusion of learners with disabilities in the system, in Ethiopia (Temesgen,

2018b). Schools do not organize and coordinate for the education of all children in synergic a manner that makes inclusion successful. Also, there is an absence of school nurses, therapists, counselors, and well trained special needs educators specific to different disability areas (Hankebo, 2018). Moreover, schools and the local community come together rarely to discuss issues of learners with disabilities. The Education and training board at the district administration level seems to ignore the issue of learners with disabilities (Dano, 2018).

#### 6.7. Lack of commitment

It is true that the inclusion of all children to school is not a soft process and requires a commitment to overcome different barriers that hinder its effectiveness. However, the lack of commitment by the implementers is one of the challenges in Ethiopia (Hankebo, 2018). School leaders, teachers, parents, and other school communities do not show a strong commitment to the effective inclusion of children and youth with disabilities (Mitiku, Alemu & Mengsitu, 2014). This is manifested in their reluctance to create an accessible and friendly school environment that can accommodate the needs of these learners (Kassaw, Abir, Ejigu & Mesfin, 2017). Taken as a whole, it is revealed in their disinclination to mainstream the issue of inclusion, participation, and achievement of all children in their school yearly plans (Bekele, 2017; Malle, Pirttimaa & Saloviita, 2015).

### III. CONCLUSION

The objective of this study is to investigate the educational experiences of children and youth with disabilities in the Ethiopian school system. The comprehensive analysis of extant literature and empirical studies revealed that the government of Ethiopia has shown its willingness to create accessible education for all by ratifying various international legal and policy frameworks, conventions, declarations, framework of actions, and forums. In line with the international treaties, inclusion of all to education has been vividly articulated in the country's education-related policy, strategy, program and plan documents. These legal and policy framework documents establish the universal right to education; emphasize the need to allocate resources; and indicate the availability of educational support provision as well as assistance to children and youth with disabilities.

In this study, the promotion of various legal and policy frameworks, mainstreaming issues related to inclusive education in school improvement programs, and encouraging children and youth with disabilities to learn have been considered as promising progress in relation to the education of children and youth with disabilities in the Ethiopian school system.

Conversely, the availability of inclusive education related legal and policy frameworks alone could not maintain significant achievements. Currently, the majority of children

and youth with disabilities are left behind from the education service in the country. From the total of school-age children with disabilities only 1.3% enrolled at the pre-primary school level; 11%, enrolled at the primary school level, and 2.8% enrolled at the secondary school level. This affirmed that 98.7%, 89.0%, and 97.2% school-age children with disabilities at pre-primary, primary and secondary levels respectively are out of school. At technical and vocational education and training institutions and universities level, there is no exact and clear data that show the enrolment of learners with disabilities.

On the other hand, the quality of educational service provision to enrolled children and youth with disabilities in special schools, special units, and regular schools is in a question. This is because there is no process engaged identifications and special assessment procedures for them. The majority of them cannot be recognized and supported as per their learning needs properly by their teachers. Hence, they are mainly left without sufficient educational support which leads them to poor achievement in education.

Besides, this study has proved that a number of variables deterred promotion of access, equity, inclusion, and quality in the education system particularly for children and youth with disabilities. The majority of pre-primary, primary, secondary and tertiary schools lack accessible facilities and a friendly school environment. There is a shortage of adequate teaching-learning materials in the schools. Teachers have found it difficult to accommodate and support the learners' needs because of their inadequate preparation in the pre-service and/or in-service programs. The classroom teaching-learning process is characterized by a highly rigid curriculum. There is a lack of awareness of the school community towards disability and inclusion. Also, lack of collaboration and strong commitment among stakeholders in education, such as school leaders, teachers, and community members as a whole obstructed the inclusion of children and youth with disabilities in education. In general, this study has confirmed that though there are legal and policy frameworks in Ethiopia that support inclusion of all, the realization of its implementation is far from reality so far.

### IV. IMPLICATION

In order to realize access, equity, inclusion, and quality in the Ethiopian education system; it requires strengthening and transforming the capacity of the schools. Particularly, to educate children and youth with disabilities, schools need to be capacitated on how to promote a barrier-free learning environment for all learners regardless of ability and disability differences. Also, they need to be staffed with adequate and trained professionals, as well as equipped with sufficient teaching-learning aids and adaptive materials. The implication of this study, therefore, indicates that practical realization of accessible inclusive school setting which accommodates all learners at all level of the education system is crucially essential. This necessitates the true implementation of legal

and policy frameworks into action. To do so, it demands maintaining functional structures across the hierarchies of the education sector. Moreover, all the actors need to be aware and responsible for ensuring the execution of legal and policy frameworks in their planning, implementation, monitoring, evaluation, and support activities.

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# Characteristics of Senile Pruritus Patients at Haji Adam Malik General Hospital Medan in 2016-2018

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## Abstract

**Background:** Pruritus or itch is a sensation in the skin that provokes the desire to scratch. Pruritus is one of the most common skin complaints in the elderly. The world's population is currently in the era of aging population. This change in demographic distribution creates growth challenges in the elderly with pruritus. Senile pruritus is described as chronic pruritus of unknown origin or cause in each elderly individual and has not been properly diagnosed.

**Objective:** This study aims to determine the characteristics of senile pruritus patients at Haji Adam Malik General Hospital Medan in 2016-2018.

**Method:** This research is a descriptive study with cross sectional research design, using secondary data derived from medical records at Haji Adam Malik General Hospital Medan in 2016-2018. The sample of his study was selected by the total sampling method of all medical record data that met the research criteria.

**Result:** There were 53 senile pruritus patients enrolled in three years. The most age group is 60-69 years (47.2%). More men than women (60.4%; 39.6%). Lowland (84.9%) is the most dominant residence. The level of education most attained was senior high school (56.6%). History of drug use (81.1%) is most found in senile pruritus patients.

**Conclusion:** This study describes the characteristics of senile pruritus at Haji Adam Malik General Hospital Medan in 2016-2018. The characteristics of patients are young elderly people aged 60-69 years old, male, living in the lowlands, high school education level, with a history of previous drug use.

**Index term:** Characteristics, Pruritus, Senile

## I. INTRODUCTION

Pruritus/itch is a sensation in the skin that provokes the desire to scratch.<sup>1</sup> Pruritus is one of the most common skin complaints in the elderly.<sup>2</sup> This related to senility experienced by the elderly. Senility is a physical and mental setback that is associated with old or senile age.<sup>3</sup> Senile skin that dry and easily fissured is easily pruritic.<sup>4</sup> Sometimes, dry skin (xerosis cutis) is discovered by chance and is not the main cause of pruritus. The pathophysiology of senile pruritus in not fully understood, but cutaneous nerve and skin changes due to aging, play an important role in trigerring pruritus.<sup>5-6</sup>

Some studies around the world found various prevalences of pruritus in elderly. Those are as follows: 6.4% in Tunisia, 14.2% in Taiwan, 18.9% in Italy, 22% in Iran, 25% in Mexico, 34.8% in Poland, 41% in Thailand, 9.5% in Turkey, 44% in India, and 19.69% in Indonesia.<sup>5-8</sup>

The current world population is in the age of aging population aged 60 years and over exceeding 7 percent of the population. This condition shows that Indonesia is transitioning towards an aging population structure. And now, the province of North Sumatera has entered an era of aging population.<sup>9</sup> This change in demographic distribution creates growth challenge in the elderly with pruritus. Senile pruritus is described as chronic pruritus of unknown origin or cause in each elderly individual and has not been properly diagnosed.<sup>6-10</sup>

Although research on senile pruritus mostly done, but the characteristics of senile pruritus patients in Indonesia are still few, so researcher want to find out the characteristics of senile pruritus patients at Haji Adam Malik General Hospital Medan.

## II. METHOD

This is a descriptive study with cross sectional design using secondary data obtained from the Haji Adam Malik General Hospital Medan medical records. All medical records selected based on inclusion and exclusion criteria were included in this study. Subjects were senile pruritus patients aged 60 years and over, both men and women who have information on residence and education level, also with or without a history of previous drug use who were seeking treatment or were consulted to the Department Dermatology and Venereology Haji Adam Malik General Hospital, Medan in 2016-2018. All data collected and arranged in the form a table that includes the frequency and percentage of the sample. Haji Adam Malik General Hospital located in Medan city, North Sumatera province, Indonesia.

## III. RESULT

Total number of senile pruritus patients at Haji Adam Malik General Hospital Medan in 2016-2018 were 68 and 53 of them were the subject of this study. Characteristics of the subjects in this study are shown based on patients sociodemographics (Table 1) include age, gender, residence, and education level, as well as a history of previous drug use. Total from 53 subjects enrolled in this study, majority of them were in the age group of 60-69 years (47.2%), 60.4% subjects were male and 39.6% subjects were female. The residence distribution of subjects in this study majority in the lowlands (hot temperature) (84.9%). The highest distribution in the education level was senior high school (56.6%).

**Table 1 Demographic Characteristics of Senile Pruritus Patients**

Variable	N	%
<b>Age (years)</b>		
60-69	25	47.2
70-79	20	37.7
≥80	8	15.1
<b>Gender</b>		
Male	32	60.4
Female	21	39.6
<b>Residence</b>		
Lowlands (hot temperature)	45	84.9
Highlands (cold temperature)	8	15.1
<b>Education</b>		
Not Graduated from Elementary/ Not in School Yet	2	3.8
Elementary School	7	13.2
Junior High School	4	7.5
Senior High School	30	56.6
University	10	18.9

Based on a history of previous drug use in this study showed 81.1% subjects had a history of drug use before were diagnosed with senile pruritus. And antihypertension drug is the most common drug that found in them.

**Table 2 History of Previous Drug Use of Senile Pruritus Patients**

History of Previous Drug Use	n	%
Yes	43	81.1
No	10	18.9

## IV. DISCUSSION

Out of 53 subjects of senile pruritus in this study, majority of them were in the age group of 60-69 years (47.2%). A similar study by Goyal et al in India also showed that out of 610 patients, 55.6% were 60 – 69 years.<sup>11</sup> In contrast, several studies conducted in Iran showed an increase in the prevalence of pruritus with increasing age, 20.8% in the 60 – 69 years patients, 22.9% in the 70 – 79 years patients and 26% in the age group 75 years and above. Skin aging plays an important role in the pathophysiology of pruritus in older population. The skin becomes drier and feels itchy.<sup>12</sup> In addition, sociodemographic factors need to be reviewed in this study. As well as data from the Central Statistics Agency which shows that the elderly population in the province of North Sumatra is dominated by the age group 60-69 years.<sup>9</sup>

The highest gender proportion was male, 32 subjects (60.4%) and 21 subjects (39.6%) were female. A similar study by Jindal et al in India reported of 125 patients, 74 patients were men and 51 patients were women.<sup>13</sup> Lee et al in Korea reported male to female ratio of 6:4.<sup>14</sup> On the other hand, a Turkish study reported male to female ratio of 1:1.7.<sup>7</sup> A study in India also reported of 282 patients, 162 patients were women and 120 patients were men.<sup>15</sup> Study Valdez-Rodriguez et al in Mexico reported of 182 patients, 62.1% were women and 37.9% were men. This study showed that elderly females tend to have a higher VAS, longer itch duration (in months), increased frequency of pruritus, and to postmenopausal skin changes, when compared with males.<sup>16</sup>

The residence distribution of subjects in this study majority in the lowlands (hot temperature) (84.9%). A study in Mexico found pruritus frequency is the highest in the winter. It is well known that dry, cold weather could affect the skin barrier. Some of these changes have been related to xerosis in the elderly.<sup>16</sup> This xerosis is caused by a chronic skin hydration problem. Aquaporin-3, a membrane channel that allows the passage of glycerol and water, is significantly reduced in the skin of people aged 60 years and over. The decrease in the lipid formation capacity and fluid loss affect the epidermal barrier function and could contribute to senile pruritus.<sup>6</sup>

The highest distribution in the education level was senior high school (56.6%). An Indonesian study in 127 patients found that high school or less is the second common after the unknown education level.<sup>5</sup> But the results obtained in this study are not too specific because the number of samples is relatively small and cannot represent every elderly population in Indonesia, especially in the province of North Sumatera. However, this result similar with other research conducted in Indonesia by Yusharyahya S et al. which states that geriatric patients with pruritus are more experienced in primary to secondary education groups.<sup>5</sup> Valdez-Rodriguez et al in Mexico also reported of 182 geriatric patients with pruritus, 84.6 % were high school or less.<sup>16</sup>

A history of previous drug use in this study showed 81.1% subjects had a history of drug use before being diagnosed with senile pruritus. A similar study by Cho et al in Korea also showed that patients undergoing targeted therapy suffer from pruritus frequently and severely.<sup>17</sup> Pruritus in elderly people can frequently be induced by drugs, because the high frequency of chronic disease in this population exposes them to absorption of numerous drugs, sometimes simultaneously.<sup>6</sup> Almost any drug may induce pruritus by various pathomechanisms. Most of the medications including angiotensin-converting enzyme inhibitors, antibiotics, antidepressants, antidiabetics, and drugs are likely to cause generalized pruritus.<sup>18</sup> Increased pruritogen release (histamine, serotonin, neuropeptides), neurological changes and neuronal deposition in the skin are thought to induce pruritus, but the pathogenesis of pruritus caused by drugs is not fully understood.<sup>19</sup>

## V. CONCLUSION

Based on this study, it can be concluded that from 68 senile pruritus patients who went to Haji Adam Malik General Hospital Medan in 2016-2018 there were 53 subjects that met the inclusion and exclusion criteria. The data obtained the characteristics of senile pruritus patients in this study based on sociodemographic, most commonly found in people aged 60-69 years (47.2%), male (60.4%), living in the lowlands (84.9%), and high school education level (56.6%). Then, the subjects who had a history of previous drug used is 81.1%.

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# Optimization of Software Testing Technique using Novel Genetic Algorithm

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## Abstract

Software Testing is a process performed to maintain software quality. Thus, the goal of testing is systematically and stepwise detection of different classes of errors within a minimum amount of time and also with a much less amount of effort. Software testing is also an important component of software quality assurance (SQA), and a number of software organizations are spending up to 40% of their resources on testing.

Software testing is a very broad area, which involves many other technical and non-technical areas, such as specification, design and implementation, maintenance, process and management issues in software engineering. The study focuses on the state of the art in testing techniques, as well as the latest techniques which represents the future direction in this domain.

Numerous genetic algorithms have been developed and implemented for optimizing the testing techniques.

In this research work, a novel genetic algorithm (GA) which combines Cuckoo search and Particle Swarm Optimization (PSO) is designed and implemented to optimize the testing technique.

For implementing this novel genetic algorithm (GA), the Booth's and Hump Camel functions are used to calculate global best evaluation. The global or final best evaluation is calculated based on the number of particles and epochs.

**Key Words:** Particle Swarm Optimization (PSO), Genetic Algorithm (GA), Cuckoo Search Algorithm, White Box Testing.

## I. INTRODUCTION

Testing [1] is the process of evaluating a system or its component(s) with the intent to find whether it satisfies the specified requirements or not. Testing [2] is executing a system in order to identify any gaps, errors, or missing requirements in contrary to the actual requirements.

### 1.1. Objectives of Software Testing

- A good test case is one that has a probability of finding an as yet undiscovered error.
- A good test is not redundant.
- A successful test is one that uncovers a yet undiscovered error [3].
- A good test should be "best of breed".
- A good test should neither be too simple nor too complex.
- To check if the system does what it is expected to do.
- To check if the system is "Fit for purpose".
- To check if the system meets the requirements and be executed successfully in the Intended environment.
- Executing a program with the intent of finding an *error*.

Different phases of software testing life cycle are represented in the

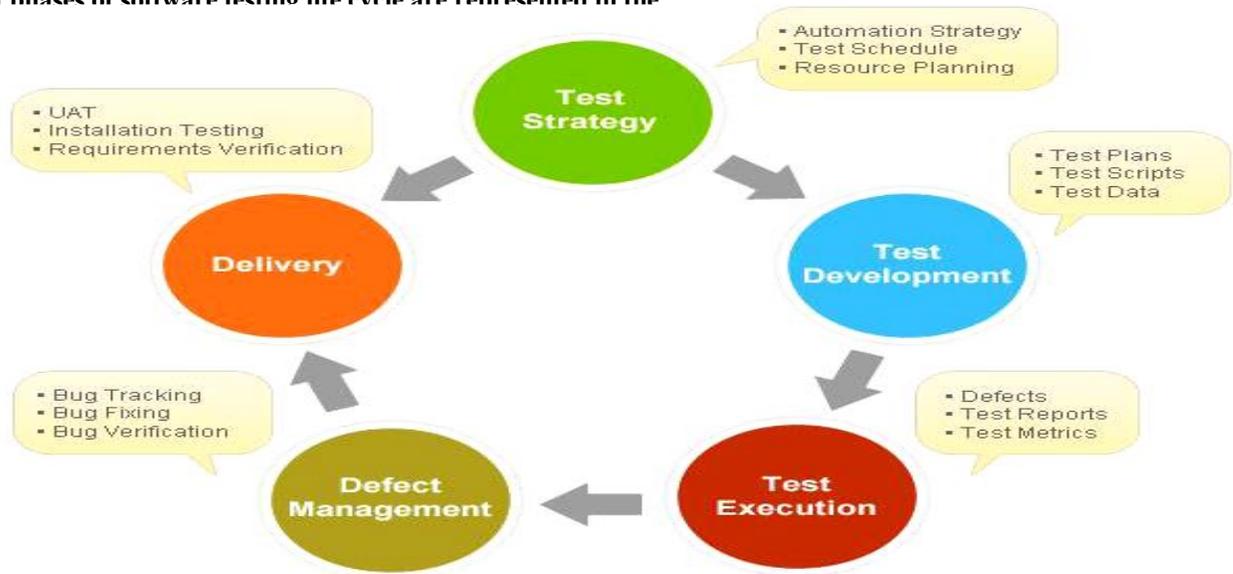


figure1.

Fig.1.: Testing activities

## II. OBJECTIVES AND AIM

### 2.1. Objectives and aims of the research

The overall aim of this research project is to design a new Genetic Algorithm (GA) [6] that is cuckoo bird search algorithm, implement and investigate the effectiveness of Genetic Algorithm (GA) with regard to random testing and to automatically generate test data to traverse all branches of software. The objectives of the research activity can be defined as follows:

- The furtherance of basic knowledge required to develop new techniques[7] for automatic testing.
- To assess the feasibility of using GA to automatically generate test data for a variety of data type variables and complex data structures for software testing.
- To analyze the performance of GAs under various circumstances e.g. large systems.
- Comparison of the effectiveness of GAs with pure random testing for software developed in Java
- The automatic testing of complex software procedures.
- Analysis of the test data adequacy using mutation testing.

The performance of GAs in automatically generating test data for small procedures is assessed and analyzed. A library of GA is developed and then applied to larger systems.

The efficiency of GAs in generating test data is compared to random testing with regard to the number of test data sets generated and the CPU time required.

This research project presents a system for the generation of test data for software written in Java. The problem of test data generation is formed and solved completely as a numerical optimization problem using Genetic Algorithm and structural testing techniques.

Software testing is about searching and generating certain test data in a domain to satisfy the test criteria. Since GAs are an established search and optimization process. The basic aim of this research is to generate test sets which will traverse all branches in a given procedure under test.

### Testing criteria

The criterion of testing [12] in this thesis is branch testing, the aim is to develop a test system to exercise every branch of the software under test. In order to generate the required test data for branch testing Genetic Algorithm, PSO and Cuckoo search are used. Flow chart for genetic Algorithm process is represented in figure 2.

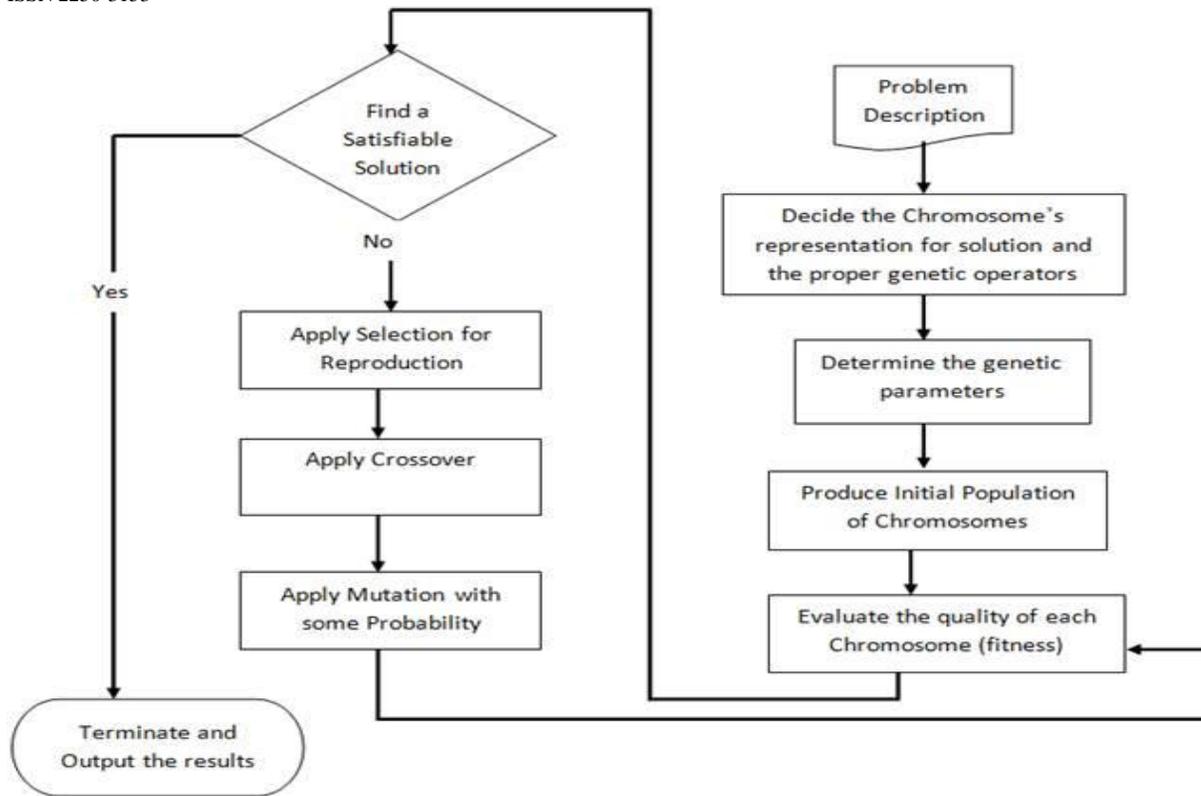


Fig. 2. Flow chart for genetic Algorithm Process

### III. Methodology in this research work

In this work, The Particle Swarm Optimization (PSO), Cuckoo search and Genetic Algorithm (GA) are used for designing and Implementing a Novel Genetic algorithm for Optimization of Testing Technique.

Structural testing can be done by the method of data flow testing or path testing [8]. Path testing comprises generating a set of paths that will cover every branch in the program and discover the set of test cases that will execute every path in this set of program path. In data flow testing, the emphasis is on the points at which variables obtain values and the points at which these values are used up.

In the area of structural or white-box testing [9], evolutionary algorithms can assist in finding test cases which cover the code base under test to maximum extent. The aim is to execute the code under test with as many different input parameters as possible, in order to maximize the chance of detecting errors in the code.

The actual aim of this work is to offer better optimization approach, which is introduced in the test case by using Genetic Algorithm [10]. Optimization approach adapted with different layer tasks to inspect. This research also provides a survey to determine better quality testing process within the time. In this study we analyze how test cases can be optimized and gives best solution. Evolutionary tests generally are a very good growing methodology associated with routinely bringing in high quality analyzes information. The actual evolutionary algorithms are now put on inside many correct living problems.

In this work, we proposed a new approach to optimize the software testing techniques [11] by test case suite reduction. The proposed technique is based on concepts of PSO, Cuckoo search and GA. The technique selects the set of test case from the available test suite that will cover all the faults detected earlier in minimum execution time. Here particles are used as agents who explore the minimum set of test cases. Half of the particles will initially start foraging with randomly selected test cases. Now particles will add new test cases on the explored path if adding of a test case increases its fault detection capacity.

Population based search protocol can turn out to be Particle swarm Optimization (PSO). PSO was designed on the basis of the social presentation of birds in a flock. Each particle flies in the search space with a velocity varied by its own flying memory and its companion's flying experience in PSO. Each particle has its major function value which is settled on by a fitness function.

### 3.1. Particle Swarm Optimization

PSO is an optimization seeks technique based on population. It is an innovative branch of evolutionary computation and the particle swarm can be seen as a simple social system. In PSO, each individual is called a particle and each particle denotes a potential solution, which forms the population set. The particles in searching space influence each other, exchanging information, to adjust the location and speed of itself and approach to the optimal solution. PSO initialize a group of particles, finding the optimal solution by iteration. During each iteration, the particle updates its speed and location by tracing individual extremism and global extremism

$v_i = \{v_{i1}, v_{i2}, \dots, v_{id}\}$  denotes the speed of the  $i^{\text{th}}$  particle;

$X_i = \{x_{i1}, x_{i2}, \dots, x_{id}\}$ ,

$i = 1, 2, \dots, N$  denotes a vector point of  $i^{\text{th}}$  particle in  $d$ -dimension solution space,  $t$  is the iteration number;

$[Math Processing Error]$  denote the location after  $t^{\text{th}}$  iteration and  $d^{\text{th}}$  dimensional component of speed vector of  $i^{\text{th}}$  particle,

$r_1$  and  $r_2$  are random numbers obeying the distribution of  $U(0, 1)$ ;

$c_1$  and  $c_2$  are accelerate factors and usually  $c_1 = c_2 = 2$ .

We use  $P_i = \{p_{i1}, p_{i2}, \dots, p_{id}\}$  to record the optimal point that is searched by the  $i^{\text{th}}$  particle, as  $p_{best}$ .

Thus there must exist an optimal point in the population, whose number is  $g$ .

Then  $P_g = \{p_{g1}, p_{g2}, \dots, p_{gd}\}$  is the optimal value of the population search.

During the process of particle optimization, it is crucial to balance the local developing ability and the global detecting ability. For different problems the balance of these two abilities are not the same.

PSO algorithm has deficiency in premature convergence, and the local search accuracy is low. It also brings factors of program structure in testing case generation. Therefore the PSO-based testing case generation technology is discussed intensively in this article. To balance the ability of exploring and self-improvement of algorithms, and to achieve better convergence speed in global search, we provide adaptive particle inertia weight factor adjusting approach, integrated with fitness and particle aggregation degree. During evolution, a local searching strategy is performed on the optimal individual of each generation to further improve the efficiency of testing case generation.

The simulations indicate that Solving Particle Swarm Optimization with Local Search (SPSOLS) algorithm proposed in this article shows better testing case generation performance and it achieves coverage rate optimization of the tested cases. It also has certain advantages in testing case generation [14] compared to homogeneous algorithm under approximate environment. Executing the function under test using the input variables from a particular test case causes a particular control path through the function to be taken. In the case of the branch coverage metric and assuming the function under test contains branch statements, the function will typically need to be executed using several test cases in order to exercise (cover) each branch. For small functions containing few branch statements, the task of finding test cases, which use all branches, is relatively simple. For more complex functions with many branch statements and input variables it makes sense to automate the task, and one approach is to use evolutionary algorithms. Evolutionary algorithms use the principles of evolution to achieve optimization based on the result of a fitness function. The fitness of a first generation of random individuals is tested, and the characteristics, known as genes, of the fittest individuals are propagated to the next generation. This process is governed by rules regarding which percentage of individuals whether their genes have propagated to the next generation, how their genes are combined to form the next generation's individuals and how the genes are randomly mutated. Figure 3 shows the flow chart for particle swarm optimization process.

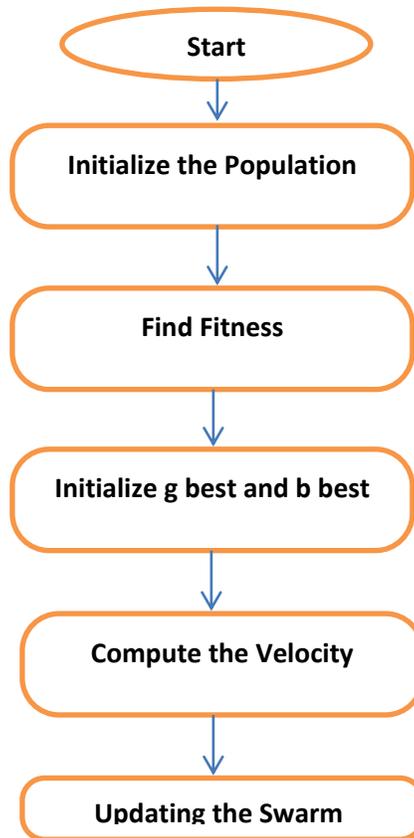


Figure. 3: Flow chart for Particle Swarm Optimization

**“Individual best”**: It is the individual best choice algorithm by assessing each individual position of the particle to its own best position *pbest*, only. The data about the other particles is not used in this *pbest*.

**“Global best”**: It is the universal best selection algorithm, which obtains the global information by making the movement of the particles encloses the position of the best particle from the complete swarm. Additionally, every particle uses its experience with earlier incidents in terms of its own best solution.

- **Swarm initialization**: For a population size  $u$ , arbitrarily generate a solution.
- **Define the fitness function**: According to the current solution, the fitness function chosen should be used for the constraints.
- ***gb* and *pb* Initialization**: In the start the fitness value estimated for every particle is placed as the *Pbest* value of each particle. Among the *Pbest* values, the optimal one is chooses as the *gb* value.
- **Velocity Computation**: The new velocity is calculated using the beneath equation

$$v[i] = v[i] + c1 * rand() * (pbest[i] - present[i]) + c2 * rand() * (gbest[i] - present[i]) \dots (a)$$

$$present[i] = present[i] + v[i] \dots (b)$$

$v[i]$  is the particle velocity,  $present[i]$  is the current particle (solution).

$pbest[i]$  and  $gbest[i]$  are defined as stated before.

$rand()$  is a random number between (0,1).  $c1, c2$  are learning factors. usually  $c1 = c2 = 2$ .

- **Swarm Updating**: Find out the fitness function once more and improve the *pb* and *gb* values. If the new value is better than the earlier one, replace the old by the current one. And as well select the optimal *pb* as the *gb*.
- **Criterion to stop**: Extend till the solution is really appropriate or maximum iteration is attained is

### The pseudo code of the procedure is as follows

```
For each particle
  Initialize particle
END
Do
  For each particle
    Calculate fitness value
    If the fitness value is better than the best fitness value (pBest) in history
      set current value as the new pBest
  End
  Choose the particle with the best fitness value of all the particles as the gBest
  For each particle
    Calculate particle velocity according equation (a)
    Update particle position according equation (b)
  End
While maximum iterations or minimum error criteria is not attained
```

Particles' velocities on each dimension are clamped to a maximum velocity  $V_{max}$ . If the sum of accelerations would cause the velocity on that dimension to exceed  $V_{max}$ , which is a parameter specified by the user. Then the velocity on that dimension limited to  $V_{max}$ .

Then we apply the cuckoo search algorithm

### 3.2.Cuckoo search algorithm

Cuckoo search algorithm is a metaheuristic algorithm which was inspired by the breeding behavior of the cuckoos and alleviates to implement. There are a number of nests in cuckoo search. Each egg points out a solution and an egg of cuckoo indicates a new solution. The new and better solution is replacing the most awful solution in the nest. The subsequent representation scheme is selected by Cuckoo Search algorithm: Each egg in a nest symbolizes a solution, and a Cuckoo egg symbolizes a novel solution. The plan is to employ the novel and probably better egg to substitute a not- so-good egg of Cuckoo in the nests. On the other hand this is the fundamental case i.e., one cuckoo per nest, but the extent of the approach can be raised by incorporating the property that each nest can have more than one egg which symbolizes a set of solutions. The process of clustering is given beneath,

- At a time only one egg is laid by cuckoo. Cuckoo dumps its egg in a arbitrarily selected nest.
- The number of accessible host nests is fixed, and nests with high quality of eggs will transmit over to the next generations.
- In case of a host bird found out the cuckoo egg, it can throw the egg away or discard the nest, and build a totally novel nest.

#### Step 1: Initialization Phase

The population ( $m_i$ , where  $i=1, 2, \dots, n$ ) of host nest is started arbitrarily.

#### Step 2: Generating New Cuckoo Phase

Using levy flights a cuckoo is selected at random and it produces new solutions. After that the produced cuckoo is evaluated using the objective function for finding out the quality of the solutions.

#### Step 3: Fitness Evaluation Phase

Evaluate the fitness function based on the equation and next select the best one.

#### Step 4: Updating Phase

The superiority of the new solution is evaluated and a nest is selected among arbitrarily. If the excellence of new solution in the selected nest is better than the old solutions, it will be replaced by the new solution (Cuckoo). Otherwise, the previous solution is placed aside as the best solution.

#### Step 5: Reject Worst Nest Phase

The worst nests are thrown away in this part, based on their chance values and new ones are built. Presently, function the best solutions are ranked based on their fitness. After that the best solutions are identified and spotted as optimal solutions.

**Step 6: Stopping Criterion Phase**

Till the maximum iteration achieves this process is repeated. The optimized effect will be inspected for the measure of software quality. The précised process is clearly shown in flowchart in figure 4.

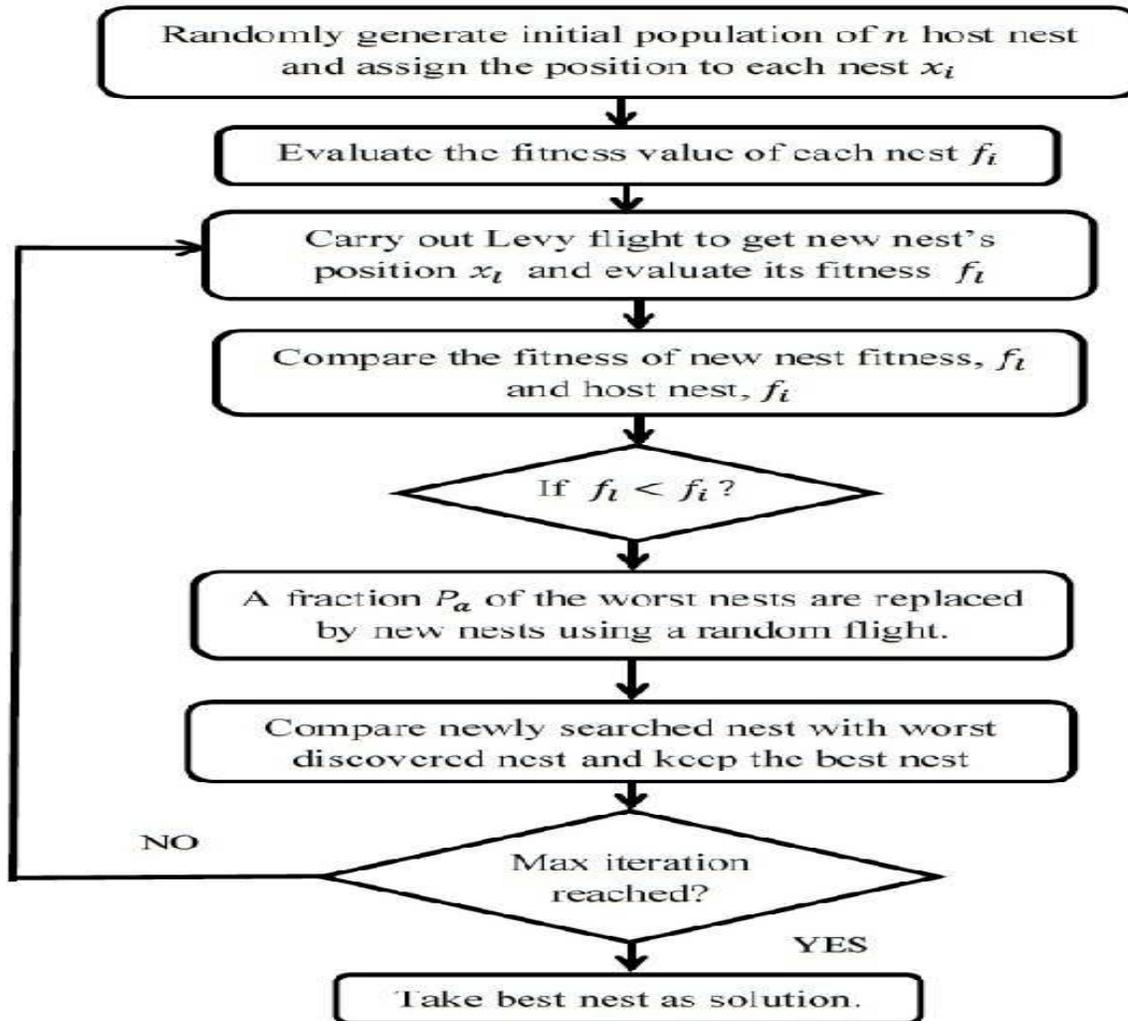


Figure. 4: Flow chart for Cuckoo search algorithm

**IV. Implementation**

The implementation of the algorithm is demonstrated in the following screens with the help of Booth’s function and Three Hump Camel function.

The functions used in this work for optimization are as follows :

$$f(x) = -a \exp\left(-b \sqrt{\sum_{i=1}^d x_i^2}\right) - \exp\left(\frac{1}{d} \sum_{i=1}^d \cos(cx_i)\right) + a + \exp(1)$$

In the above equation, the values a, b and c are constants and are usually chosen as a=20, b=0.2 and c=2π.

On a 2-dimensional domain it is defined by:

$$f(x, y) = -20 \exp\left[-0.2 \sqrt{0.5(x^2 + y^2)}\right] - \exp[0.5(\cos 2\pi x + \cos 2\pi y)] + e + 20$$

#### 4.1.Booth's Function

The Booth function is a unimodal, 2-dimensional convex mathematical function widely used for testing optimization algorithms.

Booth Function

Number of variables:  $n = 2$ .

Search domain:  $-10 \leq x_i \leq 10, i = 1, 2$ .

Number of local minima: several local minima.

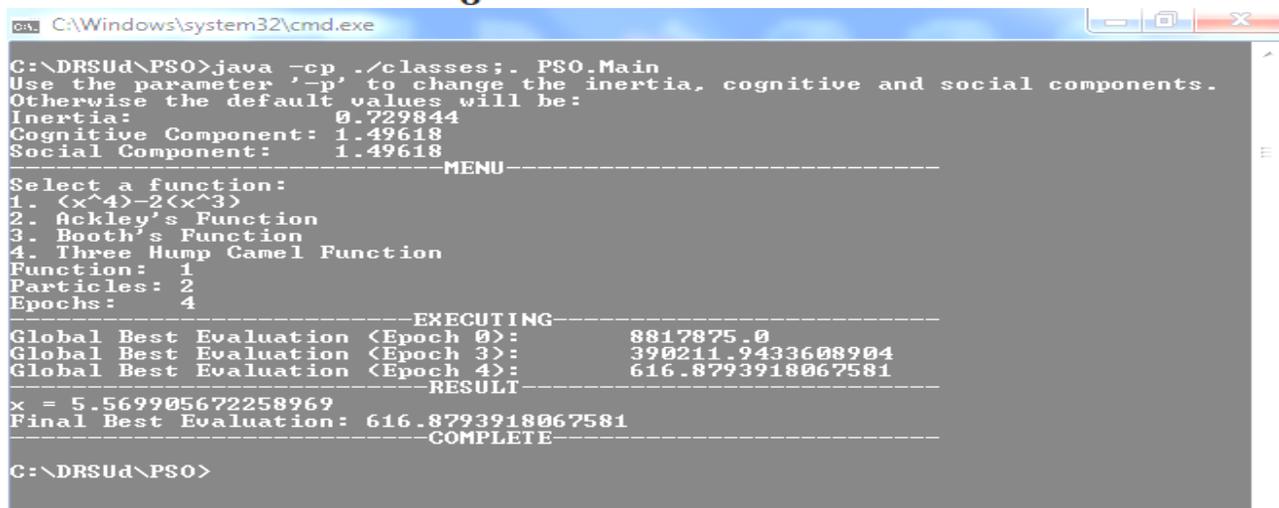
#### Booth's Function

$$f(x,y) = (x + 2y - 7)^2 + (2x + y - 5)^2$$

#### 4.2.Three Hump Camel Function

This function is used as a test function in order to evaluate the performance of optimization algorithms

$$f(x,y) = 2x_1^2 - 1.05x_1^4 + \frac{x_1^6}{6} + x_1x_2 + x_2^2$$



```
C:\Windows\system32\cmd.exe
C:\DRSUd\PSO>java -cp ./classes;. PSO.Main
Use the parameter '-p' to change the inertia, cognitive and social components.
Otherwise the default values will be:
Inertia: 0.729844
Cognitive Component: 1.49618
Social Component: 1.49618
-----MENU-----
Select a function:
1. (x^4)-2(x^3)
2. Ackley's Function
3. Booth's Function
4. Three Hump Camel Function
Function: 1
Particles: 2
Epochs: 4
-----EXECUTING-----
Global Best Evaluation <Epoch 0>: 8817875.0
Global Best Evaluation <Epoch 3>: 390211.9433608904
Global Best Evaluation <Epoch 4>: 616.8793918067581
-----RESULT-----
x = 5.569905672258969
Final Best Evaluation: 616.8793918067581
-----COMPLETE-----
C:\DRSUd\PSO>
```

Fig 5. Find the Global Best Evaluation

The above figure displays a menu to calculate the global best.

Here the result of global best evaluation is obtained using the quadratic formula

$X^4-2(x^3)$

Using Particle Swarm optimization no of particles taken here is 2 and number of epochs is chosen as 4.

Final Best Evaluation calculated is 616.87939

```
C:\Windows\system32\cmd.exe
Global Best Evaluation <Epoch 116>: 1.720121592896362E-5
Global Best Evaluation <Epoch 117>: 1.5408768671676398E-5
Global Best Evaluation <Epoch 118>: 1.4216946070177983E-5
Global Best Evaluation <Epoch 119>: 1.346002078150832E-5
Global Best Evaluation <Epoch 120>: 1.3282954039794959E-5
Global Best Evaluation <Epoch 121>: 1.1503391188938394E-5
Global Best Evaluation <Epoch 122>: 9.83839495560801E-6
Global Best Evaluation <Epoch 123>: 8.624002649781914E-6
Global Best Evaluation <Epoch 124>: 7.738312351790455E-6
Global Best Evaluation <Epoch 125>: 7.092358337956739E-6
Global Best Evaluation <Epoch 126>: 6.621232493841944E-6
Global Best Evaluation <Epoch 127>: 6.277593886494515E-6
Global Best Evaluation <Epoch 128>: 4.086593452967691E-6
Global Best Evaluation <Epoch 129>: 1.6047339670421934E-6
Global Best Evaluation <Epoch 130>: 1.564313350854718E-6
Global Best Evaluation <Epoch 137>: 7.833048094596506E-7
Global Best Evaluation <Epoch 138>: 2.8808031515836774E-8
Global Best Evaluation <Epoch 159>: 2.7850891370917452E-8
Global Best Evaluation <Epoch 166>: 2.7841647209925213E-8
Global Best Evaluation <Epoch 168>: 2.3917714031540527E-8
Global Best Evaluation <Epoch 169>: 1.247825309746986E-8
Global Best Evaluation <Epoch 170>: 6.376549066544612E-9
Global Best Evaluation <Epoch 181>: 5.492175603194482E-10
Global Best Evaluation <Epoch 191>: 4.645919204904203E-10
Global Best Evaluation <Epoch 197>: 4.2956571633112617E-10
Global Best Evaluation <Epoch 205>: 3.232578649203788E-10
Global Best Evaluation <Epoch 207>: 3.2092017931972805E-10
Global Best Evaluation <Epoch 209>: 3.192255348949402E-10
Global Best Evaluation <Epoch 211>: 3.190905317751458E-10
Global Best Evaluation <Epoch 213>: 1.3677237120646168E-10
Global Best Evaluation <Epoch 217>: 1.2354917089396622E-10
Global Best Evaluation <Epoch 219>: 1.1929657262044202E-10
Global Best Evaluation <Epoch 222>: 1.0269474159940728E-10
Global Best Evaluation <Epoch 230>: 5.1798565436911304E-11
Global Best Evaluation <Epoch 231>: 4.980549306310422E-11
Global Best Evaluation <Epoch 234>: 4.446221169018827E-11
Global Best Evaluation <Epoch 235>: 3.020872441084066E-11
Global Best Evaluation <Epoch 237>: 1.440270125385723E-11
Global Best Evaluation <Epoch 238>: 1.1468159755168017E-11
Global Best Evaluation <Epoch 241>: 6.323830348264892E-12
Global Best Evaluation <Epoch 245>: 2.9629632081196178E-12
Global Best Evaluation <Epoch 247>: 1.943334382303874E-12
Global Best Evaluation <Epoch 248>: 1.0800249583553523E-12
Global Best Evaluation <Epoch 262>: 9.876544027065393E-13
Global Best Evaluation <Epoch 263>: 9.521272659185342E-13
Global Best Evaluation <Epoch 264>: 8.988365607365267E-13
Global Best Evaluation <Epoch 266>: 8.562039965909207E-13
Global Best Evaluation <Epoch 269>: 6.430411758628907E-13
Global Best Evaluation <Epoch 273>: 9.237055564881302E-14
Global Best Evaluation <Epoch 276>: 7.815970093361102E-14
-----
RESULT
x = 5.9029740804458135E-15
y = -7.242330460787715E-15
Final Best Evaluation: 2.8421709430404007E-14
-----
COMPLETE
C:\DRSud\PSO>
```

Fig 6. Find the Global Best

The above figure 6 displays a menu to calculate the global best evaluation and here it is computed as 2.8421709430404007E-14.

```
cmd: C:\Windows\system32\cmd.exe
Global Best Evaluation (Epoch 71): 3.1351458901454147E-7
Global Best Evaluation (Epoch 74): 1.1313168824888258E-7
Global Best Evaluation (Epoch 77): 5.3737285421101995E-8
Global Best Evaluation (Epoch 80): 4.044384886657726E-8
Global Best Evaluation (Epoch 81): 1.7626077490492093E-8
Global Best Evaluation (Epoch 82): 1.2024880450236953E-8
Global Best Evaluation (Epoch 84): 5.26676027843354E-9
Global Best Evaluation (Epoch 91): 4.8032459024866545E-9
Global Best Evaluation (Epoch 93): 2.5168173051430207E-9
Global Best Evaluation (Epoch 95): 8.51011358554175E-10
Global Best Evaluation (Epoch 99): 7.066416622489211E-10
Global Best Evaluation (Epoch 100): 2.526463015759532E-10
Global Best Evaluation (Epoch 109): 1.2230364863927627E-10
Global Best Evaluation (Epoch 110): 9.602530553777734E-12
Global Best Evaluation (Epoch 112): 1.7174389377777344E-12
Global Best Evaluation (Epoch 115): 4.4440517410897624E-13
Global Best Evaluation (Epoch 124): 8.731751965016752E-14
Global Best Evaluation (Epoch 129): 2.6270551269049566E-14
Global Best Evaluation (Epoch 138): 1.7558987782114585E-14
Global Best Evaluation (Epoch 142): 1.3297915398585387E-14
Global Best Evaluation (Epoch 143): 6.8462969567633745E-15
Global Best Evaluation (Epoch 146): 6.345705879390034E-15
Global Best Evaluation (Epoch 148): 3.1673364543036778E-15
Global Best Evaluation (Epoch 151): 3.05000005188250613E-16
Global Best Evaluation (Epoch 154): 3.3195927829919154E-17
Global Best Evaluation (Epoch 175): 2.8724817671173076E-17
Global Best Evaluation (Epoch 176): 1.3160689435193218E-17
Global Best Evaluation (Epoch 179): 1.013720049970425E-17
Global Best Evaluation (Epoch 182): 1.937974329602887E-18
Global Best Evaluation (Epoch 184): 4.3215752532943143E-19
Global Best Evaluation (Epoch 187): 5.1430913720438387E-20
Global Best Evaluation (Epoch 193): 2.4015987271665272E-21
Global Best Evaluation (Epoch 197): 7.508024717762488E-22
Global Best Evaluation (Epoch 201): 6.937057520752769E-22
Global Best Evaluation (Epoch 204): 2.1192544455990664E-22
Global Best Evaluation (Epoch 208): 1.7962563655868908E-22
Global Best Evaluation (Epoch 209): 1.2264118596402642E-22
Global Best Evaluation (Epoch 210): 1.069141173250729E-22
Global Best Evaluation (Epoch 212): 1.067617401637595E-22
Global Best Evaluation (Epoch 214): 1.0658193194218886E-22
Global Best Evaluation (Epoch 217): 1.0639090611854597E-22
Global Best Evaluation (Epoch 219): 1.0637179122995156E-22
Global Best Evaluation (Epoch 223): 5.563743273367433E-23
Global Best Evaluation (Epoch 231): 1.6560452853665212E-23
Global Best Evaluation (Epoch 232): 1.4276946657652811E-24
Global Best Evaluation (Epoch 238): 8.3109730694745E-25
Global Best Evaluation (Epoch 240): 7.847225409122224E-25
Global Best Evaluation (Epoch 242): 2.0904577330085247E-25
Global Best Evaluation (Epoch 243): 6.886755702579433E-26
Global Best Evaluation (Epoch 246): 4.81047380003773E-26
-----RESULT-----
x = 0.99999999999999502
y = 3.00000000000001332
Final Best Evaluation: 4.81047380003773E-26
-----COMPLETE-----
C:\DRSud\PSO>
```

Fig 7. Find the Global Best

The above figure 7 demonstrates a menu to calculate the global best evaluation and here it is computed as 4.81047380003773E-26.

```

C:\Windows\system32\cmd.exe
Cognitive Component: 1.49618
Social Component: 1.49618
-----MENU-----
select a function:
- (x^4)-2(x^3)
- Ackley's Function
- Booth's Function
- Three Hump Camel Function
function: 4
particles: 24
pochs: 179
-----EXECUTING-----
Global Best Evaluation (Epoch 0): 281659.11666666667
Global Best Evaluation (Epoch 3): 0.5524283239003591
Global Best Evaluation (Epoch 4): 0.2488942081277118
Global Best Evaluation (Epoch 13): 0.07365562760175412
Global Best Evaluation (Epoch 20): 0.012552510839737116
Global Best Evaluation (Epoch 25): 0.010238423422373563
Global Best Evaluation (Epoch 33): 0.007955632746970207
Global Best Evaluation (Epoch 34): 0.003940134873676934
Global Best Evaluation (Epoch 35): 4.7104527222551493E-4
Global Best Evaluation (Epoch 40): 2.2446358393861046E-4
Global Best Evaluation (Epoch 44): 2.8779134526911454E-5
Global Best Evaluation (Epoch 51): 2.227555795519142E-5
Global Best Evaluation (Epoch 53): 1.960214051379139E-5
Global Best Evaluation (Epoch 60): 5.894743881625259E-6
Global Best Evaluation (Epoch 61): 1.407606648537511E-6
Global Best Evaluation (Epoch 72): 8.016849068544081E-7
Global Best Evaluation (Epoch 75): 6.723320755764365E-7
Global Best Evaluation (Epoch 78): 3.068041783174973E-8
Global Best Evaluation (Epoch 82): 2.512400041303201E-8
Global Best Evaluation (Epoch 86): 1.9415169787736118E-8
Global Best Evaluation (Epoch 88): 1.8639441769072607E-9
Global Best Evaluation (Epoch 95): 4.0745406629031577E-10
Global Best Evaluation (Epoch 108): 2.382950262983028E-10
Global Best Evaluation (Epoch 111): 1.1224289433897071E-10
Global Best Evaluation (Epoch 112): 1.815566522649416E-11
Global Best Evaluation (Epoch 119): 1.5187861001614538E-11
Global Best Evaluation (Epoch 128): 1.1192958646258978E-11
Global Best Evaluation (Epoch 132): 4.7575774485095116E-12
Global Best Evaluation (Epoch 133): 1.0105246639823905E-12
Global Best Evaluation (Epoch 138): 2.443450599096396E-13
Global Best Evaluation (Epoch 140): 3.038917391118063E-14
Global Best Evaluation (Epoch 142): 1.8079425450837484E-14
Global Best Evaluation (Epoch 154): 8.709054141189466E-15
Global Best Evaluation (Epoch 159): 5.791281866436065E-16
Global Best Evaluation (Epoch 171): 2.985877778144496E-17
Global Best Evaluation (Epoch 176): 5.439405843516122E-18
Global Best Evaluation (Epoch 178): 1.2362988207368657E-18
-----RESULT-----
= 8.234965924001198E-10
= -6.343290787741626E-10
Final Best Evaluation: 1.2362988207368657E-18
-----COMPLETE-----
::\DRSud\PSO>_
    
```

Fig 8. Find the Global Best

The above figure 8 demonstrates a menu to calculate the global best evaluation and here it is computed as 4.81047380003773E-26. The function used is Three Hump camel Function, particles used are 24 and epochs are 179.

```

C:\Windows\system32\cmd.exe
Final Best Evaluation: 1.0126873541069057
-----COMPLETED-----
C:\DRSud\PSO>java -cp ./classes:. PSO.Main
Use the parameter '-p' to change the inertia, cognitive and social components.
Otherwise the default values will be:
Inertia: 0.729844
Cognitive Component: 1.49618
Social Component: 1.49618
-----MENU-----
Select a function:
1. (x^4)-2(x^3)
2. Ackley's Function
3. Booth's Function
4. Three Hump Camel Function
Function: 3
Particles: 20
Epochs: 16
-----EXECUTING-----
Global Best Evaluation (Epoch 0): 2601.0
Global Best Evaluation (Epoch 3): 72.42862375591895
Global Best Evaluation (Epoch 7): 6.142231146796034
Global Best Evaluation (Epoch 8): 3.7382403128708734
Global Best Evaluation (Epoch 11): 2.1666925175166085
-----RESULT-----
x = 0.5411627125209448
y = 2.7691174011010524
Final Best Evaluation: 2.1666925175166085
-----COMPLETED-----
C:\DRSud\PSO>java -cp ./classes:. PSO.Main
Use the parameter '-p' to change the inertia, cognitive and social components.
Otherwise the default values will be:
Inertia: 0.729844
Cognitive Component: 1.49618
Social Component: 1.49618
-----MENU-----
Select a function:
1. (x^4)-2(x^3)
2. Ackley's Function
3. Booth's Function
4. Three Hump Camel Function
Function: 3
Particles: 20
Epochs: 27
-----EXECUTING-----
Global Best Evaluation (Epoch 0): 452.0
Global Best Evaluation (Epoch 3): 27.677720162963375
Global Best Evaluation (Epoch 6): 0.09758845840619217
Global Best Evaluation (Epoch 24): 0.06849852497492503
-----RESULT-----
x = 1.19441581034717
y = 2.8348443395990146
Final Best Evaluation: 0.06849852497492503
-----COMPLETED-----
C:\DRSud\PSO>
    
```

Fig 9. Find the Global Best

The above figure 9 displays a menu to calculate the global best evaluation with Booth's function, particles 20 and with 16 and 27 epochs.

Final best evaluation is 2.1666925175166085, particles are 20 and epochs are 16.

Final best evaluation is 0.06849852497492503, particles are 20 and epochs are 27.

```

C:\Windows\system32\cmd.exe
C:\DRSud\PSO>
C:\DRSud\PSO>java -cp ./classes:. PSO.Main
Use the parameter '-p' to change the inertia, cognitive and social components.
Otherwise the default values will be:
Inertia: 0.729844
Cognitive Component: 1.49618
Social Component: 1.49618
-----MENU-----
Select a function:
1. (x^4)-2(x^3)
2. Ackley's Function
3. Booth's Function
4. Three Hump Camel Function
Function: 4
Particles: 12
Epochs: 24
-----EXECUTING-----
Global Best Evaluation (Epoch 0): 19065.116666666667
Global Best Evaluation (Epoch 3): 131.3864017916162
Global Best Evaluation (Epoch 4): 43.48624307990893
Global Best Evaluation (Epoch 8): 7.330981676779105
Global Best Evaluation (Epoch 10): 4.097153179656994
Global Best Evaluation (Epoch 12): 1.2478552302360455
Global Best Evaluation (Epoch 15): 0.31551322027008327
Global Best Evaluation (Epoch 16): 0.017757433051313328
-----RESULT-----
x = 0.09957880293456256
y = -0.027258951386635033
Final Best Evaluation: 0.017757433051313328
-----COMPLETED-----
C:\DRSud\PSO>
    
```

Fig 10. Find the Global Best

The above figure 10 displays a menu to calculate the global best evaluation with Hump Camel function, particles 12 and with 16 and 24 epochs.

Final best evaluation computed is 0.017757433051313328.

## V. CONCLUSION

The main objective is to minimize the time, cost and effort required to test software where we need to implement certain evolutionary algorithms in software testing.

Genetic algorithm is one such evolutionary algorithm which can optimize the problem. The implementation study says that this novel genetic algorithm gives better results to increase quality of software by discovering errors. The overall aim was to develop a self-learning algorithm that has the ability to process and incorporate new information as the work environment changes (changing from one predicate to the next).

The GAs gives good results and their power lies in the good adaptation to the various and fast changing environments.

The primary objective of this research work was to propose a GA-based software test data generator and to demonstrate its feasibility. The main advantage of this novel Genetic Algorithm (GA) developed testing tool is the strength of GAs, in that the relationship between the predicate under investigation and the input variables may be complex and need not be known. Instrumentations capture the actual values of the predicates, so that the fitness can be based on these values.

In this research work a novel genetic algorithm (GA) is proposed, designed and implemented. The simulated results are shown in output screens. Global best evaluation is computed with the help of Booth's and Hump Camel functions.

All tests clearly show that the test data generated from Novel Genetic Algorithm are significantly better than randomly generated data.

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# Mathematical Models for the Coronavirus Disease (Covid-19) Pandemic

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**Abstract-** This paper presents mathematical models on the growth of the number of cases infected by the Covid-19 virus and the number of deaths caused by the Covid-19 virus. Four models are being considered, the linear, quadratic, cubic and the exponential. Analysis shows that the exponential function is the appropriate model for this pandemic. Forecasted results are very alarming. This can result to human extinction. Moreover, we recommend our humble tangible solutions for the control and to minimize the number of incidents.

**Index Terms-** Mathematical Models, COVID-19, Linear Function, Quadratic Function, Cubic Function, Exponential Function and Curve Estimation

## I. INTRODUCTION

The sporadic increase of the number of cases and deaths caused by the Coronavirus Disease or the Covid-19 is very alarming. As of this writing there is no cure, drug or vaccine which has been discovered. We tried our best in pondering why we have not discovered this solution despite of the very high level of the state of the art, science and technology that we have at present.

Different countries all over the world are in a panic situation. Panics in storing and buying necessary goods and supplies for the purpose of saving and securing lives are the immediate solutions to these crises. One possible solution we come out in our minds is to come out with a mathematical model on the number of cases and deaths caused by this virus. At this very stage, this is considered to be pandemic. Almost all countries in the world are affected.

In this paper we present appropriate mathematical models for the guidance of everyone especially the persons in authority and power.

## II. THE MATHEMATICAL MODELS

In this paper, we present two mathematical scenarios. One scene is on the number of cases and the other scene is on the number of deaths. The source of our data is from the website ([worldometers.info/coronavirus](http://worldometers.info/coronavirus)). We started with day 0 for January 22, 2020. Our cut-off day is 59 and this is March 21, 2020. For each scenario, we consider four possible models, the linear, quadratic, cubic and the exponential functions.

We try to employ the graphical method in modeling. According to Lee, Elisa t. (1992) graphical methods have long been used for display and interpretation of data because they are simple and effective. Moreover, (Lee, 1992) emphasized that graphical methods are often used in placed of or in conjunction with numerical analysis, a plot of data simultaneously serves as a number of purpose that no numerical method can.

Walpole (1992) commented that if the set of data can be represented by a nonlinear regression curve, we must then try to determine the form of the curve and estimate the parameters.

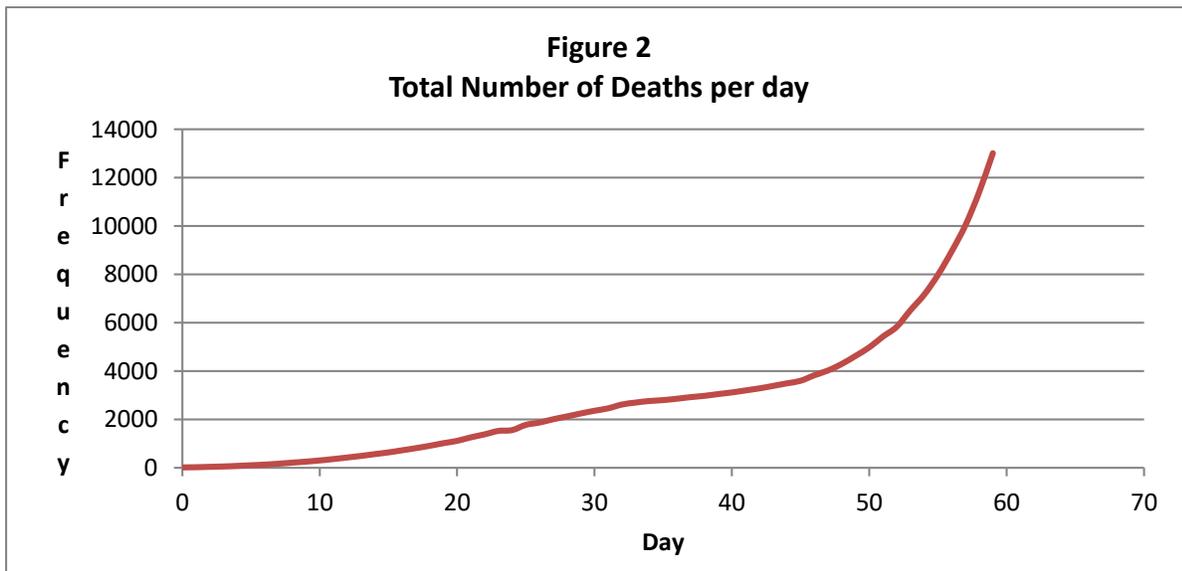
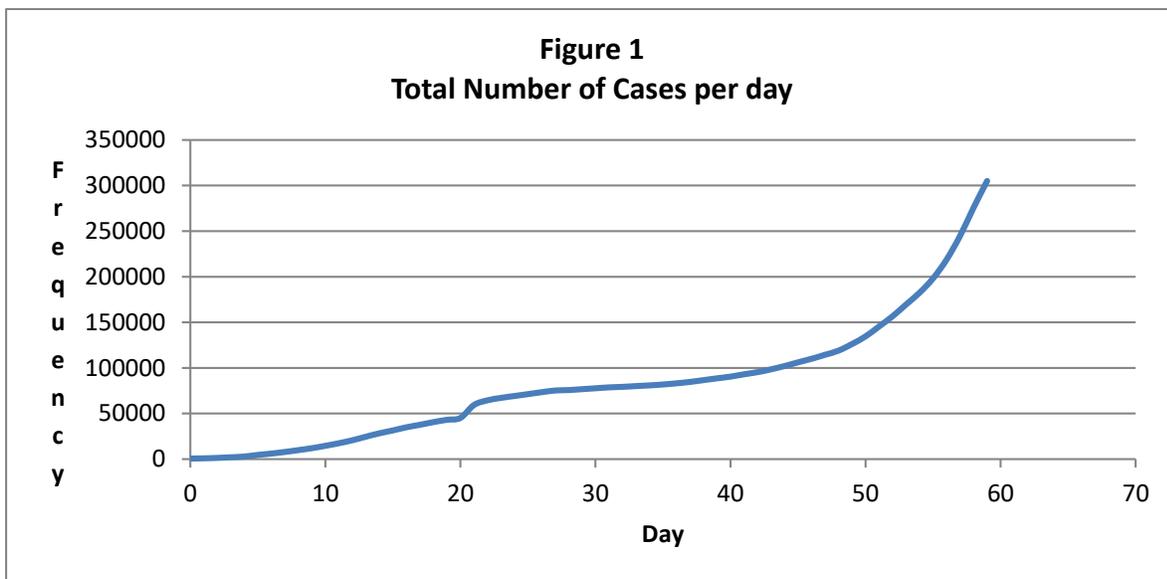


Figure 1 is all about the total number of cases per day, while Figure 2 is all about the total number of deaths per day. It is interesting to note that both graphs are in the increasing pattern. From day 0 to day 50, the graphs have the linear trend, however from day 51 to day 59 an exponential or a power function can be seen.

Table 1  
 Curve Estimation for the Total Number of Cases

<i>Dependent</i>	<i>Model</i>	<i>Rsq</i>	<i>d.f.</i>	<i>F</i>	<i>Sigf</i>	<i>b0</i>	<i>b1</i>	<i>b2</i>	<i>b3</i>
CASES	LIN	.837	58	298.08	.000	-23310	3573.09		
CASES	QUA	.901	57	260.07	.000	13116.8	-195.20	63.8693	
CASES	CUB	.960	56	445.81	.000	-26067	8125.84	-291.70	4.0177
CASES	EXP	.783	58	209.05	.000	5511.41	.0721		

From Table 1, we can see that the linear, quadratic, cubic and exponential functions are appropriate models for the growth of the total number of cases due to COVID 19. Below are their equations, where y is the total number of cases and t is the number of days:

$$y = -23310 + 3537t \tag{1}$$

$$y = 13116.8 - 195.2t + 63.8693t^2 \tag{2}$$

$$y = -26067 + 8125.84t - 291.70t^2 + 4.0177t^3 \tag{3}$$

$$y = 5511.41e^{0.0721t} \tag{4}$$

Of the four models the cubic function shows the best fit with the highest f value. As can be seen also in the graphs in Figure 3, the cubic function has the best fit. However by further analysis and by using forecasting as reflected in Table 2.

Figure 3 Graphs of the Appropriate Models for Total Number of Cases

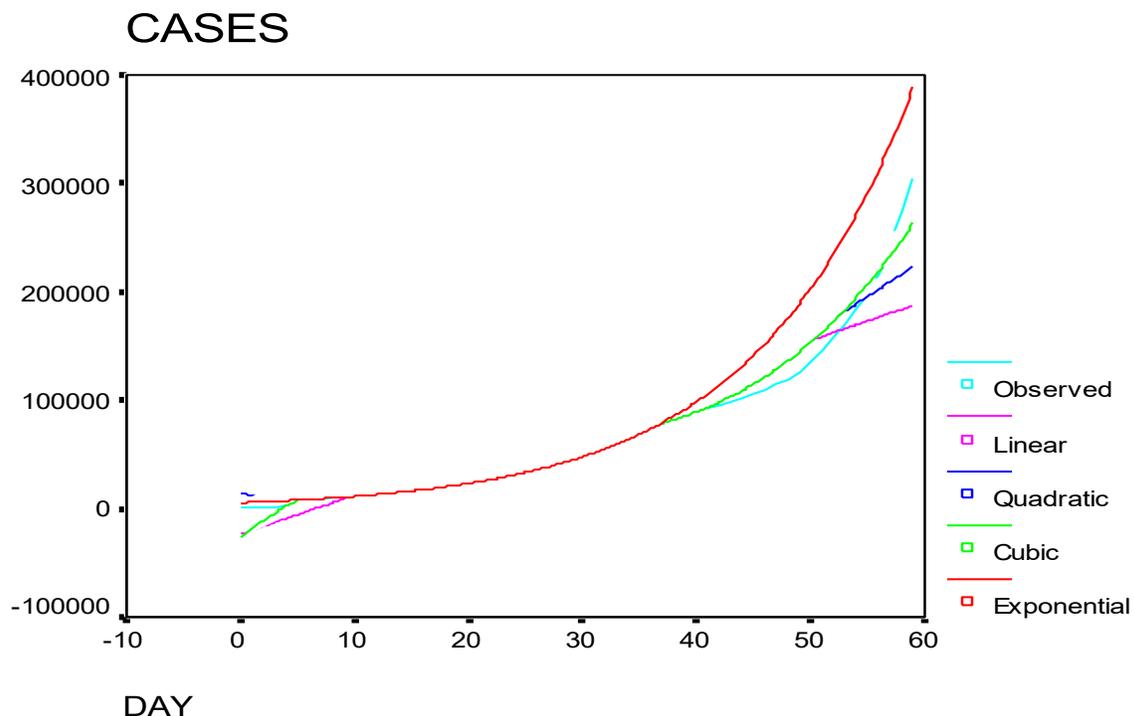


Table 2 can validate the four models by considering Day 67. On day 67, March 29, 2020, the website (worldometers.info/coronavirus) records 683,563 cases which is almost near to 690,504 cases, the forecasted value by the exponential model. It is amazing and noteworthy that the total number of cases behaves to be exponential. By day 100 (May 1, 2020) the total number of cases rises to 7.45 million and by day 200 (August 9, 2020), the total sums up to 10.1 billion. As of March 30, 2020, the world has a population of 7.77 billion people (worldometers.info). Thus, it is expected that by day 197 (August 6, 2020), the entire population of the world will be infected by this virus, granting that there is no cure that has been discovered.

Table 2  
 Forecasted Number of Cases

Model	Day 67	Day 100	Day 200	Day 300	Day 400	Day 500	Day 1000
Linear	239,168	357,077	714,377	1,071,677	1,428,977	1,786,277	3,572,777
Quadratic	286,746	632,287	2,528,837	5,702,767	10,154,077	15,882,767	63,686,917
Cubic	417,298	1,887,217	22,072,701	84,636,585	213,685,069	433,324,353	3.73E+9
Exponential	690,594	7,456,703	1.01E+10	1.36E+13	1.85E+16	2.50E+19	1.13E+35

Table 3  
 Possible Models for the Total Number of Deaths

<i>Dependent</i>	<i>Model</i>	<i>Rsq</i>	<i>d.f.</i>	<i>F</i>	<i>Sigf</i>	<i>b0</i>	<i>b1</i>	<i>b2</i>	<i>b3</i>
DEATHS	LIN	.777	58	202.51	.000	-1475.0	145.981		
DEATHS	QUA	.904	57	268.91	.000	696.821	-78.695	3.8081	
DEATHS	CUB	.956	56	407.33	.000	-868.54	253.728	-10.397	.1605
DEATHS	EXP	.872	58	395.81	.000	114.678	.0835		

From Table 3, we can see that the linear, quadratic, cubic and exponential functions are appropriate models for the growth of the number of deaths due to COVID 19. Below are their equations, where y is the total number of deaths and t is the number of days:

$$y = -1475 + 145.981t \tag{5}$$

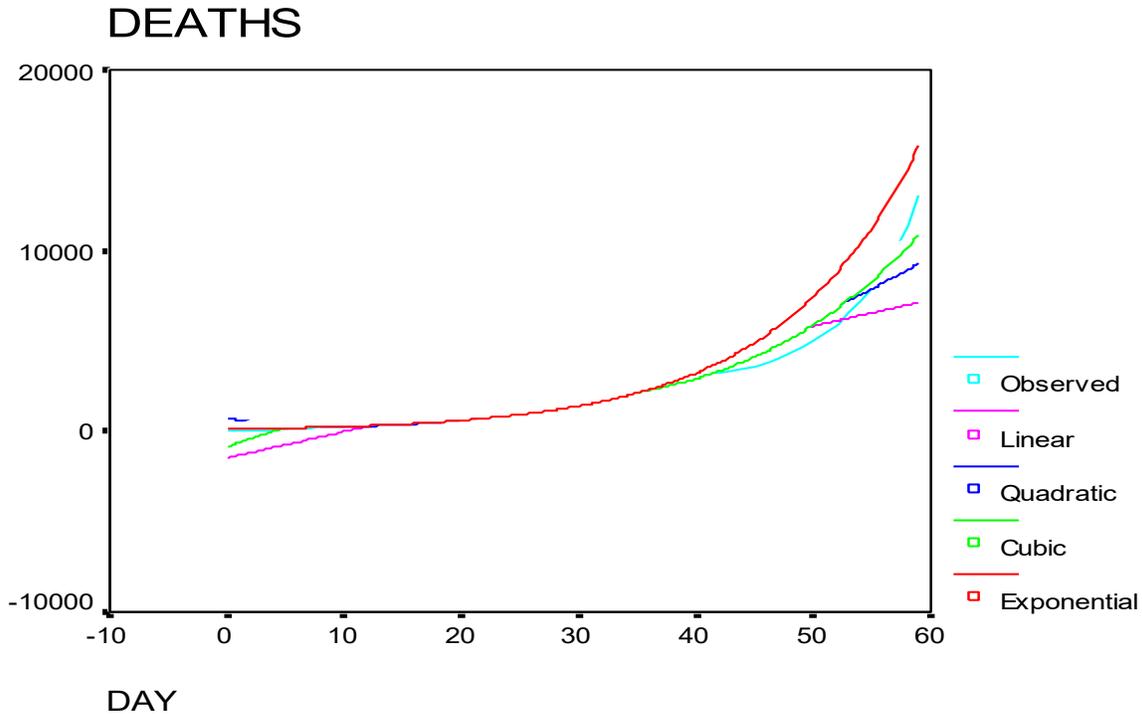
$$y = 696.821 - 78.695t + 3.8081t^2 \tag{6}$$

$$y = -868.54 + 253.728t - 10.397t^2 + .0160t^3 \tag{7}$$

$$y = 114.678e^{0.0835t} \tag{8}$$

Of the four models the cubic function shows the best fit with the highest f value. As can be seen also in the graphs in Figure 4, the cubic function has the best fit.

Figure 4 Graphs of the Appropriate Models for the total number of deaths



In a similar fashion with the total number of cases, the model for the total number of deaths can be validated in Table 4 by looking at Day 67 (March 29, 2020). As recorded by the website (worldometers.info/coronavirus), reaches 32,144 deaths. The total number of deaths as forecasted by means of the exponential function is 30,843. This is the closest value with respect to the four models. By day 216 (August 25, 2020), human population will be terminated, assuming at this point of time there is no vaccine and no cure being discovered. This is very terrible and horrifying, no one will be left in the world, and this is the total termination of human beings.

Table 4  
 Forecasted Number of Deaths

Model	Day 67	Day 100	Day 200	Day 300	Day 400	Day 500	Day1000
Linear	8,294	13,106	27,687	42,268	56,849	71,430	144,335
Quadratic	12,519	30,908	137,282	319,817	578,515	913,374	3,730,102
Cubic	17,581	80,534	913,997	3,459,520	8,677,103	17,526,745	149,855,859
Exponential	30,843	485,136	2.05E+9	8.68E+12	3.67E+16	1.55E+20	2.11E+38

### III. CONCLUDING REMARKS

A mathematical model is an abstraction from the realities. According to George E. P. Box (1979), “Models, of course, are never true, but fortunately it is only necessary that they be useful”. There is no such perfect model that will really give a true picture of a certain reality. This is due to the primary basis that models were formulated with various assumptions. We hope that with this output, we can be of help to be guided by this model.

The exponential function provides a very alarming forecast. This can result to human extinction. In this time that neither cure nor vaccine is being discovered we humbly recommend the following:

1. Establishing checkpoints in the heavy traffic highways and streets for the purpose of checking body temperatures is not an appropriate measure. This will just complicate the problem of traffic flows and management. Congestion in the checkpoints can expedite the transmission of the virus due to the closer contacts of individuals. The very good move is a house to house check-up. Those who will be considered to be positive should be advised for self-quarantine or be housed in emergency quarantine housing. Segregation of Persons under Investigation and Persons under Monitoring away from their respective family members is highly recommended.
2. Establishing of an emergency housing for those persons who are considered persons under observations or persons under monitoring. This housing will serve as the quarantine hostel for these people. Hospitals at this time are totally congested. Sports facilities such as gymnasiums, astrodomes and coliseums are good accommodations. Dormitories of State Universities and Colleges can also be used if they have. School buildings and classrooms can be utilized. Build a quarantine area with a hospital settings, facilities and health workers to attend the needs of the COVID patients. Categorize them by color coding such as severity or priority, critical, high chance of survival or recovery, low chance of recovery, old and young patients.
3. Set up an isolated island that will cater patients with infectious disease for in case in the future we might encounter this pandemic. We are one step ahead of preparation in this campaign.
4. It is suggested that classes should be temporarily suspended until a cure or vaccine has been discovered.
5. The best method and procedure for the burial of deaths in these cases is cremation. If possible there should be a mass cremation for a big number of deaths.
6. Minimize the usage of currency bills and coins. This is a good medium for the transmission of the virus.
7. Establish a mobile grocery store or mobile market. This will reduce dense and congested traffic flow in terms of human and goods.
8. Government should provide an emergency funding for this health crisis. We request that authorities should be sincere and committed in applying the protocol as provided by the orders of the highest official in the country. We advised them not to corrupt the process. Remember that corrupted money will just go to the hospital. At this very critical moment it is necessary to love one another.
9. Obey and respect the official authorities in your respective countries, cities, municipalities and barrios.
10. Eliminate and prohibit mass gatherings, forums, conferences and conventions.
11. Conduct survival analysis studies on this COVID-19 pandemic.
12. The best move and action is the prayer. Prayer for the immediate recovery of the infected persons and for the discovery of vaccine and drug that can terminate this virus. Prayer for the officials and authorities so that they will be given wisdom in making the appropriate decisions.

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# To find out the incidence of different non-neoplastic lesions in resected segment of ileum and colon

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**Abstract-** Background-The small intestine and large intestine accounts for most of the GI tract length and are the sites of a broad array of diseases. Small intestine is the principal site for digestion and absorption of ingested food from the gastro-intestinal tract.

**Methods-** This study was Conducted in the Department of Pathology at Sardar Patel Medical College and Associated group of hospitals, Bikaner. This study was hospital based prospective study. All the resected segments of ileum and colon received for histopathological examinations showing non-neoplastic lesions were included in the study.

**Results-** In the present study non-neoplastic intestinal lesions were most commonly encountered around 3<sup>rd</sup> to 6<sup>th</sup> decade of life accounting for 20.40% and 17.34% respectively, while only 3.06% of cases were above 70yr of age. A male predominance was seen in ileum & colon accounting for 36.73% and 26.53% of cases respectively. The incidence of non-neoplastic lesions affecting ileum & colon in females accounting for 22.44% and 13.26% respectively.

**Conclusion-** Our study shows that the lesions of ileum and colon can affect wide range of age groups with different etiological factors.

**Index Terms-** Non-neoplastic lesions, Ileum, Colon

## I. INTRODUCTION

The small intestine and large intestine accounts for most of the GI tract length and are the sites of a broad array of diseases. Small intestine is the principal site for digestion and absorption of ingested food from the gastro-intestinal tract. Whereas the principal function of the large intestine is recovery of water and salt. Some of the diseases are related to nutrient and water transport. Perturbation of these processes can cause malabsorption and diarrhoea. The intestines are also the principal site where the immune system interfaces with a diverse array of antigens present in food and gut microbes. Thus small intestine and large intestine frequently encounter infectious and inflammatory processes.<sup>1</sup>

Resected segments of small bowel & large bowel form the major bulk of specimens in the pathology department. They include both neoplastic as well as non neoplastic lesions. Non-neoplastic lesions are a major challenge for both surgeons & pathologists. Most common non-neoplastic lesions accounting for ileocolic

resections are inflammatory bowel disease and ischemic disease. The incidence of these are increasing. Successful management of patients necessitates a close working between endoscopist, surgeon and pathologist.<sup>2</sup>

## II. MATERIAL AND METHODS

This study was Conducted in the Department of Pathology at Sardar Patel Medical College and Associated group of hospitals, Bikaner. This study was hospital based prospective study. All the resected segments of ileum and colon received for histopathological examinations showing non-neoplastic lesions were included in the study.

**Inclusion criteria-** All the resected biopsy specimen of ileum and colon suspected to have non-neoplastic lesions.

### Exclusion criteria-

- 1) Neoplastic lesions of ileum and colon
- 2) All lesions of duodenum, jejunum, appendix, cecum, rectum.
- 3) Inadequate biopsies

## III. MATERIAL

Glass slides, formalin, ethanol, xylene, paraffin wax, cassettes, Leuckart's mould, rotary microtome, automatic tissue processor, H&E stain & microscope.

## IV. METHOD

Excisional biopsies of all cases of ileum and colon lesion were sent in 10% formalin fixative solution to the histopathology section from surgery department. These small samples were then put in cassettes and immersed in formalin for fixation.

## V. OBSERVATIONS

The present study was conducted for a period of 2 years from 1st July 2017 to 30th June 2019 in the Department of Pathology at Sardar Patel Medical College and Associated groups of PBM Hospital, Bikaner.

We received a total of 98 surgical specimens of ileum and colon which show non-neoplastic lesions. A thorough histopathological examination was conducted which showed a varied etiology of the lesions which were documented and reported.

**Table 1: Age & sex wise distribution of intestinal lesions in present study**

Age group in years	Male		Female		Total	
	No.	%	No.	%	No.	%
0-10	4	4.08	5	5.10	9	9.18
11-20	6	6.12	7	7.14	13	13.26
21-30	14	14.28	6	6.12	20	20.40
31-40	8	8.16	3	3.06	11	11.22
41-50	8	8.16	5	5.10	13	13.26
51-60	11	11.22	6	6.12	17	17.34
61-70	9	9.18	3	3.06	12	12.24
>70	2	2.04	1	1.02	3	3.06
Total	62	63.26	36	36.73	98	100%

In present study, most of the patients were found in the age group of 21-30 years(20 cases,20.40%) followed by 51-60 years of age group (17 cases,17.34%). Minimum number of patients were found in the age group of >70 years (3 cases,

3.06%). Out of 98 cases mostly were seen in males (62 cases) predominantly affected in the 3<sup>rd</sup> and 6<sup>th</sup> decades. However, the females(36 cases) were mostly affected in 2<sup>nd</sup>, 3<sup>rd</sup> & 6<sup>th</sup> decades.

**Table 2: Site wise distribution of intestinal lesions in accordance to sex in the present study**

Gender distribution	Small intestine (Ileum)		Large intestine (Colon)		Small and large intestine(Ileocolic)		Total	%
	Total	%	Total	%	Total	%		
Male	36	36.73	26	26.53	0	0	62	63.26
Female	22	22.44	13	13.26	1	1.02	36	36.73
Total	58	59.18	39	39.79	1	1.02	98	100

The present study revealed a male predominance (63.26%) while female contributed 36 out of 98 cases(36.73%). The male to female ratio was found to be 1.72:1.

**Table 3: Age and sex wise categorization of non-neoplastic intestinal lesions in the present study**

Age in years	Small intestine(Ileum)			Large intestine(Colon)			Small& large intestine(Ileocolic)			Total	
	Male	Female	Total	Male	Female	Total	Male	Female	Total	No.	%
0-10	3	2	5	1	2	3	0	1	1	9	9.18
11-20	3	6	9	3	1	4	0	0	0	13	13.26
21-30	10	4	14	4	2	6	0	0	0	20	20.40
31-40	2	2	4	6	1	7	0	0	0	11	11.22
41-50	4	3	7	4	2	6	0	0	0	13	13.26
51-60	9	4	13	2	2	4	0	0	0	17	17.34
61-70	4	1	5	5	2	7	0	0	0	12	12.24
>70	1	0	1	1	1	2	0	0	0	3	3.06
Total	36	22	58	26	13	39	0	1	1	98	100

In the present study non-neoplastic intestinal lesions were most commonly encountered around 3<sup>rd</sup> to 6<sup>th</sup> decade of life accounting for 20.40% and 17.34% respectively, while only 3.06% of cases were above 70yr of age.

A male predominance was seen in ileum & colon accounting for 36.73% and 26.53% of cases respectively. The incidence of non-neoplastic lesions affecting ileum & colon in females accounting for 22.44% and 13.26% respectively.

## VI. DISCUSSION

Various lesions affecting the small intestine and large intestine are obstructive lesions (adhesions, volvulus, intussusceptions), ischemic bowel disease, infectious enterocolitis, inflammatory bowel disease, granulomatous inflammatory diseases including tuberculosis, polyps, carcinoma, carcinoid tumours and lymphomas.

The intestinal lesions may vary from common to rare causes including non-neoplastic and neoplastic lesions which require different modalities of treatment.

Non neoplastic lesions are mainly found in small intestine while large intestine harbours most of the neoplastic lesions.

The present study was conducted for a period of 2 years from 1<sup>st</sup> July 2017 to 30<sup>th</sup> June 2019 in the Department of Pathology at Sardar Patel Medical college and Associated group of PBM Hospitals, Bikaner.

We received a total of 98 surgical specimens of ileum and colon which show non-neoplastic lesions. A thorough histopathological examination was conducted which showed a varied etiology of the lesions which were documented and reported.

Intestinal lesions in the present study were mostly seen in 3<sup>rd</sup> and 6<sup>th</sup> decade of life, however the age of patients ranged from 0-70 years. The males were affected in 3<sup>rd</sup> & 6<sup>th</sup> decades and the females were affected in 2<sup>nd</sup>, 3<sup>rd</sup>, & 6<sup>th</sup> decades of life.

The observations were in accordance with study carried out by Nanavati MG et al, 2014<sup>1</sup> which showed maximum no of cases in 3<sup>rd</sup> (23%) and 4<sup>th</sup> decades (18.5%) and Chityala Jyothi et al, 2016<sup>64</sup> which showed maximum no of cases were in 3<sup>rd</sup> and 6<sup>th</sup> decade 18.12% and 17.8% respectively.

In our study most common non-neoplastic intestinal lesion was found to be ischaemic enterocolitis with or without gangrene which was 26.53%. This finding is in consonance with study conducted by Sulegaon R et al, 2015<sup>3</sup> (25.53%).

In present study non specific enterocolitis has accounted for 21.42% cases which was similar to the studies conducted by Nanavati MG et al, 2014<sup>1</sup> (23.6%), Sulegaon R et

al, 2015<sup>3</sup> (34.04%), Chityala Jyothi et al, 2016<sup>4</sup> (58.44%), & Masgal et al, 2018<sup>5</sup> (46.15%).

## VII. CONCLUSION

Our study shows that the lesions of ileum and colon can affect wide range of age groups with different etiological factors.

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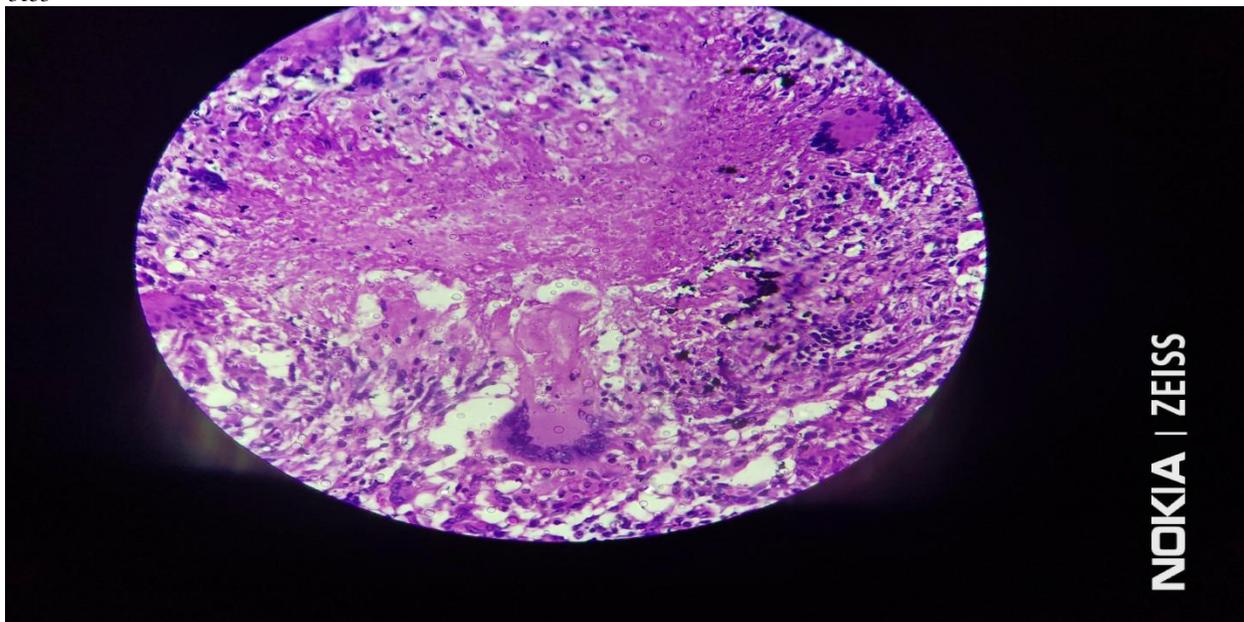
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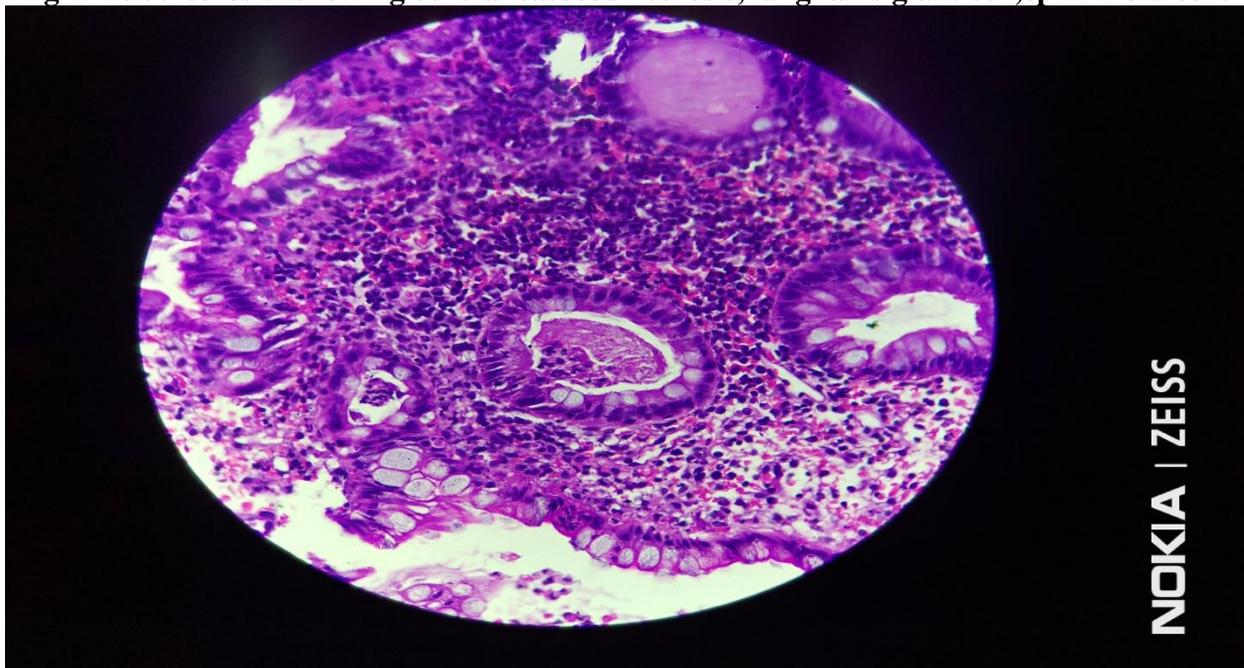
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**Fig 1. Tuberculosis: showing central caseous necrosis, langhan's giant cell,epithelioid cells**



**Fig 2. Ulcerative colitis:showing cryptitis and crypt abscess**

# Profile and function of green open space vegetation in Malang

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*Abstract-* Green open space is the areas developed to serve function as food, shade, protection, aesthetic and culture which is the main function to support the green city. The purpose of this study is to compare the profile and function of green open space in the city of Malang. This research was conducted in four green open spaces in Malang, East Java, Indonesia. Three of those were located in municipal areas as follow Veterans Green Belt (VGB), Jakarta Green Belt (JGS), Velodrome Green Space (VGS); while a study site was selected in a Permata Jingga Neighborhood Space (PNS), Neighborhood or resident area. Green space profile was analyzed by vegetation analysis indices including density, species richness and diversity. Green space function was assessed by interviews with informants. The level of density of green open space trees in Malang ranges from 505 to 1046 per hectare. The highest species richness, species diversity, and indigenous index found in VGS then followed by JBG. The high species richness, species diversity, and indigenous indices in Velodrome

are related to the shape of green space. The VGS is square while the other has a belt shape. Rectangle shape allows various types to grow in green space. The green spaces serve as shelter, protection, food, medicine, and aesthetic. Of the several types assessed, some species have a high enough use value. Avocados and manga were categorized as having a high utilization index as foods. Pine was considered to have a high medicinal use value. Gamhar, Palm oil, Mahogany, and Jackfruit have a high shading index. The Cockspur coral tree, Palm princess, Cuban royal palm and the Bottle brush have a high index of use to support the aesthetics of city parks, while Gamhar, mahogany, and Jackfruit use a high protection index.

**Key words-**biodiversity, city park, function, conservation, vegetation

## I. INTRODUCTION

The importance of urban green open space has been demonstrated in several studies [1]. Urban green open space is an important component that determines the quality of human life, both ecologically and socially-psychologically. The open green space is a meeting between natural and human systems in an urban environment. Urban green spaces, such as parks, forests, green roofs, streams, and community gardens, provide important ecosystem services. Green spaces also support physical activity, psychological well-being, and the health of the city's general public.

Green Space plays an important role in supporting urban ecological and social systems, a fact which supports public commitments in Britain and Europe. The amount of supply, distribution of green space, and access to that space are the main contributors to social and ecological functions in the urban environment. The development of Malang City has gone out of its original plan. Malang city. Change the same changes. Being a green open space (GOS) is a developed area [2]. Open space is a space that can be accessed by the public within a limited and indefinite period of time. Green open spaces can be built, walkways, city parks and urban forests. The minimum green space area of 30% is the minimum size of vegetated area to provide a balanced ecosystem of the area.

Green open spaces can control growth and maintain green areas, recreational areas or embracing. Guidelines are applied, effectively helping to save global effects and climate change in Indonesia. The concept offered by green developers is no more than a marketing strategy. Developers often associate the concept of green living with trees, plants, or the color of green. The most basic element of the Green City ecosystem is the main vegetation of trees; vegetation remains a balance of ecosystems in residential areas. Ecosystem elements that must remain balanced are hydrological function, microclimate, clean air and carbon dioxide, regulate environmental health, and synergize the natural and artificial environment.

Plant cultivation on the median road not only functions as aesthetics, but also has a functional value that can improve the function of the median road as a shade, a protector for road users. Therefore, species selection and plant management in the road median must be in accordance with the criteria for physical characteristics, plant ecology, road approval, and regulation for the road median [3].

The smart green city initiative is a combination of the concept of smart and green city in certain strategic areas. The background to this publication is the rapid growth of cities and various problems such as traffic jams, floods, landslides, slums, social gathering, and reducing the amount of green open space. In recent years, the region's problems

have become more severe because climate change requires people living in cities to think more carefully. Important to develop. These become policies and programs that are more challenging and responsive to change. The realization of smart and green cities as sustainable metaphor cities, according to the application of the principles of sustainable development, as well as providing urban needs and problems, as well as the challenges of climate change. The declining quality of settlements in urban areas can be seen from the increasingly severe congestion, the development of slums that are vulnerable to flooding, as well as the loss of green space for articulation and public health. The purpose of this study is to compare the profile and function of green open space in the city of Malang.

## II. MATERIAL AND METHOD

This research was conducted in four green open spaces in Malang, East Java, Indonesia. Three of those were located in municipal areas as follows Veterans Green Belt (VGB), Jakarta Green Belt (JGS), Velodrome Green Space (VGS); while a study site was selected on a Permata Jingga Neighborhood Space (PNS), Neighborhood or resident area (Figure 1).

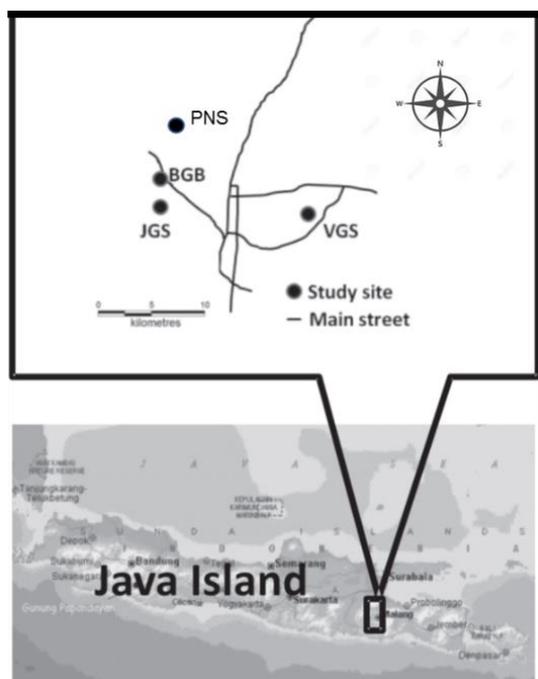


Figure 1. Map of study site in four green spaces in Malang, East Java, Indonesia [4]

The study would conduct comprehensive evaluation and analysis towards the following aspects, namely types and composition of vegetation, convenience index, landscape vegetation cover index, and green open space ecosystem. The logic model method for analyzing vegetation composition using quantitative method is used to run statistical analysis on the type and composition of vegetation, vegetation cover index towards objects found in green open space which involves green open space ecosystem (landscape). Vegetation function was analyzed using qualitative data from informants. The informants

consisted of 15 persons of vegetation expert. This analysis would result in the relationship between type of vegetation, and function as the elements of the smart green city.

## III. RESULT AND DISCUSSION

The results of this study indicate that the level of density of green open space trees in Malang ranges from 505 to 1046 per hectare. The highest species richness, species diversity, and indigenous index found in VGS then followed by JBG (Table 1). The high species richness, species diversity, and indigenous indices in Velodrome are related to the shape of green space. The VGS is square while the other has a belt shape. Rectangle shape allows various types to grow in green space.

Table 1. Green space species density and diversity among four study sites

No	VGB	JGB	VGS	PNS
Density (ind./ha)	505	607	1046	668
Number of species	28	38	46	29
Species diversity	2.23	2.91	3.05	2.85
Indigenous index	0.36	0.47	0.55	0.45

VGS consists of Narra (*Pterocarpus indicus*), Plam oil (*Elaeis guineensis*), Cockspur coral tree (*Erythrina crista galli*), Red Condo (*Mimusops elengi*), Platycladus (*Thuja orientalis*). The JGS consists of Mahogany (*Swietenia mahagoni* Jacq), Gamhar (*Gmelina arborea*), fountain tree (*Spathodea campanulata*), Mango (*Mangifera indica*), Avocado (*Persea americana*). The VGS Guanacaste (*Enterolobium cyclocarpum*), Butterfly Tree (*Bauhinia purpurea*), Gamhar (*Gmelina arborea*), Butterfly Tree (*Bauhinia purpurea*), Guanacaste (*Enterolobium cyclocarpum*), while the PNS consists of Rain Tree (*Samanea saman*), Plam oil (*Elaeis guineensis*), trees, silver date palm, (*Phoenix silvestris*) and cockspur coral tree (*Erythrina crista galli*).

Based on interviews with respondents the green spaces serve as shelter, protection, food, medicine, and aesthetic (Table 2). Of the several types assessed, some species have a high enough use value. Avocados and manga were categorized as having a high utilization index as foods. Pine was considered to have a high medicinal use value. Gamhar, Palm oil, Mahogany, and Jackfruit have a high shading index. The Cockspur coral tree, Palm princess, Cuban royal palm and the Bottle brush have a high index of use to support the aesthetics of city parks, while Gamhar, mahogany, and Jackfruit use a high protection index (Table 2).

Table 2. Respondent perception on vegetation on the utility value of green space plant species

Local name	(scientific name)	Sha.	Pro.	Food	Med.	Soc. Aes.
Avocado	( <i>Persea Americana</i> )	M	m	H		
giant crepe-myrtle	( <i>Lagerstromieia speciosa</i> )	M	l		L	M
Platycladus	( <i>Thuja orientalis</i> )	L	L			M
Norfolk pine	( <i>Araucaria heterophylla</i> )	L				M
cockspur coral tree	( <i>Erythrina crista-galli</i> )	L	M		L	H
Flamboyan	( <i>Delonix regia</i> )	M	M		L	H
Gamhar	( <i>Gmelina arborea</i> )	H	H		M	
The false ashoka	( <i>Polyalthia longifolia</i> )	M				M
Palm oil	( <i>Elaeis guineensis</i> )	H		M	L	M
Fern Tree	( <i>Fillicium desipiens</i> )	M	M		L	M
Mahogany	( <i>Swietenia mahagoni</i> Jacq)	H	H		M	L
Mango	( <i>Mangifera indica</i> )	M	M	H	L	
Jackfruit	( <i>Artocarpus heterophyllus</i> )	H	H	M	L	
Palm princess	( <i>Veitchia merillii</i> )	L				H
Cuban royal palm	( <i>Roystonea regia</i> )	M	M			H
Pine	( <i>Pinus merkusii</i> )	L			H	M
Kapok	( <i>Ceiba petandra</i> )	M	L			
Guanacaste	( <i>Enterolobium cyclocarpum</i> )	M	L		L	
The Crimson Bottlebrush	( <i>Callistemon citrinus</i> )	L	L			H
Narra	( <i>Pterocarpus indicus</i> )	M	M		L	
fountain tree	( <i>Spathodea campanulate</i> )	M	M			M
Red Condo	( <i>Mimusops elengi</i> )	M	M		L	M
Rain Tree	( <i>Samanea saman</i> )	M	M		L	M

Note: Sha. = shading, Pro. = protection, Med. = medicine, Soc. Aes. = social and aesthetic, H = high, M = medium, L = low

Green open spaces can be categorized as spaces where plants grow and are useful, and the types of plants that are planted in green space are trees, shrubs, shrubs, vines and

herbaceous plants. Open space has the power to shape the status of a city's character, social interaction and maintain the quality of its environment. Green space landscape is a man-made landscape as a result of human activities in managing the environment to meet their needs [5]. Green open spaces can take the form of roads, walkways, city parks, and urban forests. The minimum green space area of 30% is the minimum size of vegetated area to ensure the balance of the area's ecosystem. The ecosystem balance that is maintained is the hydrological function, the microclimate, the availability of clean air so that it can be guaranteed for the needs of its citizens and the absorption of carbon dioxide. In addition, vegetated areas can increase the aesthetic value of the area [6]. In addition, green space is also an important part of the conservation of biological resources of the local ecosystem and is also developed to maintain the quality of indigenous plants and environmental sustainability. This is expected to support the idea of the smart green city in Malang City. The results of this study indicate that the development of vegetation composition as supporting elements of green open space illustrates the composition of balanced vegetation. Most of the green open space in the area also functions as a park or road divider.

In addition to ecological functions, the function of green space has been recognized as a social and aesthetic function. City Park is a place to get a cool, fresh, calm and beautiful atmosphere for urban communities, including young people. City Park has become a community need for facilities that are used as aesthetic solutions and recreation areas, both children's groups, adolescents [7] older adults. Teenagers and children admit that they enjoy beauty and use various facilities in the city park, which is located close to their school [8]. Children and adolescents enjoy playing, walking on small bridges, climbing trees, and some obstacles such as shrubs because their activities in the environment and garden can enhance their aesthetic fantasy [9]. In addition, green space also supports behaviors important for physical activity [10]. The presence of large amounts of green space with good access in walking distance was found to be associated with more physical activity in the form of walking [11-13]. More recent studies have shown a positive relationship with physical activity in various forms, including sports, gardening, walking and cycling [13-14].

#### IV. CONCLUSION

The level of density of green open space trees in Malang ranges from 505 to 1046 per hectare. The highest species richness, species diversity, and indigenous index found in VGS then followed by JBG. The high species richness, species diversity, and indigenous indices in Velodrome are related to the shape of green space. The VGS is square while the other has a belt shape. Rectangle shape allows various types to grow in green space.

The green spaces serve as shelter, protection, food, medicine, and aesthetic. Of the several types assessed, some species have a high enough use value. Avocados and manga were categorized as having a high utilization index as foods.

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# Business Support Services and Performance of Small Medium Enterprises in Rwanda: Case of BDF Supported SMEs in Gicumbi District

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**Abstract-** Small Medium Enterprises (SMEs) play a great role in the growth of economy and in job creation. However, they face different challenges that constrain their growth prospective. The current study investigated the role played by Business Development Fund (BDF) in providing business support services to the SMEs to improve their growth. It was guided by three specific objectives where data was collected from a sample of 83 SMEs using structured questionnaire. Descriptive research design was used to analyze data. The findings showed that BDF provides business support services to SMEs in Gicumbi district in the form of credit guarantees, advisory services and matching grant/credit line. These services have been availed to majority of the SMEs 60% to help them start-up and operate successfully. The relationship between Business Support Services and performance of SMEs was adjusted R square= 0.736 implying it was strongly positive and statistically significant. BDF is recommended to decentralize its services and products to sector level in order to meet with the lowest income group of people.

**Key Words:** Business Development Fund, Financial Support, Matching grant, SME growth performance, SMEs

## I. Introduction

Small and medium enterprises (SMEs) have increased in numbers throughout the world, employing many people and have therefore turned to be regarded as engines of growth. Globally small and medium enterprises have a big impact in economic improvement as well as employment creation. SMEs have become drivers of economy where existing and upcoming entrepreneurs continuously provide fresh ideas, skills and innovations (Beck & Livine, 2005). As stated by Kongolo (2010) and Normah (2007), small and medium enterprises offer platform for the growth of economy in terms of providing job opportunities and bringing about innovation in an industry. They also form as sources of government funds through paying of taxes.

In Africa, the trend for SMEs is high with majority of the firms being SMEs. For instance in South Africa, more than 55% of the employed people worked in Small enterprises by 2003 and contributed to about 22% of the GDP. Similarly, micro and very small businesses contributed 16% jobs and production, medium and large contributing 26% employment and 62% of output. Similar picture is seen in Kenya where the number of people employed in the SMEs sector stood at

3.2 million in 2003 and contributing about 18% of the GDP in the country. At the time too, 90 per cent of all the firms operating in Kenya were small medium enterprises. Fifteen percent of the total formal job provision in Zimbabwe is by the small and medium enterprises (Ngui, 2014). According to a report by the Ministry of Trade and Industry (MINICOM, 2010) more than 72,000 SMEs operate in Rwanda with about 25,000 being registered formally. With respect to PSF study, Rwanda small and micro business enterprises is composed of 97.8 percent as private firms and attributed to 36% of employment in the private sector. However, these firms were found to be faced by challenges like improper accounting and financial systems. (MINICOM, 2010).

The significance of the SMEs segment and the features constraining the continued existence, progress and development of the sector remains to be at the pole position of policy discussions. This happens both to developing and to the developed countries. Government also ought to offer support and create supportive business environment for the SMEs to thrive in. In some of the empirical research conducted, (for instance, Mass & Herrington, 2006; Beek, 2007; Rogerson, 2008) the government support has been signaled out as the most influential factor for SMEs growth and development. It is also important to note that, majority of SMEs grow based on their relative competition in the market as well as the support to access credit from formal financial sector.

BDF was created in 2011 as an independent company by Development Bank of Rwanda (BRD) with partnership of the government of Rwanda for strengthening SMEs sector and facilitating creation of more jobs especially in younger entrepreneurs (BRD, 2011). BDF was initially started as only an institution offering credit guarantee. Later the government of Rwanda would get involved in the BDF and transformed it from just offering guarantee to also offering credit to small scale as well as to medium sized enterprises. The BDF therefore enlarged its operations and became an institution that offer credit guarantee, management of the grants, providing venture funds for starting up business, and also business advice services. BDF offer a wide range of services since the government interjections. This has come to be of help to many SMEs which were having difficulties in accessing these services. However, much need to be done

because the SMEs are still facing challenges in their operations and in their profitability.

One of the major challenge that face the SMEs is financial exclusion by formal financial institutions like banks. This has made it difficult for these SMEs to access credit or that they access at much higher rate. This has stifled their growth and development. Significant low figures of start-up Small and medium enterprises who apply bank loans succeed. This research therefore investigated the role of Business Development Fund (BDF) in supporting small and medium enterprises. These was guided by the following specific objectives

- i) To examine the level of business support services provided to Small and Medium enterprises by BDF in Gicumbi District.
- ii) To determine the level of performance of SMEs in Gicumbi District after obtaining support services from BDF.
- iii) To establish the relationship between business support services and performance of SMEs in Rwanda

## II. Literature Review

SMEs have a great potential of providing platforms for innovative ideas, technological advancement, product enhancement among others. Nevertheless, most of the SMEs end up underperforming due to the challenges that they face in their operations. Such challenges arise from lack of adequate finances, lack of skilled personnel, regulatory related issues, management challenges and lagging behind technological advancement, among others. It is therefore necessary to have the government interventions in creating a more competitive and supportive environment by providing mechanism like infrastructures and market accessibility. Consequently, need for establishing framework for sound regulations and financial support would auger well with the SMEs.

To achieve these, government can provide credit grantees. These refer to schemes whose main objective is to advance loans on guarantee basis to clients by sharing a portion or all the default risk that arise from the loan. In cases where the client fail to repay the loan, the lender generally cover up to the value of guarantee. The credit guarantee have some resemblance to other forms of credit like those with insurance and those with swaps (Ferrari *et al.*, 2014). There are two forms of credit guarantee schemes (CGS) that define mostly whether it is a private one or a public one. A public CGS is usually provided for by the government or in the public sector by a government agent. An example where CGS is public is in the case of Rwanda where the scheme, BDF is publicly initiated to enhance access to credit for SMEs. These public schemes are more visible in the emerging markets. On the other hand, a private CGS is one whose operation are ran and managed by private sectors or individuals. These schemes are more seen in the developed countries and are usually in the form of mutual guarantee schemes. Lastly, international credit guarantee schemes can also be designed in which case they are in the protection or support of international organization (UNIDO, 2003).

BDF deal with credit guarantees and it provides securities for those borrowing funds and could not be able to access the

same in the commercial banking. This could be because they are not eligible or due to lack of collateral to provide for the loan. In circumstances where an individual with a good business proposal approaches a bank for loan, he/she may not be given due to lack of enough collateral. In this case then, the bank can request the BDF scheme to cover as a guarantee the existing security gap (BDF, 2015).

According to UNIDO (2003) having credit guarantee schemes in an economy may act as a way of bridging existing financing gaps between small scale traders and large scale traders. They tend to enhance growth led by the private sectors as most of the SMEs are privately owned. The credit guarantee schemes may also end up reducing the lending risks to SMEs who in traditional lending are considered to be riskier and may at the same time lack the needed collateral for securing loans. The CGS may also be beneficial to the lending firms by providing necessary information about the borrower and at same time reducing the transaction costs on the side of lender as well as borrower.

SMEs can thus be able to reap benefits accruing from these CGS and be able to get finances to support their operations and their daily working capital. They can also be able to set aside the profit gained from their business to growth and development or even to other investment activities. In addition to these, the SMEs are able to compete favorably with other firms which do not have financing problems. They are also able to match competition with multinational companies operating with the country (Ferrari, Gąsiorowski & Gereben, 2014).

However, various criticism of this kind of scheme has been documented in literature. For instance Vogel and Adams (1997), argue that governments ought to spend their energy in correcting market imperfection instead of providing such funds to a particular segment of the economy. Further criticism is directed towards the government interventions on the normal operations of a bank. It is worth to note that banks are in a business of risk. Therefore the risk of default is inherent in their operations and should not be used as an excuse to provide guarantees. Banks should otherwise be able to deal with the risks they face including possible default from small scale borrowers (Seibel, 1995).

Another form of support for SMEs is through the provision of grants. These are provided towards investment activities that are at disadvantage of accessing funds elsewhere in the normal banking due to severe constrains like lack of collateral. It has also been directed to investments or sectors whose profitability are very unpredictable or whose risk are very high in comparison to other investment activities. These matching grant can be offered in liquid cash, in kind or as hybrid combing both cash and kind. In some cases such grant can be offered together with loans and or sometimes linked to other financial credit. These grant are much focused on provision of financial service towards socioeconomic infrastructure. They also target communally beneficial projects that will tend to gain more benefits to the more beneficiaries. They also differ from permanent transfers which target to provide services through channels like subsidies or safety nets. In Rwanda, BDF provides matching grants to the

best projects of startup entrepreneurs whom are unable to finance their business and it support such kind of financing for other SMEs for enhancing their growth and facilitating their performance.

According to Forbes (2015), a line of credit refers to loan advanced by a bank to individuals or to businesses whose terms are more flexible. The credit line offer the borrower an access to finance which he/she can repay at specified time or immediately on him/her finding ability to do so. Because, the line of credit is a form of a loan, it charges interest on borrowings and the borrower must meet the qualification criteria as set by the bank. In some occasion, the line of credit is granted based on the historical relation between the potential borrower and the bank.

With the existence of matching grants, the BDF offers guarantee to the bank such that the bank can be comfortable to extend the loan. It therefore acts as an investment cost subsidies for credit. For example, the BDF is currently managing rural investment facility which is being financed by the World Bank and through the Ministry of Agriculture.

According to Dyer and Ross (2008) SMEs face a lot of challenges that have made many of them fail in their operations. Some of these difficulties faced by SMEs include lack of marketing skills, poor planning management, lack of sound managerial skills and competencies, among others. Similarly Kamyabi and Devi (2011) cite these challenges and state that due to these challenges, SMEs are constrained in their operations as they seek to perform in their day to day operations. In addition to these, SMEs may find themselves constrained in their accounting and in their book keeping records (Evaraert *et al.*, 2006, 2007, 2010).

Ardiana *et al.* (2010) pointed out that the measured performance of an organization is the outcome of so many interrelated decisions made at different levels of an organization and at different stages of the output process. In case of SMEs the main measures of performance include sale volume, ability to meet the business day to day expenses, ability of the business to support the entrepreneur or owner's consumption needs. Moreover, small and medium enterprises will gauge they performance on the premise that they are able to satisfy the business needs as well as meeting the costs of the owner (Sembiring, 2016). According to Suharto (2010) various factors are behind the working conditions within SMEs.

For industries and the firms thereof to grow and expand, the main determinant is the ability to access finance. The story in the developing countries bring more challenges to SMEs to access the needed finance. They tend to face more pronounced difficulties to accessing finance at the time needed and at the affordability levels they can manage. The main reasons behind this financial access problems lie in the financial systems within the developing world that tend to place a big financing gap between the SMEs and large corporation. There is also the problem of high transaction and administrative costs in managing loans advanced to SMEs as well as collateral requirement which blocks SMEs from accessing funds Dalberg report (2011).

Various empirical research have pointed out that access to funding is one of the main force that drives the ability for firms to perform and to increasing the level of economically viable activities. According to Beck (2011) the growth and the prosperity of the SMEs is tied up to their ability to access funds easily and at affordable rates. Access to finance also tend to improve the general performance and daily operations of the firms. This is because firms will depend on their working capital to build their businesses. If the working capital is always a constrained one, then some or majority of the activities will be strained. Beck and Demirgüç (2008) point out that it is through the financial access that firms are able to grow, to reduce their risk exposure levels through sound risk management and also enhance innovations and entrepreneurial activities. Further, to this those firms that have adequate financial abilities are able to expand further and seize business opportunities through research and development (Beck, *et al.*, 2006). It can therefore be concluded that, the total production and economic activities are more enhanced in an economy that is able to provide funds for entrepreneurship (World Bank 2010) for reducing the greatest financial limitations particularly in low income nations.

The concept of growth of SMEs is indicated by the increase year by year of productivity and sales (Ronstadt, 2000). The growing business is characterized by generating enough cash, considerable high growth rates and market position, product performance, attracting repeat customers, competitive pricing, hiring skilled and experienced workers and market development (Klapper, *et al.*, 2006). The growth can either be internally instigated or externally instigated with the underlying firms being in a position to attend to both. In literature, growth of businesses has being studied by many and has led to various theories that try to explain these growth factor. On one side, some theories highlight the size and age as determinant of growth levels (Evans 1987; Heshmati 2001; Morone and Testa 2008). Mateev and Anastasov (2010) findings indicated that the enterprise growth is a function of its size, financial structure and level of productivity. Further, they suggested that asset base of a company determines how much it can grow especially in terms of sales volume with other intangible assets not having much influence.

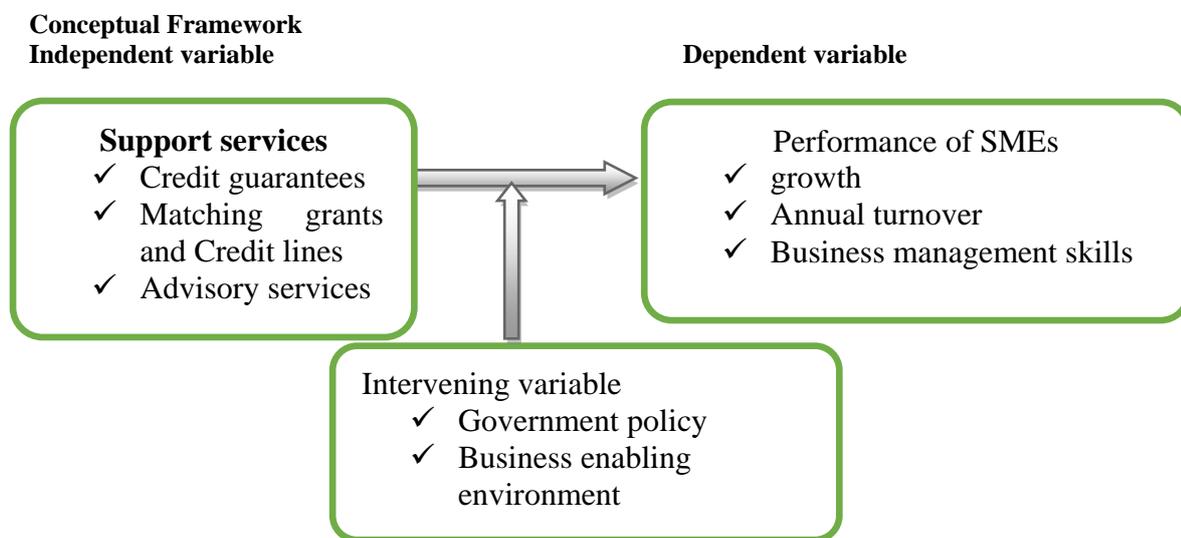
In their research, Lorunka *et al.* (2011) pointed out that the founder's gender has an impact on the firm's growth prospective. In addition other factors like capital invested at startup stage and strategies adopted by the firm are key indicator of whether the firm is having potentials of growth or not. Similarly, another key pointer to the growth factor is ability or commitment coming from the owner/founder which is a higher indicator than the number of employees. Study done by Nguyen, Gan and Hu (2015) tested the effect of financial access on SMEs' growth while Adade and Ahiawodzi (2012) in their study on the how the access to credit affect SMEs found out that there is a significant impact on SMEs in Ghana. Olowe, Moradeyo and Babalola (2013) in their study in Nigeria was concerned with establishing the effect of microfinance on the SMEs performance and growth. Ombongi and Long (2018) investigating the factors affecting the financial performance of SMEs concentrated in manufacturing.

**Theoretical Framework**  
**Contingency theory**

According to Fiedler (1964) contingency theory states that there exist no static model or formula that can be used for all firm to achieve their objectives or to streamline their operations. What this means is that, for organizations to be able to structure itself along a given path, it has to employ the operating contingency that best fit its technology. SMEs can be able to make use of this theory by adopting structurally innovative designs in their daily operation specifically in order to react to the challenges that SMEs world face. In addition to this, SMEs can adopt fitting strategies that can increase the effective and efficient methods of operations in their business management (Krishna *et al.*, 2012).

**Resources based theory**

According to Barney (1991), if a business is to grow or is to improve its performance, all it has to do is to look at the resources available to it. With the resources that a firm has, it can be able to create a competitive edge over its competitors and enhance performance. The focus here is on the resources that a firm has in terms of material resources, financial resource and human resources. This theory can be applicable in SMEs related cases of growth. This is because for SMEs to grow and expand their operations they must always start by enhancing the resources at their disposal in an efficient manner. As a matter of fact, an SME should not complain about inability to access funds if what it has it is unable to maximize on it. The theory fit well with the growth strategies that an SME can adopt. Such strategies should focus from first within and then externally. However, due to their strained resources, SMEs can as well seek resources outside but should be able to effectively utilize any resource that it acquires.



**Figure 1: Conceptual frameworks**

**III. Materials and Methods**

The study was conducted in Gicumbi district, and it involved a descriptive research design. The researcher used both quantitative and qualitative methods of data collection and analysis; this is involving the collection of data from the respondents and analyzes their response with the relation to the topic and area of the study. The target population was composed of 505 SMEs. For estimating the sample from population, the researcher used the following Yamane T. (1967) formula:  $n = \frac{N}{1+N*(e)^2}$  Where n is the sample size, N is

the total population and e is the error

$$\frac{N}{1+N*(e)^2} = \frac{505}{1+505*(0.1)^2} = \frac{505}{6.05} = 83.4 \approx 83.$$

Respondents were selected using purposive sampling technique based on size and location. The researcher collected primary data through use of questionnaire. Descriptive statistics were used to present data. In addition, Pearson’s coefficient correlations were used to determine the relationship between BDF and performance of SMEs in

Gicumbi district, Rwanda. Further regression analysis were conducted to give better analysis of the study variables.

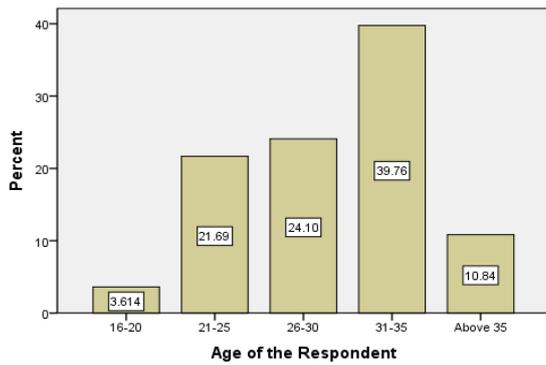
**IV. Results and Discussions**

**Part I: Demographic characteristics of the respondents**

**Table 1: Gender of respondents**

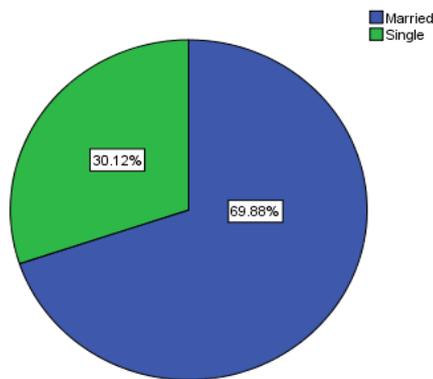
Gender	Frequency	Percentage
Male	57	68.7
Female	26	31.3
<b>Total</b>	<b>83</b>	<b>100</b>

Source: Primary data



**Figure 2: Age of the Respondents**  
Source: Primary data

The finding shows that the majority of respondents (39.76%) were aged between 31 to 35 years, followed (24.1%) respondents were aged between 26 to 30 years, 21.69% had years ranging from 21 to 25 years.



**Figure 3: Marital Status of respondents**  
Source: Primary data

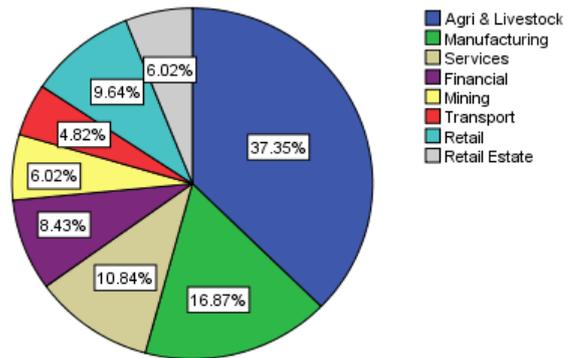
Figure 3 shows that majority of the respondents are married.

**Table 2: Distribution of respondents by Educational level**

	Frequency	Percent
Primary	7	8.4
VTC Certificate	19	22.9
Secondary Certificate	37	44.6
University	17	20.5
Master	3	3.6
<b>Total</b>	<b>83</b>	<b>100.0</b>

Source: Primary data

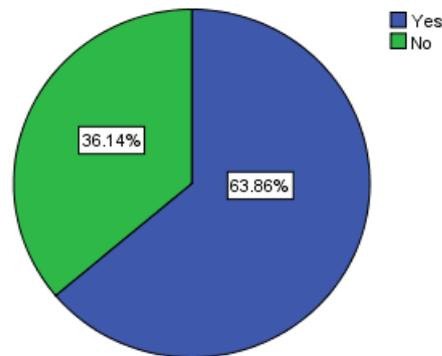
Table 2; the majority of the owners of the sampled SMEs were educated at secondary level as stated by 37 (44.6%) respondents, 19 (22.9%) had attending vocational training centers, 17 (20.5%) had university education, primary educated people were 7 (8.4%) while 3 (3.6%) SMEs had masters' degree. presented in Figure 4.3.



**Figure 4: Primary Business**  
Source: Primary data

The majority (37.35%) of surveyed SMEs were involved in the businesses of agriculture and livestock product and 16.87% of them were manufacturing SMEs as represented in Figure 4.3. Gicumbi district is rural district where agriculture and livestock are the major economic activities of its population. Those Activities were agricultural production, while manufacturing SMEs were in agricultural food processing and beverages making and bottling. Gicumbi district registered over 76% engagement in Agriculture and this was the highest employing sector as per the 2012 census (NISR, 2012a) and the finding in this study is in agreement and reflecting the national status.

**Part II: Findings based on the objectives**



**Figure 5: Did you start your business with support of BDF?**  
Source: Primary data

As represented in Figure 4.4 the majority, 53 (63.86%) of SMEs started their operations under BDF support. Consequently, BDF is assisting the startup businesses than existing ones because most of starting up businesses lacks collateral for getting bank loan as confirmed by manager of BDF Gicumbi in interviews with researcher. The remaining, 30 (36.14%) of the respondents did not start their business with the support of BDF.

**Table 3: which of the following financial support have you received?**

	Responses N	Percent of Cases
Credit Grant	45	57.7%
Matching Grant	36	46.2%
Credit Line	27	34.6%
Advisory Service	55	70.5%

Source: Primary data

Most (70.5%) of surveyed SMEs have received advisory services and 57.7% of the SMEs received credit grants while only 27% of them have received credit line, as clarified by Table 4.

**Table 4: Level of growth of sales volume and profitability since BDF support**

	Frequency	Percentage
Less Than 10%	26	31.3
10%-20%	34	41.0
20%-30%	14	16.9
30%-40%	5	6.0
40%-50%	2	2.4
Above 50%	2	2.4
<b>Total</b>	<b>83</b>	<b>100.0</b>

Source: Primary data

The findings showed that 41.0% of concerned SMEs had increased their sales volume and profitability in a range of 10% to 20%, while 31.3% had less than 10% of total sales volume and growth of profitability. A total of 16.9% realized an increase of 20% to 30%. A few SMEs made growth of 30% and above indicating that majority experienced growth of up to 30% in their first year of operation. This finding is consistent with findings that suggest SMEs struggle in their

**Table 7: Business management skills before BDF support**

	Highly Increased		Increased		Slightly Increased		No Change	
	N	%	N	%	N	%	N	%
Increased my employee numbers	0	0.0%	15	18.1%	16	19.3%	52	62.7%
Customers are satisfied	0	0.0%	0	0.0%	13	15.7%	70	84.3%
Market development	0	0.0%	3	3.6%	43	51.8%	37	44.6%

*Highly increased (1)      Increased (2)      Slightly increased (3)      no change (4)*

Source: Primary data

The business management skills of the SMEs owners was determined by their ability to expand their employee numbers and even retain them, ability to satisfy their customers and ability to develop market. According to the findings, 52(62.7%) of the SMEs had no increase in their employee numbers, 70(84.3%) had no change in their customer

**Table 8: Business management after BDF support**

first years and may not realize profits (Petkovic, Jager, & Sasic, 2016).

The annual turnover of the SMEs was measured by asking them to indicate the range of average turnover they make. The findings are presented in Table 6.

**Table 5: Annual turnover before getting BDF support**

	Frequency	Percent
Less than 4 Million	69	83.1
More than 5 Million	14	16.9
<b>Total</b>	<b>83</b>	<b>100.0</b>

Source: Primary data

The majority (83.1%) of surveyed SMEs agreed that their annual turnover was less than 4 Million but 16.9% responded otherwise. **Table 6: Annual turnover after getting BDF support**

	Frequency	Percent
Less than 4 Million	31	37.3
More than 5 Million	52	62.7
<b>Total</b>	<b>83</b>	<b>100.0</b>

Source: Primary data

According to Table 7 SMEs that made average turnover of less than 4 Million were 31 (37.3%) while those whose turnover were more than 5 Million were 52 (62.7%). The difference between BDF support and non BDF supported period is 38 (45.8%) increment in SMEs that earned more than 5 Million average turnover. This shows that BDF support helped these SMEs to improve in their production and sales. The finding is in line with that of Wekesa, Gladys, Bwisa, and Namusonge (2014) in which SMEs that received business management skills were able to improve their marketing strategies and customer satisfaction and in return increased their returns.

satisfaction while 43(51.8%) slightly developed their market. The finding shows that majority of the respondents did not manage to increase their employees and this affected the ability to satisfy their customers. Though majority managed to develop their market, the number that had not done so was also high.

	Highly Increased		Increased		Slightly Increased		No Change	
	N	%	N	%	N	%	N	%
Increased my employee numbers	14	16.9%	69	83.1%	0	0.0%	0	0.0%
Customers are satisfied	0	0.0%	31	37.3%	39	47.0%	13	15.7%
Market development	14	16.9%	60	72.3%	9	10.8%	0	0.0%

Highly increased (1)      Increased (2)      Slightly increased (3)      no change (4)

Source: Primary data

According to the finding, 14(16.9%) highly increased the number of their employees, 69(83.1%) increased their employees. A total 31(37.3%) increased customer satisfaction, 39 (47.0%) slightly increased customer satisfaction and 14(16.8%) did not do so. About market development, 14(16.9%) highly developed their market, 60(72.3%) increased and the remaining nine (10.8%) slowly developed their market. Business support services such as advisory services, training services among others are key for SMEs' success. These help them to manage their business through difficulty times like death stage (Modeer, 2013).

**Table 9: Factors that caused your business to fail**

	Frequency	Percent
Poor Management	20	24.1
Lack of Market	13	15.7
Natural Factors	18	21.7
Higher Competition	7	8.4
Government Policy (Taxes)	25	30.1
<b>Total</b>	<b>83</b>	<b>100.0</b>

Source: Primary data

The major causes of poor performance for SMEs were government policies that are related to taxes as agreed by 30.1% of poor performers' SMEs and poor management by 24.1% as well as natural factors by 21.7% for each. In the deep analysis with the help of interviewee, it was discovered that poor management is the most common cause of failure, and some financed projects were not well implemented due to various reasons; the will of loan holder where loan were deviated and being used in the other non-business concerned projects. In addition the cost of doing business in Rwanda is still high especially for new entrepreneurs who do not have sufficient funds to finance their businesses. Because the most financed projects were agriculture and livestock related businesses and much of them depending on climate conditions; climate change was also a cause of failure of some financed project.

The relationship between business support services and performance of SMEs was established through Pearson's coefficient of correlation and multiple regression analysis.

**Table 10: Pearson's Coefficients Correlation Matrix**

		Growth	Turnover	MgtSkills	CreditG	Advisory	MGCL
Growth	Pearson Correlation	1	.533**	.361**	.610**	.668**	.636**
	Sig. (2-tailed)		.000	.001	.000	.000	.000
	N	83	83	83	83	83	83
Turnover	Pearson Correlation	.533**	1	.759**	.585**	.773**	.746**
	Sig. (2-tailed)	.000		.000	.000	.000	.000
	N	83	83	83	83	83	83
MgtSkills	Pearson Correlation	.361**	.759**	1	.555**	.628**	.528**
	Sig. (2-tailed)	.001	.000		.000	.000	.000
	N	83	83	83	83	83	83
CreditG	Pearson Correlation	.610**	.585**	.555**	1	.621**	.476**
	Sig. (2-tailed)	.000	.000	.000		.000	.000
	N	83	83	83	83	83	83
Advisory	Pearson Correlation	.668**	.773**	.628**	.621**	1	.778**
	Sig. (2-tailed)	.000	.000	.000	.000		.000
	N	83	83	83	83	83	83
MGCL	Pearson Correlation	.636**	.746**	.528**	.476**	.778**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	

N	83	83	83	83	83	83
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\*\* Correlation is significant at the 0.01 level (2-tailed).

CreditG=Credit grant, Advisory=Advisory Services, MGCL= Matching grants and credit lines, MgtSkills= Management Skills

Source: Primary data

The researcher first presented the correlation matrix for all the study variables in this research. The results are as shown in Table 11 where all the variables were found to be positive and

significant at 0.05 since the p-values obtained were less than 0.05.

**Table 11: Model Summary between BSS and Growth**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.737 <sup>a</sup>	.544	.526	.31234

**ANOVA<sup>a</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	9.178	3	3.059	31.360	.000 <sup>b</sup>
	Residual	7.707	79	.098		
	Total	16.885	82			

a. Dependent Variable: Growth

b. Predictors: (Constant), MGCL= Matching grants and credit lines, CreditG= Credit grant, Advisory=Advisory Services

Source: Primary data

The first regression model that was determined was in relation between the business support services and growth of SMEs in Gicumbi District. According to the results displayed in Table 12, the R square was 0.544 while the adjusted R square was 0.526. This revealed that 52.6% of the changes in growth of

SMEs in Gicumbi district are as result of the BDF support services matching grant and credit line, credit grant and advisory services. In addition to this, the model is found to be significant since the p-value is found to be less than 0.05 according to the analysis of variance (ANOVA) output.

**Table 12: Regression Coefficient between BSS and Growth**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.188	.259		4.591	.000
	CreditG	.209	.063	.321	3.314	.001
	Advisory	.173	.101	.233	1.718	.090
	MGCL	.230	.092	.301	2.490	.015

a. Dependent Variable: Growth

CreditG=Credit grant, Advisory=Advisory Services, MGCL= Matching grants and credit lines, MgtSkills= Management Skills

Source: Primary data

Further, the researcher presented the regression coefficients for the first model between the Business Support Services (BSS) and growth of SMEs in Gicumbi district. According to the findings presented in Table 13, the coefficient for credit

grant and matching grant and credit lines were found to be significant since the p-values were less than 0.05. However, the coefficient for advisory services was not significant to the growth of SMEs in Gichumbi district.

**Table 13: Model Summary between BSS and Annual Turnover**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
2	.818 <sup>a</sup>	.669	.656	.31296

**ANOVA<sup>a</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
2	Regression	15.633	3	5.211	53.203	.000 <sup>b</sup>
	Residual	7.738	79	.098		
	Total	23.371	82			

a. Dependent Variable: Turnover

b. Predictors: (Constant), MGCL= Matching Grant and Credit Line, CreditG=Credit Grant, Advisory= Advisory Services

Source: Primary data

Table 14 shows the second regression model between business support services and annual turnover. According to the results, the R square was found to be 0.669 while the adjusted R square was 0.656. This implied that 65.6% of the changes in annual turnover of SMEs in Gicumbi district are as

a result of the changes in in business support services offered by BDF. Similarly, the regression model was found to be significant since the p-value in the ANOVA analysis was less than 0.05.

**Table 14: Regression Coefficients between BSS and Annual Turnover**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
2	(Constant)	.686	.259		2.644	.010
	CreditG	.134	.063	.175	2.114	.038
	Advisory	.331	.101	.378	3.269	.002
	MGCL	.331	.093	.368	3.570	.001

a. Dependent Variable: Turnover

b. MGCL= Matching Grant and Credit Line, CreditG=Credit Grant, Advisory= Advisory Services

Source: Primary data

The regression coefficients for the second model were also determined and displayed in Table 15. According to the regression analysis conducted, all the coefficients for business support services were found to be positive and significant to annual turnover. This is because the p-values obtained were

all less than 0.05. Hence, credit grant, advisory services and matching grants and credit lines were significant to the annual turnover.

**Table 15: Model summary between BSS and Management Skills**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
3	.665 <sup>a</sup>	.443	.422	.50867

**ANOVA<sup>a</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
3	Regression	16.237	3	5.412	20.917	.000 <sup>b</sup>
	Residual	20.441	79	.259		
	Total	36.677	82			

a. Dependent Variable: MgtSkills= Management skills

b. Predictors: (Constant), MGCL= Matching Grant and Credit Line, CreditG=Credit Grant, Advisory= Advisory Services

Source: Primary data

The third regression model was concerned about the relationship between business support services that is, matching grant and credit lines, credit grant and advisory services on one hand and the management skills on the other hand. The results for this analysis were displayed in Table 16. The table shows that the R square obtained was 0.443 while

the adjusted R square was 0.422. This revealed that 42.2% of the changes in management skill was due to the business support services offered by BDF. The analysis of variance, further showed that the third regression model was significant since the p-value obtained was less than 0.05.

**Table 16: Regression Coefficients between BSS and Management Skills**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		

	(Constant)	.674	.422		1.599	.114
3	CreditG	.258	.103	.269	2.513	.014
	Advisory	.414	.164	.378	2.519	.014
	MGCL	.119	.151	.106	.792	.430

- a. Dependent Variable: MgtSkills= Management Skills
- b. Predictors: (Constant), MGCL= Matching Grant and Credit Line, CreditG=Credit Grant, Advisory= Advisory Services

Source: Primary data

Table 17 shows the regression coefficients between business support services and management skills that were obtained in this research. According to the results, the p-values obtained for credit grant and for advisory services were found to be significant at 0.05 since they were less than the threshold of

0.05. However, the coefficient for matching grants and credit lines was more than 0.05, hence found not to be statistically significant to management skills for SMEs in Gicumbi district.

**Table 17: Regression model**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
4	.863 <sup>a</sup>	.746	.736	.23963

**ANOVA<sup>a</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
4	Regression	13.296	3	4.432	77.182	.000 <sup>b</sup>
	Residual	4.536	79	.057		
	Total	17.833	82			

- a. Dependent Variable: Performance
- b. Predictors: (Constant), MGCL, CreditG, Advisory

Source: Primary data

The last regression model that is the fourth model was to analyze the relationship between business support services and the overall performance of SMEs in Gicumbi district. The results for the model summary and ANOVA are represented in Table 18. According to this table, that R square was found to be 0.746 while the adjusted R square was 0.736 showing

that 73.6% of the changes in performance of the SMEs is influenced by the business support services provided by BDF. Moreover, the p-value obtained in the analysis of variance was found to be less than 0.05 showing that the model was significant at 5%.

**Table 18: Regression Coefficients between BSS and Performance**

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	
	B	Std. Error	Beta			
4	(Constant)	.849	.199		4.277	.000
	CreditG	.200	.048	.300	4.138	.000
	Advisory	.306	.077	.401	3.952	.000
	MGCL	.227	.071	.289	3.197	.002

- a. Dependent Variable: Performance

Source: Primary data

The final analysis that was conducted in relation to the regression coefficients between the business support services offered by BDF and the performance of SMEs in Gicumbi district. The analysis, as displayed in Table 19, revealed that

all the coefficients were significant to the performance of the SMEs because the p-values obtained were less than 0.05. This shows that the business support services, namely, credit grant, advisory services and matching grants and credit lines are

statistically significant to the performance of SMES in Gicumbi district.

The support given to SMEs have been found to significantly help SMEs to thrive beyond startup stage and business management skills positively affected performance of SMEs (Ofunya Afande, 2015). This finding supports the findings of the current study thereby establishing that a positive, strong and significant relationship does exist between Business Support Services provided by BDF and performance of SMEs operating in Gicumbi district.

## V. Conclusion

BDF provides business support services to SMEs in Gicumbi district in the form of credit guarantees, advisory services and matching grant/credit line. These services have been availed to majority of the SMEs to help them startup and operate successfully. Through the services the SMEs have experiences significant growth, increased annual return and developed their business management skills. Majority of the SMEs are in position to increase their sales volume and profits, greased their average annual return to above 5 million and increase the number of employees, customer satisfaction and develop their markets after joining BDF. The support provided to the SMEs have positively and significantly increased the performance of the SMEs in Gicumbi district.

## VI. Recommendations

Government of Rwanda is recommended to reduce taxes related to business stages in order to strengthen growth of SMEs. Throughout this study it has been identified that BDF weakened by its supervisory system to financed SMEs; some financial support were not used by SMEs what is requested for which is caused some of them to fail. For this reason BDF is recommended to strengthen its supervisory system in order to ensure best use of its financial support.

BDF is also recommended to decentralize its services and products to sector level in order to meet with the lowest income group of people who live in upcountry and have lower level of education; this was provided because to date BDF has direct employees at district level this cause lowest income group and lower educated people to feel BDF services as they are not concerned with. Small and medium enterprise were recommended to use guaranteed finance what is requested for and following the management advise given by BDF through advisory services. For young entrepreneurs and early stages SMEs are recommended to join BDF and learn how to successfully obtain finance for their projects.

The present study was carried out in the one branch of BDF among 30 branches countrywide; this allow other similar studies to be conducted in the other branches in order to get big picture of contribution of BDF and financial support of SMEs in Rwanda and the obtained results would be used for broader perspectives.

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# Impacts of rapid population growth and climate change on domestic water demand in Setif Province, Algeria: Present and future supply challenges

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## Abstract

Algeria has made recently tremendous efforts to cope with its water stress thanks to significant achievements in hydraulic infrastructure. Nevertheless, Setif Province remains one of Algerian provinces that are insufficiently supplied with drinking water. The demand may not be met in the short and long term by currently mobilized volumes due particularly to the rapid population growth, the climatic hazards.

Forecasting water demand is an effective tool that can be used to estimate future demand and deepen understanding of its short and long-term trends based on the selected variables. It concretely contributes to improve hydraulic infrastructure dimensioning, thus avoiding overuse of financial funds, and ensuring the sustainable management of natural water resources and their protection.

We focus in this paper firstly on analyzing population growth, water consumption evolution and implemented strategies to meet the demand in Setif Province since Independence Day. Then we expand our work to forecast future needs by 2030 through graphical simulation in order to show critical water shortages in light of rapid population growth and climate change hazards. We propose at the final stage adequate coping solutions that can help government to elaborate sustainable policies to protect water resources from overexploitation and depletion.

**Keywords:** Population growth impact, Domestic water demand, Climate change impact, Water stress, Future supply forecast.

## 1. Introduction

Fresh water is the source of life and necessary element for human well-being and development, evolution of life was possible thanks to the presence of water [1], any limited access to it generates socio-economic instabilities and unexpected insecurity ramifications. According to the UN report 2019 «World Water Development Report 2019», water use has been increasing worldwide by about 1% per year since the 1980s, driven by a combination of population growth, socio-economic development and changing consumption patterns. It is also expected that the global water demand will continue increasing at a similar rate until 2050, accounting for an increase of 20% to 30% above the current level of water use, mainly due to rising demand in the industrial and domestic sectors. Over 2 billion people live in countries experiencing high water stress, and about 4 billion people experience severe water scarcity during at least one month of the year. Stress levels will continue to increase as demand for water grows and the effects of climate change intensify [2, 3].

Setif Province, with big capability of mass population attractiveness due to its geographical position within the heart of the eastern highlands part of the country and the nature of socio-economical activities prospering within it, is one of the Algerian cities that is experiencing water stress since many years, triggered by severe cyclic droughts due to climatological conditions and exacerbated by the rapid population growth, which resulted in increasing the risk of depletion of the water resources to meet the ever increasing demand and put more pressures on them.

In addition to water resources scarcity, overexploitation, climatic factors, production capacity limitation, supply networks degradation and the financial funds lack for new projects, there are other constraints that worsen situation and limits household water supplies, like pollution hazards that threaten both ground and surface waters and water wastage through the non-sustainable management and use,

especially within such an arid region classified with the driest countries in the world [4, 5]. Algerian provincial authorities and central government leaders have been felt the crisis magnitude and immediately adopted strategic measures mainly based on launching new infrastructure projects, dams and desalination plants to meet the increasing domestic water demand [6-8], realisation of wastewater plants and promoting treated water reuse in order to fight against pollution hazards and protect natural resources [4].

The government has been also focusing on elaborating efficient supply policy that integrates resources saving through controlling the household water use and consumption [9]. Those efforts have contributed to reducing water shortages but the ultimate goal to keep offer pacing with demand was not reached as many parts of the province still facing acute frequent shortages. In this paper we will review domestic water in Setif Province since the independence, then we forecast future situation up to 2030. We start by exposing the demographic growth since 1962, we give a historic overview about domestic water in Setif Province, its achievement and the different steps that passed by, we will calculate future water needs and graphically simulate the situation by 2030, then we discuss the results and propose appropriate solutions.

## 2. Demographic growth

Setif Province is located about 300 km to the South East of the capital Algiers and covers an area of 6,549 km<sup>2</sup>. It was formerly attached to the province of Constantine [10], and then emerged from the administrative division of 1974. Setif Province is blessed with numerous geographic, historical and cultural particularities which offer real development assets and grant it the great population attractiveness especially for those who are seeking better living standards. After independence in 1962, Setif Province has gradually expanded especially with the first three-year plan (1967-1970), housing construction programs planned during the period (1970-1986), then with property development projects (1986-2000) in order to receive the ever increasing population which continues to happen to the present day [11]. Figure 1 shows population level and growth rate for Setif Province metro area (capital of the province) from 1950 to 2020 [12].

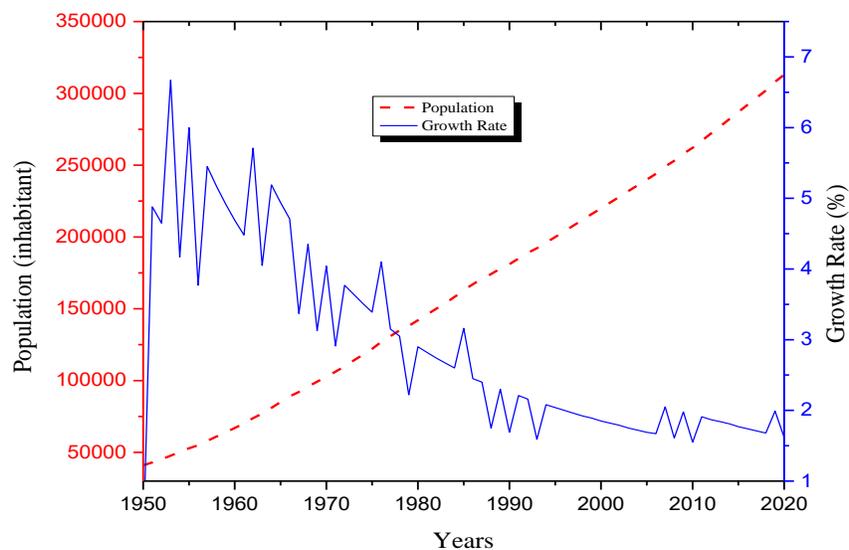


Figure 1: Population growth in the capital city of Setif Province, Algeria (1950-2030) [12]

Setif Province as whole witnessed very high growth rates in the early stages of independence, reaching its peak of 3.81% in the period 1977-1987, and then started to decline gradually until it reached its lowest level in the last census of 2008 (1.25%) where the number of population almost tripled as shown in Table 1.

Table 1: Population growth in the Setif Province (1950-2030) [13, 14]

	1962 - 1977	1987	1998	2008	2020
Population	686600	1000694	1311413	1482336	1897434
Growth ratio	2.95	3.81	2.43	1.25	2.03

During that period of time, the population growth of the province has changed a lot due to many reasons especially socio-economic conditions, inner and outer immigration, in addition to the loss of great parts of residents as a result of the administrative division change that was in 1974 and 1984, a several municipalities have been separated from the province and transferred their inhabitants to new ones [13]. The map in Figure 2 below shows the change of administrative boundaries of Setif Province to present day.

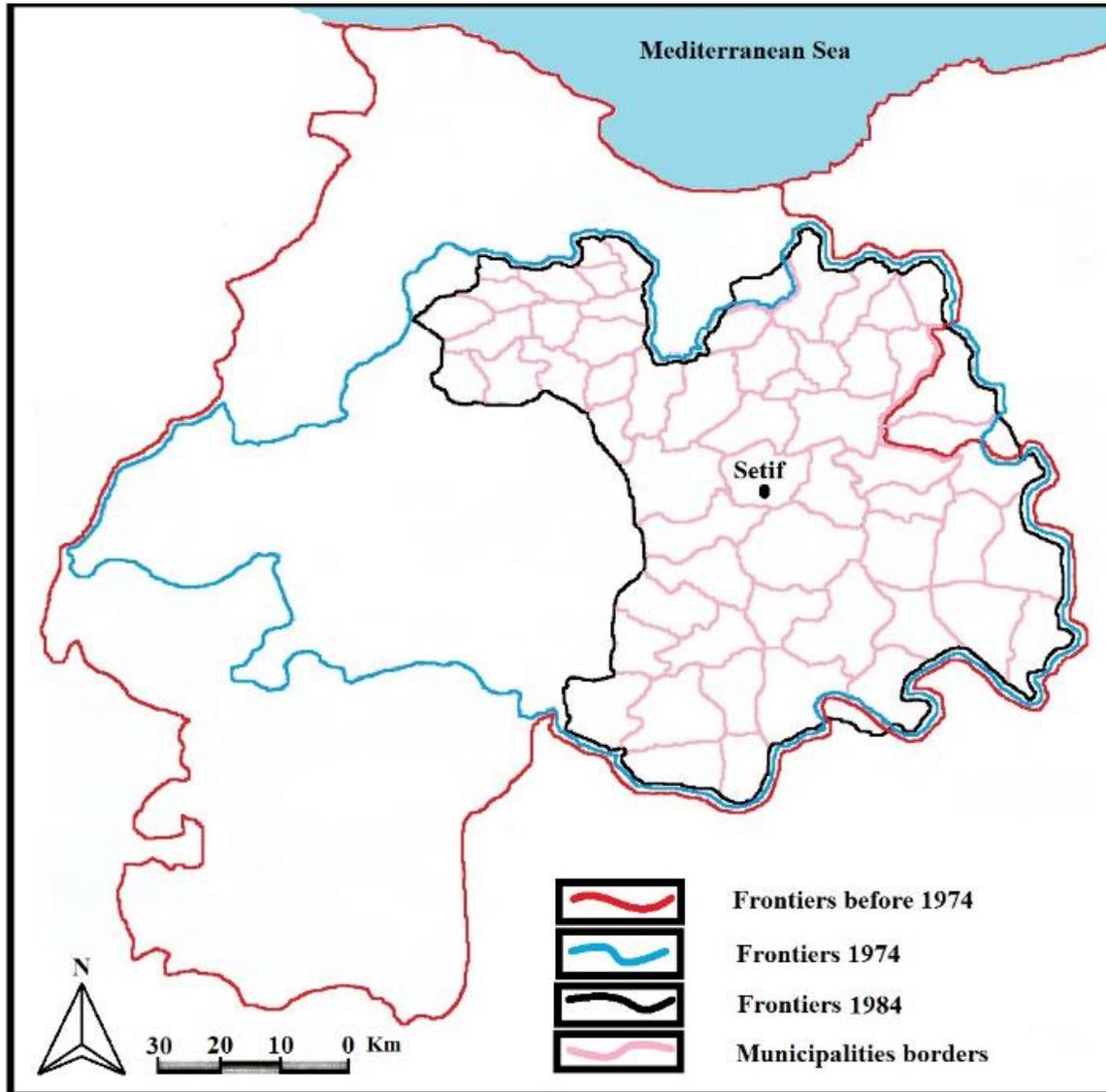


Figure 2: Provincial administrative boundaries reorganization of Setif Province, Algeria from 1962 to 2020 [14]

### 3. Historical overview of domestic water in Setif Province since independence

After Independence Day (1962), the whole country inherited the same difficult socio-economic conditions from the colonial era. Setif Province was not an exception, although that fact, the water resource was largely sufficient to satisfy the demand of the residents, they were supplied from the conventional waters of little abundant surface sources spread on the territories of the province, but the great part comes from underground origins (wells, boreholes) [15]. This situation didn't last longer to be turned upside down due to pressure on those resources, the main reasons were essentially the population growth and water wastage behaviour that appeared among consumers since water was ceded to them at very symbolic prices (Algerian Dinars per cubic meter, DZD/m<sup>3</sup>) as shows Figure

3, also the absence of any governmental policy or strategy for mobilization of resources and efficiently distribution of domestic waters has exacerbated rapidly that issues.

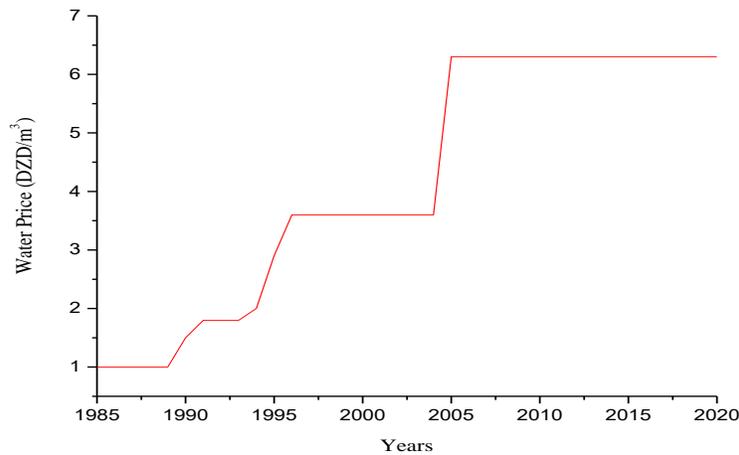


Figure 3: Water price evolution in Setif from 1985 to 2020<sup>1</sup> [9]

The water shortages have been emerged by 1976 in Setif Province and their frequency gradually increased the same as in other provinces at national scale. The water demand of ever growing population has become a challenge to be met at that time by the same resources because of the absence of new water mobilization projects. The resources became insufficient and the risk of their depletion increased, especially if we know that a great part of the supply was ensured by underground aquifers which they were exhausted much faster than being replenished. The government tried to set an end to that period of indifference and recklessness by creating on 21<sup>st</sup> June, 1980 what was called at that time Ministry of Hydraulics (Decree n° 80-173), in hope to reorganize the drinking water and sanitation sector and find solutions for the current issues [16].

As a result, the first strategy of domestic water management and rationing was adopted by 1981, which has opted to heavy investment in water transfer infrastructures and the building of dams as the main vector of water sector development, they allow mobilizing far resources and increasing the capacity of both storage and supply. The central government also published the first law on water n° 83-17 on July 16<sup>th</sup>, 1983, and created a new company on 1985 called ANBT (decree n° 85-163) for managing water transfers and dams at the national level.

The actions taken by the government had a positive reflection on the local development in the province and the water projects contributed notably to increase water supply for the residents but just for a short period of time. Water allocation disparities, supply disruption and shortages have strongly re-emerged in many municipalities of the province during the period of instability that the country has experienced between 1991 and 2000. It was also combined with a severe financial crisis caused by the drops of hydrocarbons prices that limited the financial revenues and slowed down the realization of several water infrastructure projects and interrupted all plans [17]. This has led to worsen drinking water supply not only in the province of Setif Province but rather in whole country.

By 1992, drinking water supply plan has been set and became necessary to manage water endowments for municipalities, which some among them they can be supplied once every two days or even every three or four days for just few hours per day [18]. By 1998, despite the continuously population growth, allocated resources did not show the same trends and all municipalities were supplied equitably which set a limited daily water endowment to 91 L/(capita·d). The Table 2 below shows daily water allocation in cubic meter for every municipally by 1998.

Table 2: Water endowment in the municipalities of Setif Province by 1998 [14, 19]

Municipality	Supply (m <sup>3</sup> /d)	Municipality	Supply (m <sup>3</sup> /d)	Municipality	Supply (m <sup>3</sup> /d)	Municipality	Supply (m <sup>3</sup> /d)
Setif Capital	21767	Ksar El Abtal	1881	Belaa	1328	Guidjel	2538
Aïn Abessa	1370	Amoucha	1794	Tachouda	704	Guenzet	416
Aïn Arnat	2742	Oued El Barad	274	Aït Naoual Mezada	597	Harbil	332
Mezloug	1217	Tizi N'Bechar	1703	Aït Tizi	715	Draa Kebila	1433
Ouricia	1320	Serdj El Ghoul	1005	Bouandas	1416	Hammam Guergour	1301

<sup>1</sup> Water Price is evaluated in Algerian Dinar DZD, 1 DZD = 0.057 Chinese Yuan = 0.0073 Euro = 0.008 US Dollar.

Municipality	Supply (m <sup>3</sup> /d)	Municipality	Supply (m <sup>3</sup> /d)	Municipality	Supply (m <sup>3</sup> /d)	Municipality	Supply (m <sup>3</sup> /d)
Aïn Azel	3738	Babor	1678	Bousselam	1483	Taya	850
Aïn Lahdjar	2718	Aïn Sebt	1300	Beni Hocine	929	Tella	621
Beidha Bordj	2844	Beni Aziz	1630	Bougaa	2587	Hammam Soukhna	1045
Bir Haddada	1659	Maaouia	817	Aïn Roua	1042	Talaifacene	1598
Aïn El Kebira	2922	Beni Ourtilane	1089	Beni Fouda	1536	Maoklane	1383
Ouled Addouane	728	Beni Chebana	1414	Djemila	2345	Boutaleb	758
Dehamcha	884	Aïn Legraj	1556	Bazer Sakhra	2328	Hamma	1124
Aïn Oulmene	5447	Beni Mouhli	790	El Eulma	10926	Ouled Tebben	863
Guellal	1810	El Ouldja	812	Guelta Zerka	1284	Rasfa	1276
Ouled Si Ahmed	860	Bir El Arch	1911	Ouled Sabor	910	Salah Bey	1989
Total for Setif Province: 119338 m <sup>3</sup> /d							

After the black decade the political stability has been re-established again by the end of 1999. The socio-economic development train, especially water sector, have been pushed forward by the new government projects and sustained by the oil and gas prices boom. Water sector and all kind of issues related to it (water policy, drinking water supply, wastewater treatment and reuse, building dams and all others water infrastructure projects) have become the main missions of the newly created Ministry of Water Resources on 2000 (executive decree n° 2000-325). A year later two public companies, ADE (executive decree n° 01-101) charged of drinking water supply and ONA (executive decree n° 01-102) charged of water sanitation, were created, and their affiliates were established throughout nearly the whole national territory to ensure the implementation of the national drinking water policy through the management of production operations, transport, treatment, storage, supply and distribution of water, water sanitation, as well as the renewal and development of related infrastructures.

In order to breathe new life into the water sector, new water law (n° 05-12) was published on 2005 and the national water plan on 2010, also 3 economic programs of revival have been adopted successively since 2001 as the public decision-makers wanted to take benefits from the oil windfall to improve living conditions [17]: The economic recovery support plan PSRE (2001-2004), the complementary growth support plan PCSC (2005-2009) and the five-year development plan (2010-2014). Setif Province benefited from that to achieve some water projects (Figure 4), mainly:

- a) The West supply System from Ighil-Emda dam to Mahouane dam (122 Mm<sup>3</sup>/y): 31 Mm<sup>3</sup> for the drinking water supply of the capital city of Setif and neighboring municipalities and 91 Mm<sup>3</sup> for the irrigation of 13,000 ha in the High Plains of Setif [20];
- b) The East supply System from Erraguène dam to Tabellout dam, then to the newly built dam Draa Diss (191 Mm<sup>3</sup>/y): 38 Mm<sup>3</sup> for the drinking water supply of the city of El Eulma and neighboring municipalities and 153 Mm<sup>3</sup> for the irrigation of 30,000 ha [20].



Figure 4: Main water supply systems in Setif Province [21-23],

Implementation of this strategy has contributed to restoring and bring the water sector back again on the right railroad thanks to that infrastructure projects that have been revived. They contributed to transfer huge volumes of waters from dams located in neighbouring provinces to other dams newly constructed within the province. The daily water endowment has been increased consequently in many municipalities (Figure 5).

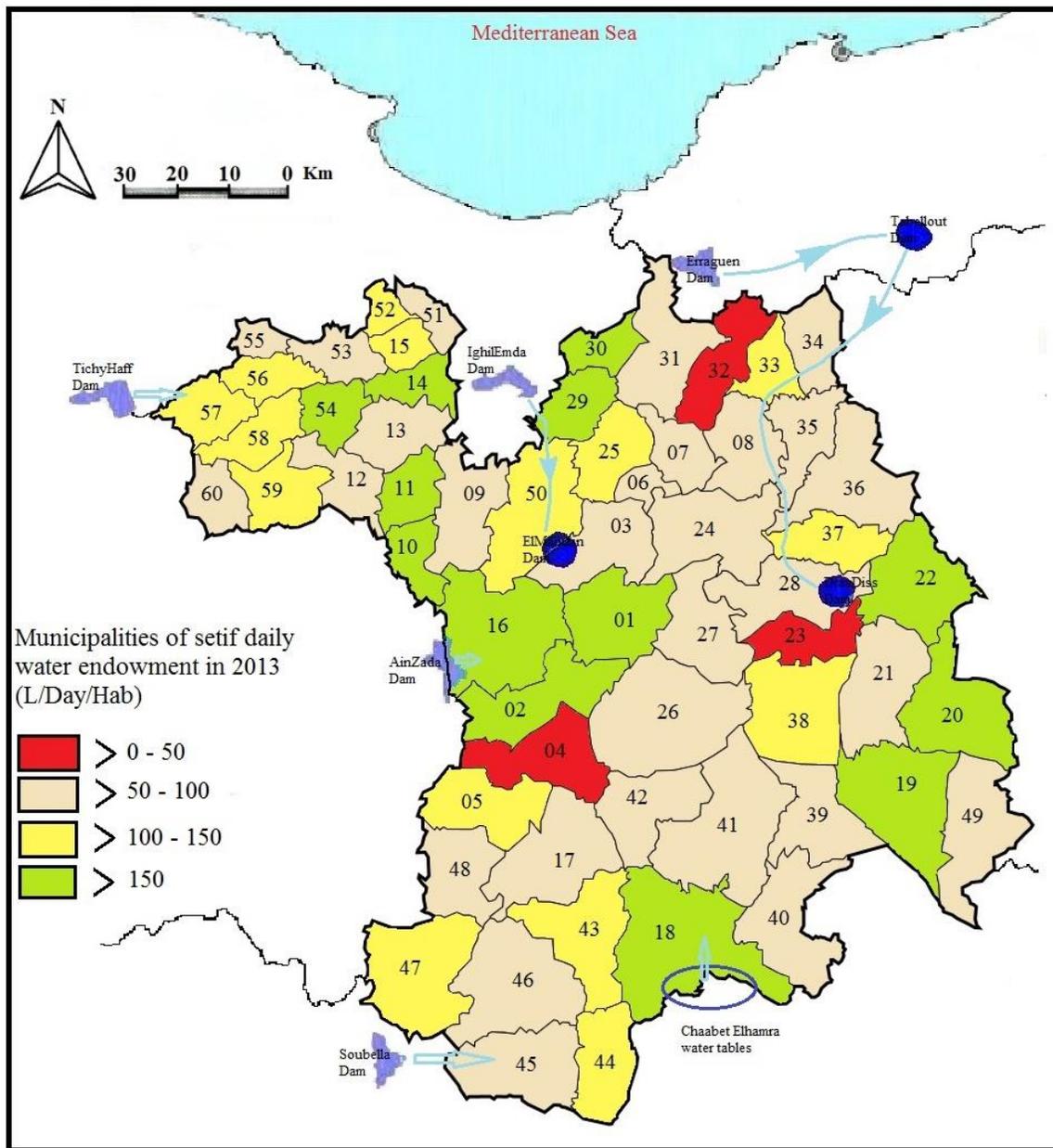


Figure 5: Water endowment in the municipalities of Setif Province by 2013 [19].

The red color shows that within those municipalities the daily water endowment per capita is extremely low, it is around only 50 L/(capita·d), while the green color indicates that demand in those regions is almost satisfied. To balance the situation between regions supply plans to provide residents with water day by day or even one day after two days have been adopted, these plans are still used until the present day. However, governmental implemented strategy after instability period and accomplishment of water interrupted projects have contributed to increase gradually the daily water endowment for many of those municipalities up to admitted standards but not all, the average daily water endowment for the province is shown in the below (Figure 6).

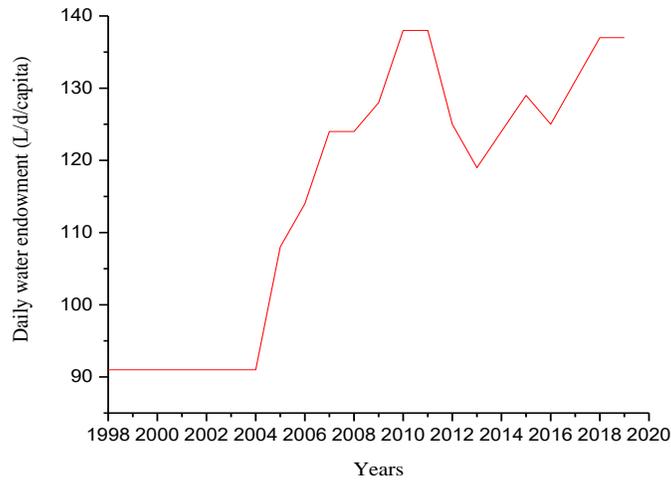


Figure 6: Annual evolution of daily water endowment in Setif Province 1998-2020 [13, 14, 19]

#### 4. Future trends

Sustainable access to water resources is a major concern for local authorities of Setif Province as well as for central government. Those worries are justified by high costs for achieving new projects in addition mainly to the lack of mobilizable resources (Figure 7) and their vulnerability to climate conditions (precipitations and cyclic droughts) as it is shown below in the Figures 8 and 9.

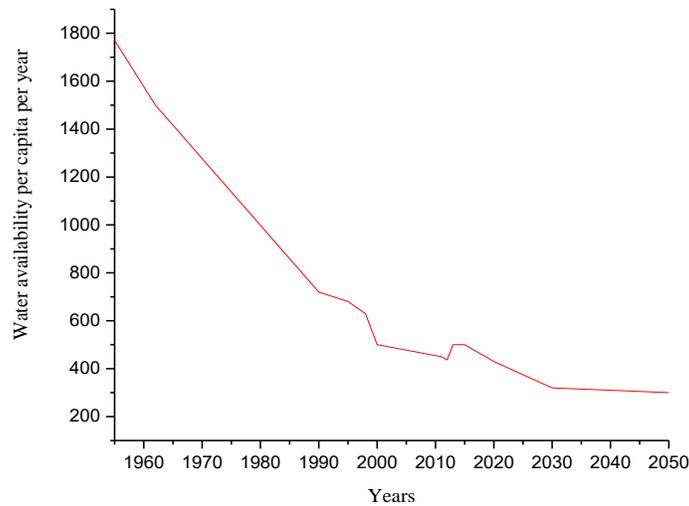


Figure 7: Evolution of the Annual Water availability per capita in Algeria (1955-2050) [9, 24]

There is a big and uneven spatial distribution of surface and groundwater in Algeria from one hydrographic region to another [25], Setif Province belongs to Algiers-Hodna-Soummam hydrographic basin where 0.74 billion m<sup>3</sup> of underground water and 3.4 billion m<sup>3</sup> of surface waters are concentrated. Within the limits of the province there is 785 Mm<sup>3</sup> (615 Mm<sup>3</sup> for surface and 170 Mm<sup>3</sup> for groundwater), but those potentialities are not well used which necessitates improving exploitation and building dams to block waters, especially in the northern regions. As Figure 7 shows, the availability of water in our country for each inhabitant is estimated at 1500 m<sup>3</sup>/y on 1962, it decreased sharply by 1990 to less than half and continued decrease until reached 430 m<sup>3</sup>/y by 2020, and it is estimated to be only 320 by 2030.

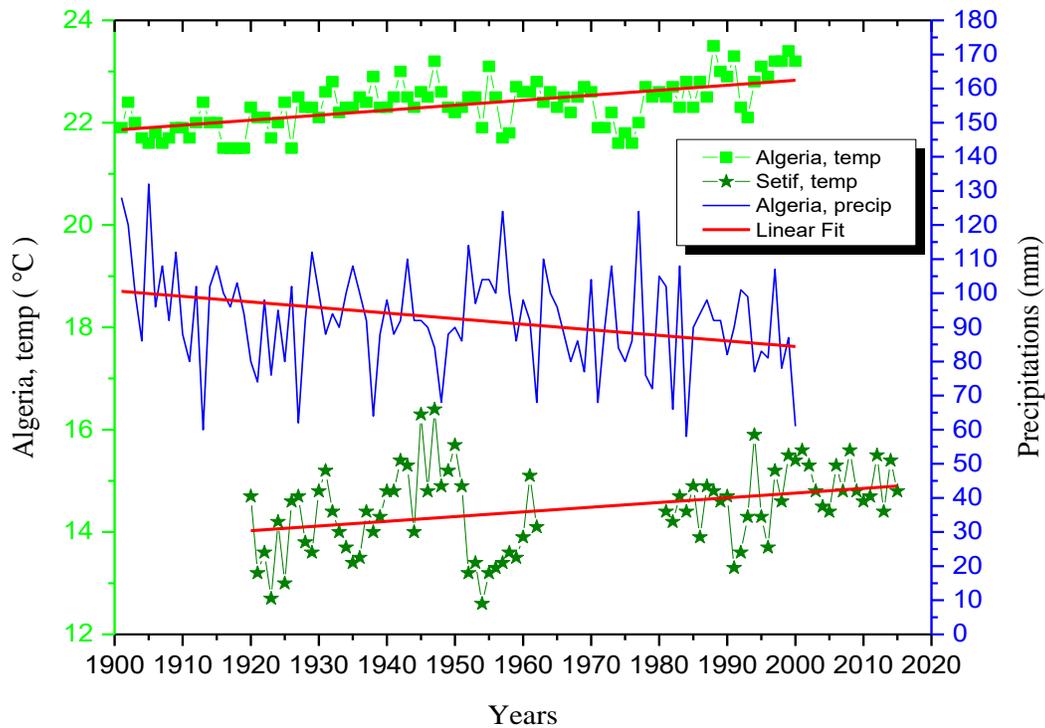


Figure 8: Annual temperature and precipitation variation in Setif Province by 2019<sup>2</sup> [26-28]

The average temperature in Setif Province is 14.4 °C and the average rainfall is 403.8 mm. For comparison, in Tokyo, the average annual temperature is 15.9 °C and the average precipitation is 1525.6 mm. Algeria as whole belongs to the driest region in the world [5, 29] and it falls under the water scarcity threshold internationally defined by UNDP and the World Bank with 1000 m<sup>3</sup>/(capita-y) [30]. From Figure 8 we can notice clearly that the temperature in Setif Province and whole Algerian territory is increasing while the precipitations are decreasing in the same time. The assessment of the two graphs reveals a drop of 55mm in the annual rainfall from 1981 to 2015 compared with that of 1920 to 1962, and 0.48°C of increase in the annual averages of temperatures [27]. This warming shift would not affect only the seasonal patterns but rather the annual trend that can be moved towards severe arid weather. Indeed, if worldwide the rise was 0.74 °C, that region can reach even more than double. The impact on water resources is estimated about 12% [26, 28].

The phenomenon of climate change in Setif Province specifically and Algeria generally is an issue that rose up real challenges, particularly in terms of water availability where the impact is highly felt. Experts predict at the medium term an increase in temperature of 2 °C would result in 10 to 15% rainfall reduction and increasing frequency of more intensive droughts [31]. The Saharan regions and the highlands where Setif Province is located they occupy 93% of the whole Algerian territory, but receive only 10% of the total flow that is estimated of 12.4 billion m<sup>3</sup>. The 81 exploited dams in Algeria are used to ensure 35% of water supply by storing 8 billion m<sup>3</sup> of that flow, which is nearly the mobilizable potential.

The frequently drought and climatic fluctuations over the past three decades have accentuated the phenomenon of soil degradation, thus caused desertification of most vulnerable agricultural areas used to ensure food security such as steppes and high plains. They have become more exposed to degradation and erosion by intensive flows which in turn reduce the storage capacity of dams by 2 to 3% each year due to siltation [32]. Currently, more than 50 dams are affected by siltation (with 32 × 106 m<sup>3</sup>/y), and they are also subjected to leaks which affect around twenty dams (with 40 × 106 m<sup>3</sup>/y), and evaporation (around 250 × 106 m<sup>3</sup>/y) [33, 34].

The persistent Intensive drought (Figure 9) since the early 1970s reduced rainfall by 30% (50% during the year 2001- 2002), which impacted negatively groundwater reserves of major aquifers in the north as watercourses flow regimes changed and declined. Also,

<sup>2</sup> Some temperature data for Setif Province from 1962 to 1981 are missing due to the interruption of records after the country gained its independence on 1962.

the groundwater aquifers used to ensure up to 63 % of supply are already 90% overexploited or even more in some regions in the northern part of the country. The mineralization ratio increased in many of those aquifers due to the droughts coupled with the overexploitation [35].

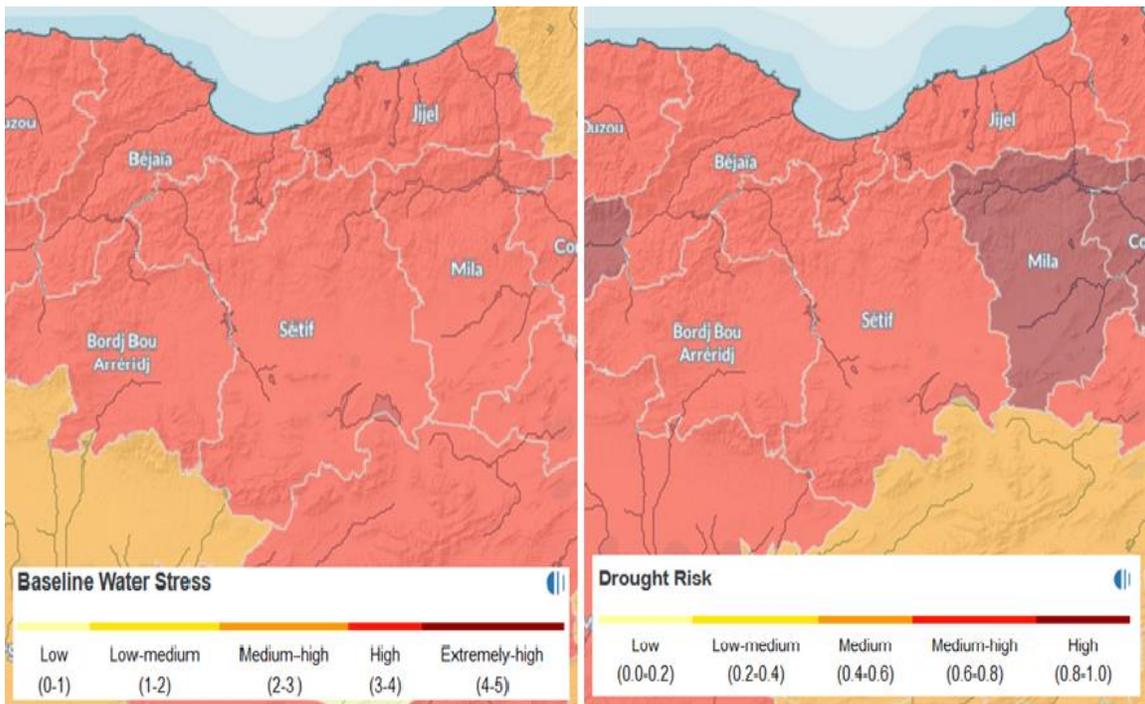


Figure 9: Baseline water stress and drought risk in Setif Province [29].

The drinking water needs increased in the province of Setif Province with the population's growth up. Comparing to the national average standard that allocates 186 L/(capita-d), the province was suffering from a flagrant deficit in 1998 as it was providing only 91 L/(capita-d) for its inhabitants, and thus an enormous amounts are required to quench the residents thirst. The situation continued until 2005 where the supplies started to be improved but the gap persisted until 2015 and even to present day (Figure 10).

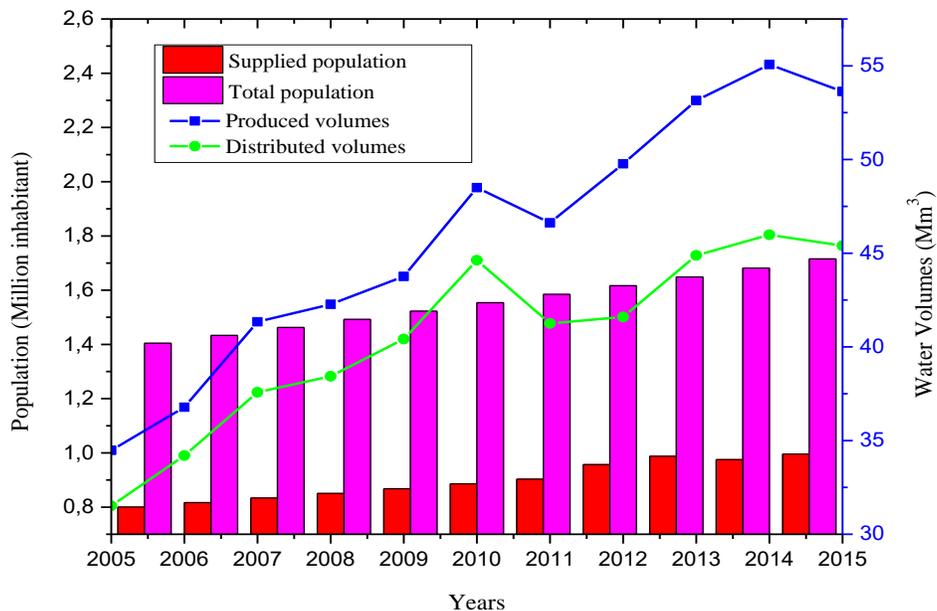


Figure 10: Drinking water supply vs population growth in Setif Province (2005-2015) [19].

Despite the reasons that led to that fact, reaching satisfactory level in terms of drinking water supply does not seem easy to achieve in the nearest horizon due to the challenges facing it. Simulation of the future demand of water is very important tool for the best water resources management and decision making, in the following part we will simulate future water needs against population growth up in Setif Province using GIS mapping software to show drinking water supply critical situations under a climate change risks, and then we suggest solutions to avoid future disruptions and shortages.

We will perform our simulation up to 2030, for this reason we need annual population growth coefficient and population statistics for every municipality to calculate firstly the annual total population using the following equation:

$$P_n = P_0 \times (1 + \alpha)^n \quad (1)$$

where  $P_n$  is the future population value for the year  $n$ ,  $P_0$  is the initial population for the year  $(n-1)$  and  $\alpha$  is the annual growth rate.

We need also daily endowment ( $d$ ) for each province to finally calculate the future water needs for the corresponding population at any future year using the following equation

$$Q_n = P_n \times d \times 0,001 \quad (2)$$

where  $Q_n$  is the daily average water needs in ( $m^3/d$ ) for the corresponding calculated population  $P_n$  at a given future year  $n$  and  $d$  is statistical data of the daily water allocation ( $L/d$ ). (For our calculations we take  $\alpha = 1.8\%$  and  $d = 137 L/(\text{capita} \cdot d)$  as a latest values). The results of the application of the equation (1) and equation (2) are given in Table 3.

Table 3: Evolution of the population and water needs in Setif Province until 2030 [36].

Code	Municipality	Pop 1998	Pop 2008	Pop 2020	Q2020 (m <sup>3</sup> /d)	Needs (m <sup>3</sup> /d)	Deficit (m <sup>3</sup> /d)	Pop 2030	Q2030 (m <sup>3</sup> /d)	Needs (m <sup>3</sup> /d)	Deficit (m <sup>3</sup> /d)
1	Setif Capital	239195	288461	367344	50326	68693	-18367	439087	60155	82109	-21954
2	Mezloug	13373	16976	21618	2962	4043	-1081	25840	3540	4832	-1292
3	Ouricia	14507	18087	23033	3156	4307	-1152	27532	3772	5148	-1377
4	Guellal	19886	21385	27233	3731	5093	-1362	32552	4460	6087	-1628
5	Ksar El Abtal	20667	23833	30350	4158	5676	-1518	36278	4970	6784	-1814
6	Ouled Addouane	7998	9613	12242	1677	2289	-612	14633	2005	2736	-732
7	Aïn El Kebira	32113	36295	46220	6332	8643	-2311	55247	7569	10331	-2762
8	Dehamcha	9709	9141	11641	1595	2177	-582	13914	1906	2602	-696
9	Aïn Roua	11454	11499	14644	2006	2738	-732	17503	2398	3273	-875
10	Beni Hocine	10210	11220	14288	1957	2672	-714	17079	2340	3194	-854
11	Bougaa	28431	30987	39461	5406	7379	-1973	47168	6462	8820	-2358
12	Hammam Guergour	14295	15853	20188	2766	3775	-1009	24131	3306	4512	-1207
13	Maoklane	15201	15715	20012	2742	3742	-1001	23921	3277	4473	-1196
14	Talaifacene	17555	20337	25898	3548	4843	-1295	30956	4241	5789	-1548
15	Bouandas	15556	16966	21606	2960	4040	-1080	25825	3538	4829	-1291
16	Aïn Arnat	30129	43551	55461	7598	10371	-2773	66292	9082	12397	-3315
17	Aïn Oulmene	59855	73831	94021	12881	17582	-4701	112384	15397	21016	-5619
18	Aïn Azel	41073	48487	61746	8459	11547	-3087	73806	10111	13802	-3690
19	Hammam Soukhna	11481	13439	17114	2345	3200	-856	20456	2803	3825	-1023
20	El Ouldja	8921	8592	10942	1499	2046	-547	13079	1792	2446	-654
21	Bir El Arch	21004	24995	31830	4361	5952	-1592	38047	5212	7115	-1902
22	Belaa	14593	14666	18677	2559	3493	-934	22324	3058	4175	-1116
23	El Eulma	120068	155038	197435	27049	36920	-9872	235995	32331	44131	-11800
24	Beni Fouda	16876	17667	22498	3082	4207	-1125	26892	3684	5029	-1345
25	Amoucha	19714	22767	28993	3972	5422	-1450	34655	4748	6481	-1733
26	Guidjel	27891	33685	42897	5877	8022	-2145	51274	7025	9588	-2564
27	Ouled Sabor	10005	12510	15931	2183	2979	-797	19042	2609	3561	-952
28	Guelta Zerka	14110	15472	19703	2699	3684	-985	23551	3226	4404	-1178
29	Tizi N'Bechar	18719	21086	26852	3679	5021	-1343	32097	4397	6002	-1605
30	Oued El Barad	3013	2333	2971	407	556	-149	3551	487	664	-178
31	Babor	18445	15762	20072	2750	3754	-1004	23992	3287	4487	-1200
32	Serdj El Ghoul	11044	9311	11857	1624	2217	-593	14173	1942	2650	-709
33	Beni Aziz	17913	19383	24684	3382	4616	-1234	29504	4042	5517	-1475
34	Aïn Sebt	14290	14798	18845	2582	3524	-942	22525	3086	4212	-1126
35	Maaouia	8976	7005	8921	1222	1668	-446	10663	1461	1994	-533
36	Djemila	25765	24145	30748	4212	5750	-1537	36753	5035	6873	-1838
37	Tachouda	7735	7578	9650	1322	1805	-483	11535	1580	2157	-577
38	Bazer Sakhra	25586	27996	35652	4884	6667	-1783	42615	5838	7969	-2131
39	Tella	6826	7562	9630	1319	1801	-481	11511	1577	2152	-576

Code	Municipality	Pop 1998	Pop 2008	Pop 2020	Q2020 (m <sup>3</sup> /d)	Needs (m <sup>3</sup> /d)	Deficit (m <sup>3</sup> /d)	Pop 2030	Q2030 (m <sup>3</sup> /d)	Needs (m <sup>3</sup> /d)	Deficit (m <sup>3</sup> /d)
40	Beidha Bordj	31250	35276	44923	6154	8401	-2246	53696	7356	10041	-2685
41	Aïn Lahdjar	29871	34338	43728	5991	8177	-2186	52268	7161	9774	-2613
42	Bir Haddada	18233	20860	26564	3639	4968	-1328	31753	4350	5938	-1588
43	Salah Bey	21855	27175	34606	4741	6471	-1730	41365	5667	7735	-2068
44	Hamma	12353	13223	16839	2307	3149	-842	20128	2757	3764	-1006
45	Boutaleb	8328	9456	12042	1650	2252	-602	14394	1972	2692	-720
46	Rasfa	14025	16075	20471	2805	3828	-1024	24469	3352	4576	-1223
47	Ouled Tebben	9482	10385	13225	1812	2473	-661	15808	2166	2956	-790
48	Ouled Si Ahmed	9456	10238	13038	1786	2438	-652	15584	2135	2914	-779
49	Taya	9346	10302	13119	1797	2453	-656	15681	2148	2932	-784
50	Aïn Abessa	15058	16770	21356	2926	3994	-1068	25527	3497	4774	-1276
51	Aït Tizi	7859	6983	8893	1218	1663	-445	10629	1456	1988	-531
52	Aït Naoual Mezada	6562	5630	7170	982	1341	-358	8570	1174	1603	-428
53	Bousselam	16302	16095	20496	2808	3833	-1025	24499	3356	4581	-1225
54	Draa Kebila	15748	14977	19073	2613	3567	-954	22798	3123	4263	-1140
55	Beni Mouhli	8678	8521	10851	1487	2029	-543	12970	1777	2425	-649
56	Beni Chebana	15534	13174	16777	2298	3137	-839	20053	2747	3750	-1003
57	Beni Ourtilane	11969	10591	13487	1848	2522	-674	16121	2209	3015	-806
58	Aïn Legraj	17100	14668	18679	2559	3493	-934	22327	3059	4175	-1116
59	Harbil	3650	3675	4680	641	875	-234	5594	766	1046	-280
60	Guenzet	4571	3541	4509	618	843	-225	5390	738	1008	-270
Total for Setif Province		1311412	1489980	1897434	259948	354820	-94872	2268007	310717	424117	-113400

**5. Discussions**

From Table 3, we can see that total population in Setif Province will reach 2268007habitant by 2030, with an increase of19.53% comparing to 2020. The distribution of population is shown on maps (Figures 11). As for water endowment, the province is globally supplied with 259948 m<sup>3</sup>/d, while in the fact it needs 354820 m<sup>3</sup>/d, it is suffering from a deficit of 94872 m<sup>3</sup>/d to reach the national average of daily water endowment which is187 L/(capita·d). This deficit will be further aggravated by 2030, it will grow to 113400m<sup>3</sup>/d as the needs according to the same national average daily endowment will reach 424117 m<sup>3</sup>/d, but supplies will be limited to 310717 m<sup>3</sup>/d for whole province.

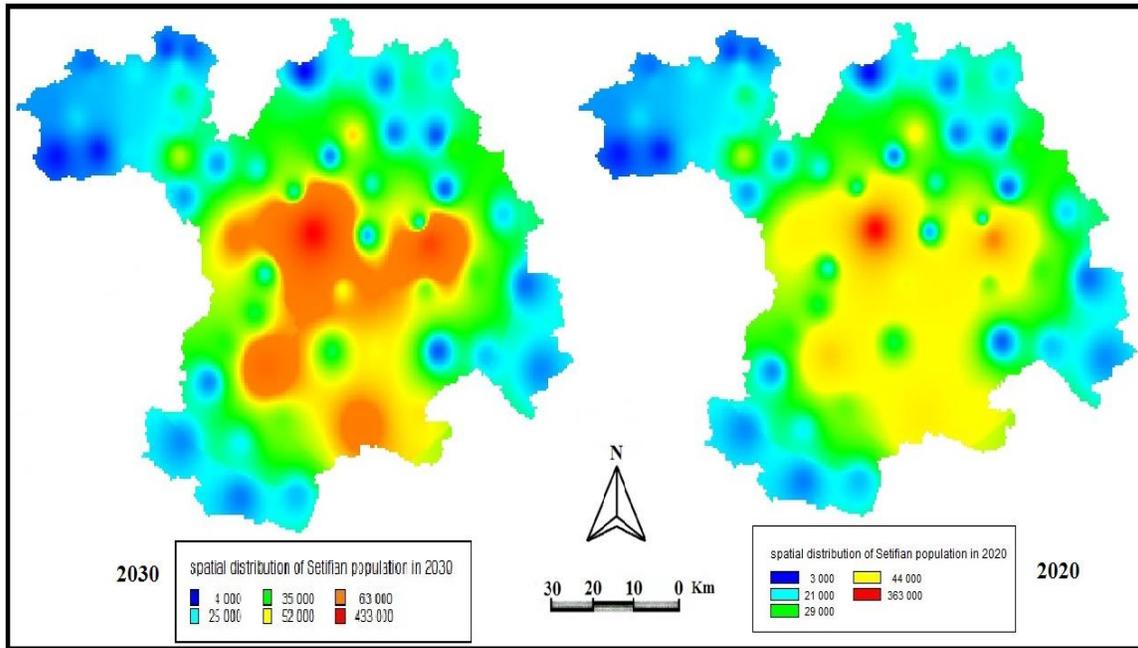


Figure 11: Spatial distribution of Setifian population by 2020

Those two maps illustrating the regions of high population growth showed in red color and concentrated mainly around the center, which represents the capital of the province and the neighbouring big agglomerations. As we move far the color turns to green indicating less growth factor, while the blue shows more less population growth.

Despite the fact that Setif Province is located in the northern part of the country which benefits from higher water potentialities comparing to the southern desert part, but it stills suffering from water insufficiency and unequal supply as show the two maps below (Figure 12).

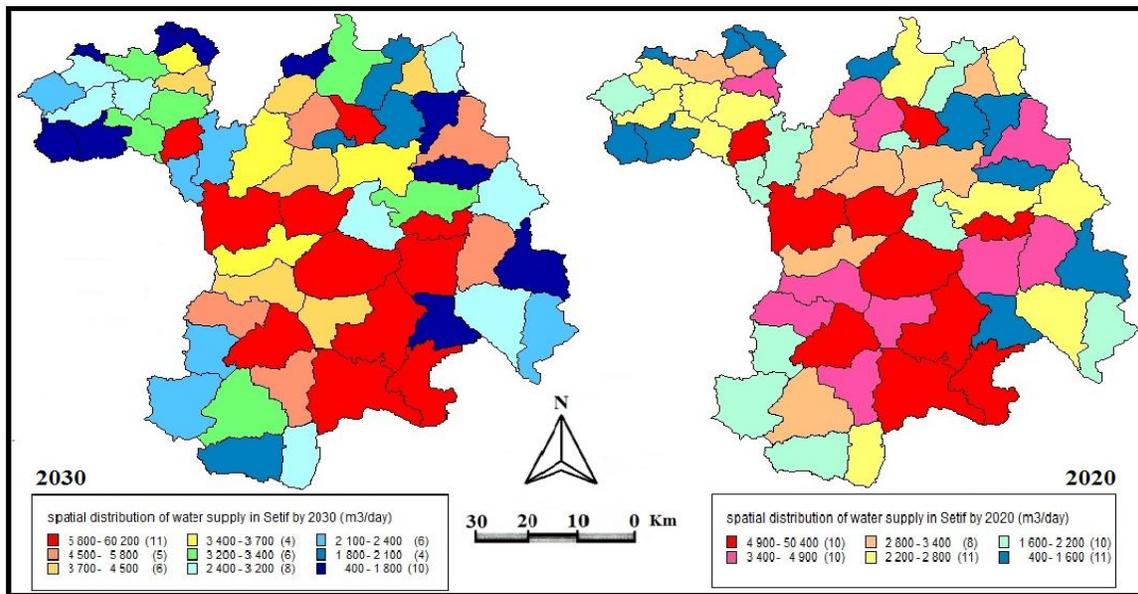


Figure 12: Spatial distribution of water supply in Setif Province by 2020

By 2020, the entire province is supplied with 137 m<sup>3</sup>/(capita-d) less than the national average standard (187 m<sup>3</sup>/(capita-d)), but as shows the maps (Figure 12) this factor is very different from region to another, about 10 municipalities shown with red color are located among very low supplied category, this number will increase to 11 by 2030. Also the number of municipalities slightly satisfied with water supply will decrease from 11 by 2020 to only 10 by 2030, the rest 50 (over 60 the total number of Setif's municipalities) show very high contrast in terms of drinking water supply. The supply (offer by 2030) which must be at least at the same level of the national standard is compared to the demand (2030) and is shown on the map below (Figure 13).

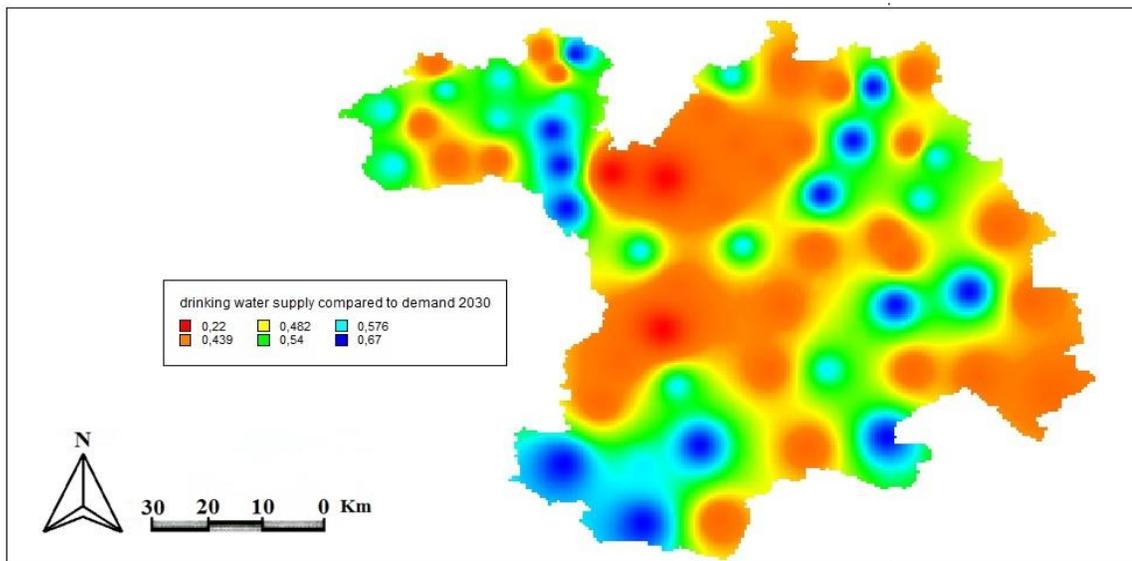


Figure 13: Spatial distribution of water supply/demand in Setif Province by 2030

As we can notice from the map (Figure 13) the supply/demand ratio by 2030 is far smaller than 1 for all municipalities, this means that the offer is covering just a portion from the real needs of residents which is the case of whole province. The red color indicates more severe shortages and is dominating great parts of the map, the regions falling under this color are supplied just with about quarter of their needs, while the fewer regions painted blue are experiencing a less severe shortages and their needs are satisfied up to 75 %.

## 6. Challenges

With no change of actual water resources potentialities and production capacities, the projection of domestic water in Setif Province shows that by 2030 more serious shortages problems will be encountered to satisfy the increased water needs driven by population growth and the negative impacts of climatic changes on resources. The ramifications would not be related only to the depletion of current available resources but the well-being and socio-economic development would be also affected. Since the appearance of water shortages and supply disruptions the Setifians have been protesting in many regions of the province to urge local authorities for finding solutions to reduce the magnitude of that chronic dilemma and to make drinking water more available for them.

Realisation of new large-scale projects for mobilizing more water resources requires big investments that generate environmental, social and economic costs, and this can be beyond the government capacities, especially, when oil and gas prices fall down. The Algerian economy is about totally depends on their revenues, and this would greatly affect the water sector in the country and all services related to it. In addition to that, many other factors can heavily threaten the resources in the province as well as in the entire country, among those challenges we find.

The rapid population growth put huge continuous pressures on resources, and as a result the high demand reduces water quality and exposes resources to more depletion vulnerably especially non-renewable ones due to the overexploitation.

All kind of pollution problems (solid or liquid) discharged directly into the environment will contribute to water quality degradation and decrease consequently surface and groundwater potentialities in the future.

Setif Province is located in the world driest region and characterized by semi-arid climate which make it highly vulnerable to water stress. The high temperatures increase evapo-transpirations and droughts intensity, and the low precipitations due to climate change reduce the surface flows that are necessary for the replenishment of both surface water bodies and underground aquifers. The siltation of dams is also another phenomenon occurs due to corrosion and results in reduction of stored volumes which can affect much more water mobilization capacities and therefore the supply.

Setif Province is supplied at the expense of its neighbouring as a great part of Setifians water needs brought to them from dams located in bordering provinces through huge pipes. Supply from remote regions generates high costs and promotes losses through the poor connections and obsolete distribution networks. The percentage of those leakages in Setif Province is estimated at 30% in addition to waters of theft scourge through bypassing metering systems. Wastage is also another aspect of water sector issues in the province which is turned up due to the low water price subsidized by government up to 70% to make it affordable for low-income consumers (Table 4).

Table 4: Water price in Setif Province [19].

Consumption	0-25 m <sup>3</sup> /trimester	25-55 m <sup>3</sup> /trimester	55-82 m <sup>3</sup> /trimester	> 82 m <sup>3</sup> /trimester
Price (DZD/m <sup>3</sup> )	6.3	20.48	34.65	40.95

## 7. Recommendations

To face this situation and meeting the rapid increasing water demand in this province at the medium and long range a management plan must be implemented to reduce the effects of these issues, and different measures have to be taken to diversify the resources and ensure their sustainability, such as:

Developing infrastructures to collect and increasing storage capacities is a necessity as well as the interconnection of dams to ensure equilibrium distribution between regions;

Developing and adopting the best strategy and sustainable integrated management techniques to rationalize consumption and supply, to increase water potentialities and ensure resources sustainability;

Resorting to the non-conventional resources such as treated waters reuse is an important alternative solution for protecting the environment and increasing available volumes for especially agricultural and industrial purposes. Also desalinated waters are regarded as a good option to quench the resident thirst despite the relatively high costs compared to underground and surface water withdrawals;

Conducting serious studies to better understand demand patterns and determinants for best future planning and infrastructures dimensioning;

Water price can be an option to control used volumes among large consumers once adopting progressive scale with a large gap between pricing classes, henceforth saving wasted quantities due to the overuse. Also raising public awareness about water scarcity will serve the same goals;

Seasonal precipitations result in important surface flows that are lost mainly through streams that bring them back to the sea. The artificial aquifers recharge techniques can take benefits from that to renew, increase and even improve underground waters quality by dilution its salinity. Also promoting the use of the rain harvesting systems will contribute to collect enormous amounts that can serve many domestic purposes especially if it is jointly used with efficient household equipment, therefore safe important volumes of high quality drinking waters.

## 8. Conclusions

In regions with semi-arid climate which is very changeable like Setif Province, high temperatures and irregular precipitations directly affect the abundance of natural water resources used to supply residents. Also, the lack of means that allow mobilize and protect those resources can worsen situation and result in negative reflection on socio-economic development and human well-being. In this context, simulation of future needs by 2030 in Setif Province showed significant offer/demand gap due population growth and climate vagaries. It is a milestone in the elaboration of adequate integrated sustainable policies for resources management. The challenge is about the implementation of the proposed measures to overcome or at least minimize that gap in a short term.

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# Assessment Of Factors Influencing Midwives Management Of Labour Pain At Tertiary Hospitals In Ekiti State, Nigeria

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**Abstract-** Background: Childbirth is a critical time in the life of women during which they experience high level of pain and health care providers need to respond appropriately to the woman's reports on labour pain. Unmet pain management often lead to psychological trauma and subsequent feto-maternal mortality therefore, this study assessed the factors influencing midwives management of labour pain at tertiary hospitals in Ekiti State. Methods: A quantitative descriptive cross-sectional design was employed through self-structured questionnaire distributed among One hundred and seventy-eight midwives, all working at the obstetric units of the tertiary hospital in Ekiti State. Result: It showed that majority 96(55.9%) of the midwives had an average knowledge, and 118(68.6%) of midwives had a positive attitude towards pain management in labour. Moreso, findings revealed a positive significant relationship between educational qualifications of midwives and labour pain management while no significant relationship was found between the labour pain management and hospitals policy. Conclusion: Lack of labour pain relief equipment, shortage of staff and hospital policies influenced midwives management of labour pain. Therefore, availability of the labour pain relief equipment should be provided with the employment of more midwives.

**Index Terms-** Assessment, factors, labour pain management, midwives

## I. INTRODUCTION

Labour pain is a major concern for most women even before the day of delivery as they become anxious about the pain that may be encountered during delivery and wants it relieved. One of the major determinants of maternal satisfaction in labour is adequate pain relief and the woman being able to cope with the pain.

Unmet expectation of pain management and a negative birth experience seem to affect women's decision about subsequent delivery, thereby opting for a caesarean section. Moreover, pain, anxiety and stress during labour affects uterine oxygen consumption as well as [uterine contractility](#), and this increases [peripheral resistance](#), cardiac output and blood pressure as a result of increased adrenaline secretions. This can lead to an increase release of catecholamines and cortisol into the circulation

causing widespread vasoconstriction (Czech, Fuchs, Lorek, Drosdzol-cop & Sikora, 2018).

Apart from maternal consequences such as heightened stress, fear, depression, confusion, hypertension, hypoglycaemia and tight and tense throat due to extreme screaming, Although pain management is one of the most critical aspects of patient care and it is relevant to all skilled health attendants, there have been few published pain management research studies focusing specifically on midwives working in maternity unit or labour wards. Management of pain in labour by midwives are affected by many factors and this study will therefore be assessing the factors influencing midwives management of labour pain at the three tertiary hospitals in Ekiti State, Nigeria.

The specific objectives of this study is to:

1. assess the level of knowledge of midwives on labour pain management (LPM)
2. assess the attitude of midwives towards labour pain management
3. determine the availability of drugs in management of labour pain by midwives
4. determine the availability of equipment for labour pain management by midwives
5. assess the influence of shortage of staff on management of labour pain by midwives
6. to identify significant relationship between educational qualification, hospital policies and management of labour pain

## 1.3 Research Questions

1. what is the level of knowledge of midwife on management of labour pain?
2. what are the attitudes of midwives towards management of labour pain?
3. what are the available drug in management of labour pain management?
4. what are the available equipment for management of labour pain by midwives?
5. what is the influence of shortage of staff on midwives management of labour pain?

## Research Hypotheses

The following null hypothesis will be tested in the study;

- I. Ho1. There is no significant relationship between hospital policies and management of labour pain by midwives.
- II. Ho2. There is no significant relationship between educational qualifications of the midwives and management of labour pain.

Perceptions of labour pain intensity varies from one individual to another. Although, some women feel no pain in labour and give birth unexpectedly (Jones, Othman, Dowswell, Alfirevic, Gates, Newburn, Jordan, Lavender & Neilson, 2012). On the other hand labour pain has been reported to be the most severe pain that a woman experiences in her lifetime (Obuna & Umeorah, 2014). One of the major determinants of maternal satisfaction in labour is adequate pain relief that enables the woman to cope with the pain.

The Pathways of labour pain are visceral and somatic. The visceral one occur during the first stage of labour and it is connected with the tension exerted on the cervix which causes its dilatation, while the somatic kind of pain appears at the end of the first stage till second stage ends (Czech et al., 2018).

There are different pain relieving method used by women during childbirth (Thomson, Feeley, Moran, Downey & Oladapo, 2019). Commonly, these include non-pharmacological interventions ( hydrotherapy, massage techniques, music therapy, emotional support from family members, breathing exercise, assuming specific positions) and pharmacological interventions include (epidural analgesia, opioids like pethidine, non-opioid drug like drugamol injection, diclofenac injection, pentazocine, and hyoscine butyl bromide injection).

A lack of specific education regarding different labour pain management (especially pharmacological options) during medical or midwifery undergraduate education is one of the factors influencing labour pain management and most healthcare providers lack information materials regarding pain management options (McCauley et.al, 2018). Some midwives have doubts regarding the efficacy of non-pharmacological methods.

The difficulty in providing individualised care for women in labour due to shortage of midwives compared to the high number of labouring women, although family members could stay with the woman in the early stages of labour in the antenatal ward, but their presence are always restricted in the labour room due to limited space and out of respect for the privacy of other women in labour room. Some healthcare providers are aware of measures for pain relief but facilities to implement this option may be unavailable. With regards to pharmacological options, some hospitals policies only limit the midwives to the use of non-opioid; whereas training on nerve block, epidural and the use of nitrous oxide are been left out

## II. METHODS

### 2.1 Research Design

This study employed a descriptive cross-sectional survey of midwives working in the obstetric and gynaecological unit of the three institutions using a self-administered structured questionnaire to assess the factors influencing midwives management of labour pain at tertiary hospitals in Ekiti State.

### 2.2 Research Settings

The study was carried out in three tertiary hospitals in Ekiti State. These hospitals are Ekiti State University Teaching Hospital (EKSUTH), Afe Babalola University (ABUAD) Multisystem Hospital in Ado-Ekiti and Federal Teaching Hospital (FTH), Ido-Ekiti. These hospitals are tertiary hospital established by the state government(EKSUTH), private institutions (ABUAD) and federal government(FTH).

### 2.3 Sampling Technique;

Total enumeration method (purposive sampling) was employed to select all midwives in the units. In FTH (69 midwives), EKSUTH (67 midwives) , ABUAD (42 midwives), making a total of 178 midwives working in Obstetrics and gynaecology units that participated in the study.

### 2.4 Instrumentation

Data was collected using a self-developed questionnaire. The questionnaire consists of four sections. Sections A to G with thirty-seven items was used as the tool for collecting information from the registered midwives. **Section A:** assessed the socio-demographic data(7 items) indicating personal information about the subjects (midwives) . **Section B:** assessed the level of knowledge of midwives on labour pain management. There are 11(eleven) items assessed with multiple choice questions with four (4) options (A-D) in which only one of the options give the correct answer. The score ranges between 0-11, where any respondents with 0-3 has low knowledge, 4-7 moderate knowledge and 8-11 high knowledge. **Section C:** assessed attitude of midwives towards management of labour pain with 5 items using 5 likert scale. **Section D:** determined hospital factors influencing labour pain management. This factors comprised of four sub-construct . They are (i) The availability of drugs in management of labour pains by midwives with 4 items (ii)The availability of equipment for labour pain management by midwives with 3 items. (iii) Availability of staff on management of labour pain by midwives with 4 items .(iv) Hospital policies on labour pain management by midwives with 3items. The questionnaire was validated and reliability index using Chronbach alpha coefficient for midwives knowledge was 0.638, Attitudes was 0.980 and hospital factors was 0.666.

### Inclusion criteria

All midwives working at the obstetric and gynaecological unit of the tertiary hospitals and are willing to participate in the study.

### Exclusion criteria

Midwife not working at the obstetric and gynaecological unit as at the period of carrying out this research. Midwives on annual or maternity leave were excluded as they may not be available within the environment.

### 2.5 Method of Data Analysis

The collected data were coded into the computer using a statistical software Statistical Package for the Social Sciences (SPSS) version 23. The research questions were answered using descriptive statistics (percentages, mean score and frequency counts) while inferential statistics of Pearson correlation was used to test the two hypotheses at 0.05 level of significance.

III. RESULTS

**Socio demographic data**

Table 4.1 Respondents were found across the age spectrum of 21 to 51years and above with a mean age of 36years. More (32%) of the participants were between 31 to 40 years. Majority

(83.1%) were Christian by believe as a result of its commonest practice in the study settings. More than half (73.8%) of the midwives were married. Most (51.7%) of the participants were BNSc holders compared to participants with RM (43%), MSc (8%) and PhD (0.6%).

**Table 1: Socio demographic data of the midwives**

	Category	Frequency: N=172	Percentage %	x±SD
<b>Age:</b>	21-30yrs	45	26.2%	2.2±1.01. Mean age = 36yrs
	31-40yrs	55	32.0%	
	41-50yrs	48	27.9%	
	51yrs and above	24	14.0%	
<b>Religion</b>	Christianity	143	83.1%	
	Islam	28	16.3%	
	Traditional	1	.6%	
<b>Gender</b>	Male	6	3.5%	
	Female	166	96.5%	
<b>Marital Status</b>	Single	36	20.9%	
	Married	127	73.8%	
	Divorced	9	5.2%	
<b>Educational qualification</b>	R.M	74	43.0%	
	BNSc	89	51.7%	
	MSc	8	4.7%	
	PhD	1	.6%	
<b>Duration of work experience</b>	1-5yrs	52	30.2%	
	6-10yrs	46	26.7%	
	11-15yrs	22	12.8%	
	16yrs and above	52	30.2%	

**Level of Knowledge of midwives**

Table 2. Revealed the level of knowledge of midwives on labour pain management is average, for most 96 (55.9%) of the participants had an average knowledge at the rating of 4-7, 62(36%) had high knowledge at a rating of 8-11 while 14 (8.1%) of the participants rating from 0-3 had a low knowledge towards labour pain management.

**Table 2: Level of knowledge of midwives on management of labour pain in tertiary hospital**

<b>X=6.6, M=7, Max=11, Min= 0</b>			
<b>Category</b>	<b>Classification</b>	<b>Frequency N=172</b>	<b>Percentage %</b>
0-3	Low	14	8.1%
4-7	Average	96	55.9%
8-11	High	62	36%
<b>Total</b>		<b>172</b>	<b>100</b>

**Table 3: Midwives knowledge towards labour pain management**

<b>Items</b>	<b>Correct options</b>	<b>Yes</b>	<b>No</b>
What do you understand by the term labour pain?	It is the pain felt during the uterine contraction of child birth	94(54.7%)	78(45.3%)
Who are those qualified to manage labour pains independently by virtue of professional qualification?	Midwives are qualified to manage labour pains	153(89%)	19(11%)
Labour pain management is defined as?	Methods adopted to ease labour pain and help the woman in labour relax	94(54.7%)	78(45.3%)
At what stage of labour should pain be managed?	Labour pain should be managed during the first stage of labour	146(84.9%)	26(15.1%)
Which of these under listed measures do you use to manage labour pain?	Pharmacological and non-pharmacological methods	118(68.6%)	54(31.4%)
What degree of pain must a woman in labour experience before it is relieved?	The degree of pain must be moderate	91(52.9%)	81(47.1%)
Why should pain be relieved in labour?	Pain should be relieved in labour to enjoy the birth experience	50(29.1%)	122(70.9%)
What makes you assume that a woman is having pain in labour?	Woman is having pain in labour if she screams often.	110(64%)	62(36%)
The complications which may arise from pharmacological pain relief use towards the end of first stage of labour may affect?	The complication may affect both the mother and foetus	110(64%)	62(36%)
What is your view about pain management in labour?	Labour pain is a natural process which is inevitable but could be managed.	113(65.7%)	59(34.3%)
The decision to offer labour pain relief should be based on?	The decision should be based on joint decision made by the woman in labour and the midwife	61(35.5%)	111(64.5%)

**Midwives attitudes towards management of labour pain in the selected tertiary hospitals**

Table 4 showed the attitude of the respondents towards labour pain management. It is expected that all women must surely go through labour pain management (77.3%) and (75%) agreed that their previous experience enables them to understand that women goes through pain and needs to be relieved. However, (65.1%) of the midwives contradicted the belief that pain management is not necessary in labour and (68.6%) of the respondents disagreed that labour pain remains constant and can never be managed.

**Table 4 Midwives attitude towards labour pain management**

<b>Items</b>	<b>Strongly agree</b>	<b>Agree</b>	<b>Undecided</b>	<b>Disagree</b>	<b>Strongly disagree</b>
It is expected that all women must surely go through labour pain	44(25.6%)	89(51.7%)	8(4.7%)	22(12.8%)	9(5.2%)
My previous birth experience enables me to understand that	38(22.1%)	91(52.9%)	22(12.8%)	21(12.2%)	-

women goes through pain and needs to be relieved					
Pain management is unnecessary in labour as it relieves the women for few moment and re-occur	21(12.2%)	39(22.7%)	25(14.5%)	69(40.1%)	18(10.5%)
Labour pain remains constant, hence can never be managed	13(7.6%)	41(23.8%)	36(20.9%)	55(32.0%)	27(15.7%)
My years of experience in pain management improves my labour pain management practices	36(20.9%)	85(49.4%)	40(23.3%)	9(5.2%)	2(1.2%)

**Hospital factors**

**(A) Available drug in management of labour pain by midwives at tertiary hospitals in Ekiti State**

Table 5 indicates the available drug in management of labour pain by midwives in selected tertiary hospitals in Ekiti State. Most (69.8%) shows that non- Opioids are the only available drugs for relief of pain that can be administered by midwives while (51.7%) agreed that epidural analgesia is readily available for patient use.

**Table 5 Available drug in labour pain management by midwives at tertiary hospitals in Ekiti State**

Items	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
Non-Opioids like paracetamol, diclofenac and hyoscinebutyl bromide are the only available drugs for relief of pain by midwives	28(16.3%)	92(53.5%)	20(11.6%)	31(18.0%)	1(0.6%)
Inhalational analgesia like Entonox and nitrous oxide for labour pains can only administered by midwife on maternal request	10(5.8%)	37(21.5%)	67(39.0%)	52(30.2%)	6(3.5%)
In relieving of pain Entonox is always readily available for me to administer to my patient	4(2.3%)	33(19.2%)	46(26.7%)	74(43%)	15(8.7%)
In relieving of pain, epidural analgesia is readily available for use on my patient	3(1.7%)	86(50%)	47(27.3%)	27(15.7%)	9(5.2%)

**(B). Available equipment for management of labour pain**

Table 6. Revealed available equipment for management of labour pain by midwives at the selected tertiary hospital. Most (76.8%) of the midwives disagree that there is facility to practice hydrotherapy for labour pain management and less than half (42.4%) of the respondents agree that the labour room have diversional therapy such as listening to music and television (22.1%).

**Table 6 Available equipment for management of labour pain by midwives at tertiary hospitals in Ekiti State**

	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
There is facility to practice hydrotherapy for labour pain management	9(5.2%)	31(18%)	32(18.6%)	89(51.7%)	11(6.4%)
My labour room have facilities for diversional therapy such as listening to music	4(2.3%)	69(40.1%)	24(14%)	65(37.8%)	10(5.8%)
My labour room have facilities for diversional therapy such as television	5(2.9%)	33(19.2%)	13(7.6%)	110(64%)	11(6.4%)

**(C) Influence of shortage of staff on management of labour pain by midwives**

Table 7. Showed the influence of shortage of staff on labour pain management by midwives. Majority (51.2%) of the midwives agreed that the husbands and other close relatives are allowed to give emotional support to the woman in labour and most (82.6%) of the midwives always attend to their patients individually to relief them of pain. However, majority (71.5%) of the respondents agreed that shortage of staff will lead to poor labour pain management while high influx of patient in the labour unit affects labour pain management practices.

**Table 7: Influence of shortage of staff on management of labour pain by midwives at the tertiary hospitals in Ekiti State**

	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
Husbands and close relatives are allowed to give emotional support to the woman in labour	27(15.7%)	61(35.5%)	26(15.1%)	47(27.3%)	11(6.4%)
I'm always too busy to attend to my patients individually as to relief labour pain	10(5.8%)	20(11.6%)	36(20.9%)	78(45.3%)	28(16.3%)
When the labour unit is short staffed, pain management in labour is always handled poorly.	23(13.4%)	100(58.1%)	24(14%)	16(9.3%)	9(5.2%)
High influx of patient in the labour ward unit affects my labour pain management practices	42(24.4%)	70(40.7%)	23(13.4%)	24(14%)	13(7.6%)

**Test of hypothesis**

**Hypothesis 1:**  $H_{01}$  = There is no significant relationship between hospital policies and management of labour pain by midwives  
 The results in Table 8 revealed no significant relationship between the labour pain management and hospital policy ( $r = 0.139$ ,  $n=172$ ,  $p=0.069$ ). The hypothesis which stated that “There is no significant relationship between the labour pain management and hospital policies” was accepted by this findings. This implies that relationship does not exist between hospital policy and labour pain management.

**Table 8: Correlation between hospital policies and management of labour pain by midwives.**

Hospital Policies		Labour Pain management	Remarks
	Pearson correlation	0.139	Accept null hypothesis
	Sig. (2-tailed)	0.069	
	N	172	

**Hypothesis 2:**  $H_0$  = There is no significant relationship between educational qualifications of the midwives and management of labour pain

Table 9: revealed a positive significant relationship between the educational qualification of midwives and labour pain management ( $r = 0.188$ ,  $n=172$ ,  $p=0.014$ ). The hypothesis which stated that “There is no significant relationship between the educational qualifications and labour pain management” was rejected by this findings. This implies that educational qualifications have a great significant relationship with labour pain management. An increase in level of educational qualification may result in an increase in the level of management of labour pain.

**Table 9 Correlation between educational qualifications of midwives and labour pain management**

Educational qualifications		Labour pain management	Remarks
	Pearson correlation	0.188	Reject null hypothesis
	Sig. (2-tailed)	0.014	
	N	172	

\*. Correlation is significant at the 0.05 level (2-tailed).

#### IV. DISCUSSION

The demographic findings in this study revealed that most of the midwives were between 31-50 years 103(59.9%), female 166(96.5%) and most were Christians (83.1%). The mean age was 36 years. This study is in line with a study led by Ohaeri et al (2019) who found that most of the respondents (98.2%) were female and Christian (83.7%). The mean age was  $39.7 \pm 9.83$  years.

This study showed that most 96(55.9%) of the respondents had an average knowledge of labour pain management in the three tertiary hospital in Ekiti state. This might be as a result of their years of experience, increase in work load and continuing education regarding different labour pain managements. This was slightly different from the study conducted by Ohaeri et al., (2019) which revealed high level of knowledge (56.8%) from their findings found out that 6% had low level, 40.5% an average level of knowledge on labour pain management.

This study also found that Labour pain management is a methods adopted to ease labour pain and help the woman in labour relax and majority 118(68.6%) of respondents had a positive attitude towards pain management. This relates with the study led Sahile et al., (2017) 94.8% of respondents agreed to the use of labour analgesia, thus signifying a positive attitude towards pain management in labour. Nevertheless, 65.1% of the respondents agreed that pain management is necessary in labour. This corroborates with a study conducted by Ohaeri et al., (2019) who established a safe and optimal labour pain experience utilizes pharmacological and non-pharmacological interventions in achieving painless labour and it is explicitly anchored by nurse-midwives

This study showed that 120(69.8%) non-opioid analgesia such as paracetamol, diclofenac, hyoscine butyl bromide are available drugs used for labour pain management by midwives without prescription. This was in consonance with the study of Jones et al, (2012) who found out that the non-opioid drugs are administered by midwives with the primary aim to relieve the pain of labour. This contradicts the study by Azaito et al, (2017) where Opioids and non-opioids pharmacological agents such as Pethidine, Phenergan, Diclofenac, Buscopan, Midazolam, Xylocaine 1% and Tramadol were used by midwives to manage labour pain. Most midwives used Pethidine and Phenergan to sedate or calm the women in labour pain. Similarly, Burns et al., (2018) as well contradicts the findings and showed that in other parts of the world, parenteral (intravenous or intramuscular) opioids commonly used in labour include morphine, nalbuphine, fentanyl and more recently remifentanyl.

This study established that there were no adequate facility to practice hydrotherapy 132(76.8%) for labour pain management and no adequate diversional therapy in the labour room such as television 134(78%) and music 104(57.1%). This is in line with a study by Mousa et al., (2018), where about 91% of respondents agreed that there were no equipment for pain relief.

This findings established that most 142(82.3%) available midwives were not too busy to relieve pain in labour though the pain management could be poorly handled due to shortage of staff 123(71.5%). More staff are needed to reduce the workload on the available ones. This is in line with a study conducted McCauley et al., (2018) which revealed that many healthcare providers

highlighted the difficulty in providing individualised care for women because of the shortage of nurse-midwives compared to the high number of labouring.

Findings from table 8 of this study revealed no significant relationship between labour pain management and hospital policy ( $r = 0.139$ ,  $n=172$ ,  $p=0.069$ ). This findings contradicts the study conducted by McCauley et al., 2018, about labour pain management and its restriction on midwives autonomy in which some hospital policies only limit the midwives to offer only non-opioid drugs while the administration of nerve block, epidural and nitrous oxide use are been left out.

Table 9 revealed a significant relationship between educational qualification of midwives and management of labour pain ( $r = 0.188$ ,  $n=172$ ,  $p=0.014$ ). This findings was against the study conducted by Bitew et al., (2016) at Amhara regional state referral hospitals reported that Obstetric care givers who had diploma (low level qualification) were 2.69 times more likely to use obstetric analgesia methods than professionals who had second degree (high level qualification). More so, study conducted by Sahile et al., (2017) is in line with this study as reported that skilled attendants who were MSc intern (higher level qualification) were 2.87 times more likely to use labour pain management methods than professionals who had diploma (low level qualification).

#### V. CONCLUSION

Comfort in labour is not merely an emotional or physical relieving of malaise and pain, as labour pain is a major concern for most women even before the day of delivery as they become anxious about the pain that may be encountered during delivery and wants it relieved. Therefore, non-availability of equipment for pain relief, shortage of staff and hospital policies influences labour pain management. Therefore, this study recommends that health institutions should make equipment for labour pain management available, employment of more staff (midwives) and policy makers and healthcare administrators should develop policies that will facilitate midwives autonomy in labour pain management to enhance its effectiveness.

#### Ethical Approval

Ethical approval was obtained from Babcock University Health Research and Ethical Committee and the Health and Research Committee of the three tertiary hospital.

#### Conflict of interest

No conflict of interest was declared by authors

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# Prevalence And Antimicrobial Susceptibility Profile Of Pathogenic Bacteria Isolated From Poultry Farms In Umuahia, Abia State, Nigeria.

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**Abstract-** This study investigated the prevalence of pathogenic bacteria from poultry farms in Umuahia, Abia state and the antimicrobial susceptibility profile of the isolates using the disk diffusion method. A total of 92 isolates (comprising 32 *Escherichia coli*, 9 *Klebsiella* spp, 26 *Salmonella* spp, 13 *Shigella* spp and 12 *Staphylococcus* spp) were obtained. The isolates were completely (100%) resistant to Cefazidime, Cefuroxime, Cefixime, Cotrimoxazole, Erythromycin, Streptomycin and Tetracycline but 48.9% were susceptible to Gentamicin, 67.5% to Ofloxacin, 9.8% to Augmentin, 68.8% to Nitrofurantoin, 68.8% to Ciprofloxacin, 16.7% to Cloxacillin and 33.3% to Chloramphenicol. Out of the 32 *Escherichia coli* isolates, 53.1% were susceptible to Gentamicin, 71.9% to Ofloxacin, 75.0% to Nitrofurantoin and 68.8% to Ciprofloxacin. Out of the 9 *Klebsiella* spp isolates, 22.2% were susceptible to Gentamicin, 33.3% to Ofloxacin, 33.3% to ciprofloxacin and 44.5% to Nitrofurantoin. Out of the 26 *Salmonella* spp isolates, 50.0% showed susceptibility to Gentamicin, 76.9% to Ofloxacin, 76.9% to ciprofloxacin and 73.1% to Nitrofurantoin. Out of the 13 *Shigella* spp isolates, 30.8% were susceptible to Gentamicin, 69.2% to Ofloxacin, 76.9% to ciprofloxacin and 76.9% to Nitrofurantoin. Out of the 12 *Staphylococcus* spp isolates, 83.3% were susceptible to Gentamicin, 75.0% to Augmentin, 16.7% to Cloxacillin and 33.3% to Chloramphenicol. The high rate of antimicrobial resistance of bacterial isolates from different poultry farms to some of the antibiotics used have major implications for human and animal health with adverse economic implications. The study therefore recommends that proper information should be made available to poultry farmers and poultry feeds producers on dangers of antibiotic resistant strains, judicious use of antibiotics by farmers, veterinarians and physicians, biosecurity plan and use of regulations to control poultry litter disposal.

**Index Terms-** Antibiotic, Pathogenic Bacteria, Poultry, Resistance, Susceptibility.

## I. INTRODUCTION

During the past years, worldwide increase in the use of antibiotics as a necessary part of the poultry and livestock production industry to treat and prevent infectious bacterial diseases and as growth promoters at sub therapeutic levels in feeds has led to the problem of the development of bacterial antibiotic resistance (Apata, 2009). It has been shown in recent scientific evidence that resistance to antibiotics is not only caused by the natural ability of a tiny fraction of the bacteria with unusual traits to survive antibiotic's attack, enabling resistant strains to multiply, but also stems from the transmissibility of acquired resistance to their progeny and across to other unrelated bacteria species through extra chromosomal DNA fragment called the plasmid which provide a slew of different resistances (Gould, 2008). The emergence and continuous spread of resistant bacterial strains like *Campylobacter* spp, *Escherichia coli*, *Salmonella* spp, *Shigella* spp, *Staphylococcus* spp from poultry products to consumers endangers humans with new strains of bacteria that resist antibiotic treatment. Resistant bacteria interfere with their mode of action of some antibiotics through a range of effectors' mechanisms, including, alteration in the configuration of cell wall, modification of membrane carrier systems and synthesis of inactivating enzymes or ribosome. These mechanisms are spectacular to the type of resistance developed. Due to the growing global concerns that animals can transmit resistance bacteria to humans, there is an increase in public and governmental interest in phasing out inappropriate

antibiotic use in animal husbandry. Improvement in the hygienic practice of handling raw animal products and adequate heat treatment to eliminate the possibility of antibiotic resistant bacteria surviving may play a role in preventing the spread.

Increasing antibiotic surveillance capacity to counter the spread of emerging resistances and on the alternative approach to sub-therapeutic antibiotics in poultry, especially the use of probiotic microorganisms that can positively influence poultry health and produce safe edible products should be given more attention. Since the introduction of these antimicrobial agents in human and veterinary medicine, acquired resistances against frequently used antibiotics have been observed (Smith, 1999). A major factor in emergence, selection and dissemination of antibiotic resistant microorganisms in both veterinary and human medicine is the use of antibiotics (Tollefson and Flynn, 2002). There has been many reports in the past years about the rise in antibiotics resistance but antibiotic resistance still remains a global problem till date. Antibiotics are administered for therapeutic purpose in intensively reared food animals, and as Antimicrobial growth promoters (AMGPs) to the whole flock rather than individuals (Van der Bogaard and Stobberingh, 1999). Resistance to antibiotics can occur naturally for a particular organism/drug combination or acquired resistance, where misuse of antimicrobials results in a population being exposed to an environment in which organisms that have genes conferring resistance (either spontaneously mutated or through DNA transfer from other resistant cells) have been able to flourish and spread. Hence, there is high antibiotic selection pressure for resistance in bacteria in poultry and consequently their fecal flora contains a relatively high proportion of resistant bacteria (Van der Bogaard and Stobberingh, 1999). Resistant strains from the poultry gut easily contaminate poultry carcasses and when consumed, they alter or affect human endogenous flora (Van der Bogaard and Stobberingh, 2001). Gene transfer occurs majorly *in vivo* between gastrointestinal tract bacteria of humans and pathogenic bacteria, as identical resistant genes are present in diverse bacterial species from different hosts (Scott, 2002). With respect to this, there is high probability that most pathogenic bacteria that threaten human health may soon be resistant to all known antibiotics (Scott, 2002). Certain antibiotics however are critical to human infections caused by multidrug resistant pathogens, or because alternative therapies are less effective or are associated with side effects (Akond *et al*, 2008) It is very much important to determine the effectiveness of antimicrobial agents against specific pathogens-either human or animal source for proper therapy (Prescott *et al*, 2005). The increase development of resistance to antimicrobial drugs is a serious problem worldwide, which is a menace to the ability to treat infections in animals and humans (Adeleke and Omafuvbe, 2011). More so, the use of antimicrobials in agriculture especially as growth promoters, chemotherapeutic and prophylactic agents in food animals' bacteria are of public health implication (Heuer and Smalla, 2007; Witte, 1998) which centers around problems related to prescribing inappropriate antibiotic treatment in cases of infection. The objectives of this research are to assess the prevalence of antimicrobial resistant bacteria in some poultry farms in Umuahia and to determine the antimicrobial susceptibility profile of the isolates.

## II. MATERIALS AND METHODS

Five (5) poultry farms in Umuahia, Abia state, Nigeria were visited and a total of 50 samples were collected, which includes 30 faecal samples, 20 drinking water samples. A quantity of faecal sample was aseptically collected and transferred into a sterile universal sample container. The drinking water samples were collected aseptically using the sterile universal sample container. The samples were collected in batches and a total of 10 samples which includes 6 fecal samples and 4 drinking water samples were collected in each of the poultry farms visited. The samples were taken to the laboratory upon collection for inoculation on the appropriate medium.

The culture media used were Nutrient agar, *Salmonella Shigella* agar and MacConkey agar. The culture media were prepared according to the manufacturer' s instructions. The required amount of culture media was weighed and dissolved in appropriate volume of distilled water in a conical flask. Dissolved media was autoclaved at 121°C for 15 minutes (but the *Salmonella Shigella* agar was boiled to 100°C with frequent agitation). The culture media were allowed to cool to about 45°C before aseptically dispensed into sterile Petri dishes and allowed to solidify.

## III. CULTURING ON AGAR MEDIA AND IDENTIFICATION OF BACTERIAL ISOLATES

After collections of samples, 1g of the faecal sample was inoculated into peptone broth for primary enrichment, and then incubated at 24 hours at 37°C

For the drinking water sample, 1ml was inoculated into peptone broth for primary enrichment, and then incubated for 24 hours at 37°C. Using a sterile wire loop, a loopful of sample from the peptone water broth containing the samples, was streaked on the different media used. The culture plates were incubated for 24 hours at 37°C. After the initial reading of the primary plates, isolates were sub cultured to obtain pure colonies (single colony growth). From these pure cultures, appropriate

microbiological procedures for identification of the isolates were carried out. Pure colonies of all the isolates were identified using colony morphology on agar plates, Gram staining and Biochemical tests.

#### IV. GRAM STAINING

A colony of each of the organism was emulsified in a drop of sterile distilled water on a glass slide using a wire loop sterilized by flaming. The emulsions were allowed to air dry completely, and then fixed by passing over the Bunsen burner flame three times. The slides were placed on a staining rack, and then flooded with crystal violet. The Stain was allowed to stay 30-60 seconds, after which the stain was washed off with clean water. Lugol' s iodine solution was added and allowed to stay for a minute, then washed off with water. The slides were decolorized for five seconds with acid-alcohol solution, and then washed off with water. The slides were finally counterstained with safranin solution for 2 minutes and also washed off with water. These slides were air dried and viewed microscopically using 100 x objective (oil immersion) and the Gram' s reaction of the organisms was recorded. The method used was that described by Cheesbrough (2006)

#### V. BIOCHEMICAL TESTS

**CATALASE TEST-** Using a small sterile applicator stick, several colonies of the test organism was immersed in 2ml of freshly prepared 3% H<sub>2</sub>O<sub>2</sub> solution in a test tube. Immediate bubbling indicates a positive test and no bubbling indicates a negative test.

**METHYL RED TEST-** MR-VP broth was prepared by mixing one (1) g of peptone water powder and one (1) g of K<sub>2</sub>HPO<sub>4</sub> with 200ml of distilled water. This mixture was dispensed into 5ml volume bijou bottles and sterilized. After sterilization, 0.25ml of glucose solution sterilized by steaming was added into each of the bijou bottles. The test organisms were then inoculated into the various bottles and appropriately labeled. The bottles were incubated for five days. After incubation, five drops of methyl red were added to the bottles for methyl red test. A positive test was indicated by appearance of red color. Negative test was indicated by a yellow coloration of the media.

**VOGES- PROSKAUER TEST –** MR-VP broth was prepared by mixing one (1) g of peptone water powder and one (1) g of K<sub>2</sub>HPO<sub>4</sub> with 200ml of distilled water. This mixture was dispensed into 5ml volume bijou bottles and sterilized. After sterilization, 0.25ml of glucose solution sterilized by steaming was added into each of the bijou bottles. The test organisms were then inoculated into the various bottles and appropriately labeled. The bottles were incubated for five days. After incubation, 1ml of the MR-VP broth with test organisms was transferred to sterile test tubes. Fifteen (15) drops of VP reagent A was added to the test tubes followed by 5 drops of VP reagent B. A positive test was indicated by appearance of pink-red color. Negative test was indicated by a light-yellow coloration of the media.

**INDOLE TEST-** was performed on the bacterial isolates to determine the ability of the organisms to convert tryptophan into the indole. The test organism was inoculated into a bijou bottle containing 3ml of sterile peptone water and incubated at 35-37°C for 48 hours. Indole was tested by adding 0.5ml of Kovac' s reagent and examined for a ring of red color in the surface layer within 10 minutes. A ring of red layer indicates positive test. Absence of a ring of red layer indicates a negative test.

**CITRATE UTILIZATION TEST-** was used to detect the ability of an organism to use citrate as its sole source of carbon and energy. Slopes of Simmons citrate agar were prepared in bijou bottles as recommended by manufacturer. Using a sterile wire loop, the slope was first streaked with a saline suspension of the organism and then the butt was stabbed and incubated at 35°C for 48 hours. A bright blue color is a positive test.

#### VI. ANTIMICROBIAL SUSCEPTIBILITY TESTING

Bacterial isolates were tested for antibiotics susceptibility by the Kirby Bauer disc agar diffusion technique. Muller Hinton agar plates were prepared as recommended by the manufacturer. A suspension of the isolates was prepared by picking the colonies with the aid of a sterile wire loop and mixing with normal saline in sterile bijou bottles and this was matched with the turbidity of 0.5 McFarland standard. Sterile swab sticks were dipped into the suspension and spread evenly onto the surface of the Muller Hinton agar plates. The antibiotics discs were aseptically placed on the surface of the Muller Hinton agar plates with the aid of a sterile forceps. Plates were incubated at 35°C for 16-18 hours. The antibiotics used were Gram negative and Gram-positive disk from Abtek Biologicals, UK Ltd containing ceftazidime (30µg/mL), cefuroxime (30µg/mL), gentamicin (10µg/mL), cefixime (5µg/mL), ofloxacin (5µg/mL), augumentin (30µg/mL), nitrofurantoin (300µg/mL), ciprofloxacin

(5µg/mL), cotrimoxazole (25µg/mL), cloxacillin (5µg/mL), erythromycin (5µg/mL), streptomycin (10µg/mL), tetracycline (10µg/mL) and chloramphenicol (10µg/mL).

## VII. RESULTS

In this study, a total of 92 bacterial isolates were obtained from the faecal and drinking water samples of poultry farms in Umuahia (Table 1). These include *E. coli* (32), *Klebsiella* spp (9), *Salmonella* spp. (26), *Shigella* spp (13) and *Staphylococcus* spp (12) (Table 2). Out of the 92 bacterial isolates, 61 were obtained from the faecal samples (Table 3) and 31 were obtained from the drinking water samples (Table 4). The antimicrobial susceptibility patterns of the isolates are presented in table five and six. Out of the 32 *Escherichia coli* isolates, 53.1% showed susceptibility to Gentamicin, 71.9% to Ofloxacin, 75.0% to Nitrofurantoin and 68.8% to Ciprofloxacin (Table 5). 22.2% of *Klebsiella* spp were susceptible to Gentamicin, 33.3% to Ofloxacin, 33.3% to ciprofloxacin and 44.5% to Nitrofurantoin (Table 5). The rate of *Salmonella* spp. susceptibility to the tested antimicrobial agents was as follows: 50.0% were susceptible to Gentamicin, 76.9% to Ofloxacin, 76.9% to ciprofloxacin, and 73.1% to Nitrofurantoin (Table 5). 30.8% of *Shigella* spp were susceptible to Gentamicin, 69.2% to Ofloxacin, 76.9% to ciprofloxacin and 76.9% to Nitrofurantoin (Table 5). 83.3% of *Staphylococcus* spp were susceptible to Gentamicin, 75.0% to Augmentin, 16.7% to Cloxacillin and 33.3% to Chloramphenicol (Table 5).

There was a high rate of multidrug resistance (resistance to three or more antimicrobials agents) among the isolates. All the 92 isolates showed complete resistance to seven antimicrobial agents namely Ceftazidime, Cefuroxime, Cefixime, Cotrimoxazole, Erythromycin, Streptomycin and Tetracycline (Table 6). Overall, 48.9% of the isolates were susceptible to Gentamicin, 67.5% to Ofloxacin, 9.8% to Augmentin, 68.8% to Nitrofurantoin, 68.8% to Ciprofloxacin, 16.7% to Cloxacillin and 33.3% to Chloramphenicol (Table 7).

TABLE 1: NUMBER, PERCENTAGE AND SOURCE OF ISOLATED ORGANISMS.

SAMPLE TYPE	P 1	P 2	P 3	P 4	P 5	TOTAL
FS	14	12	9	13	13	61 (66.3%)
DWS	7	5	6	6	7	31 (33.7%)
TOTAL	21	17	15	19	20	92

FS (faecal sample); DWS (drinking water sample); P (poultry)

P 1 (Precious poultry farm)

P 2 (Iwuchukwu poultry farm) P 3 (MOUAU poultry farm 1) P 4 (Cecelia poultry farm)

P 5 (MOUAU poultry farm 2).

TABLE 2: NUMBER AND PERCENTAGE PREVALENCE OF DIFFERENT ISOLATED ORGANISMS.

ISOLATES	P 1	P 2	P 3	P 4	P 5	TOTAL
<i>E coli</i>	7	5	5	8	7	32 (34.8%)
<i>Staphylococcus spp</i>	2	3	1	2	4	12(13.0%)
<i>Shigella spp</i>	2	3	2	3	3	13 (14.1%)
<i>Salmonella spp</i>	6	4	5	5	6	26 (28.3%)
<i>Klebsiella spp</i>	4	2	2	1	-	9 (9.8%)
TOTAL	21	17	15	19	20	92

P (poultry)

P 1 (Precious poultry farm)

P 2 (Iwuchukwu poultry farm) P 3 (MOUAU poultry farm 1) P 4 (Cecelia poultry farm)

P 5 (MOUAU poultry farm 2)

TABLE 3: PREVALENCE OF DIFFERENT ISOLATED ORGANISMS FROM FAECAL SAMPLES.

ISOLATES	P 1	P 2	P 3	P 4	P 5	TOTAL
<i>E coli</i>	5	3	2	5	4	19 (31.2%)
<i>Staphylococcus spp</i>	-	1	-	-	2	3 (4.9%)
<i>Shigella spp</i>	2	3	2	3	3	13 (21.3%)
<i>Salmonella spp</i>	4	3	3	4	4	18 (29.5%)
<i>Klebsiella spp</i>	3	2	2	1	-	8 (13.1%)
TOTAL	14	12	9	13	13	61

P (poultry)

P 1 (Precious poultry farm)

P 2 (Iwuchukwu poultry farm) P 3 (MOUUAU poultry farm 1) P 4 (Cecelia poultry farm)

P 5 (MOUUAU poultry farm 2).

TABLE 4: PREVALENCE OF DIFFERENT ISOLATED ORGANISMS FROM DRINKING WATER SAMPLE.

ISOLATES	P 1	P 2	P 3	P 4	P 5	TOTAL
<i>E coli</i>	2	2	3	3	3	13 (41.9%)
<i>Staphylococcus spp</i>	2	2	1	2	2	9 (29.0%)
<i>Shigella spp</i>	-	-	-	-	-	-
<i>Salmonella spp</i>	2	1	2	1	2	8 (25.6%)
<i>Klebsiella spp</i>	1	-	-	-	-	1 (3.2%)
TOTAL	7	5	6	6	7	31

P (poultry)

P 1 (Precious poultry farm)

P 2 (Iwuchukwu poultry farm) P 3 (MOUUAU poultry farm 1) P 4 (Cecelia poultry farm)

P 5 (MOUUAU poultry farm 2).

TABLE 5: SENSITIVITY PATTERN OF ISOLATED ORGANISMS

ISOLATES	ANTIBIOTICS													
	CAZ	CRX	GEN	CXM	OFL	AUG	NIT	CPR	COT	CXC	ERY	STR	TET	CHL
<i>E.coli</i> (32)	0 (0)	0(0)	17 (53.1%)	0(0)	23 (71.9%)	0(0)	24(75%)	22(68.8%)	NA	NA	NA	NA	NA	NA
<i>Staphylococcus</i> spp (12)	NA	NA	10(83.3%)	NA	NA	9(75%)	NA	NA	0(0)	2(16.7%)	0(0)	0(0)	0(0)	4(33.3%)
<i>Shigella</i> spp (13)	0(0)	0(0)	4(30.8%)	0(0)	9(69.2%)	0(0)	10(76.9%)	10(76.9%)	NA	NA	NA	NA	NA	NA
<i>Salmonella</i> spp (26)	0(0)	0(0)	13(50%)	0(0)	20(76.9%)	0(0)	19(73.1%)	20(76.9%)	NA	NA	NA	NA	NA	NA
<i>Klebsiella</i> spp (9)	0(0)	0(0)	2(22.2%)	0(0)	3(33.3%)	0(0)	4(44.4%)	3(33.3%)	NA	NA	NA	NA	NA	NA

CAZ-ceftazidime, CRX-cefuroxime, GEN-gentamicin, CXM-cefixime, OFL-ofloxacin, AUG-augmentin, NIT-nitrofurantoin, CPR- ciprofloxacin, COT-cotrimoxazole, CXC-cloxacillin, ERY-erythromycin, STR-streptomycin, TET-tetracycline, CHL-chloramphenicol and NA – Not applied.

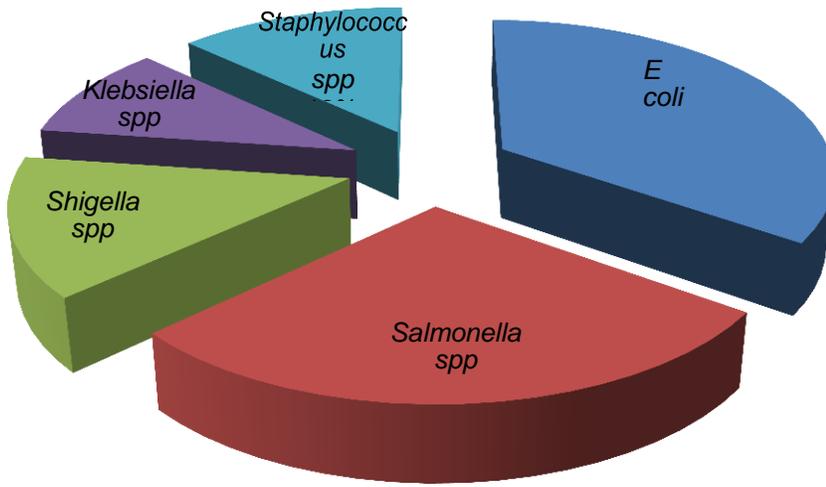
TABLE 6: RESISTANCE PATTERN OF ISOLATED ORGANISMS

ISOLATES	ANTIBIOTICS													
	CAZ	CRX	GEN	CXM	OFL	AUG	NIT	CPR	COT	CXC	ERY	STR	TET	CHL
<i>E.coli</i> (32)	32 (100%)	32 (100%)	15 (46.9%)	32 (100%)	9 (28.1%)	32 (100%)	8 (25%)	10 (31.2%)	NA	NA	NA	NA	NA	NA
<i>Staphylococcus</i> spp (12)	NA	NA	2 (16.7%)	NA	NA	3 (25%)	NA	NA	12 (100%)	10 (83.3%)	12 (100%)	12 (100%)	12 (100%)	8(66.7%)
<i>Shigella</i> spp (13)	13 (100%)	13 (100%)	9 (69.2%)	13 (100%)	4 (30.8%)	13 (100%)	3 (23.1%)	3 (23.1%)	NA	NA	NA	NA	NA	NA
<i>Salmonella</i> spp (26)	26 (100%)	26 (100%)	13 (50%)	26 (100%)	6 (23.1%)	26 (100%)	7 (26.9%)	6 (23.1%)	NA	NA	NA	NA	NA	NA
<i>Klebsiella</i> spp (9)	9 (100%)	9 (100%)	7 (77.8%)	9 (100%)	6 (66.7%)	9 (100%)	5 (55.6%)	6 (66.7%)	NA	NA	NA	NA	NA	NA

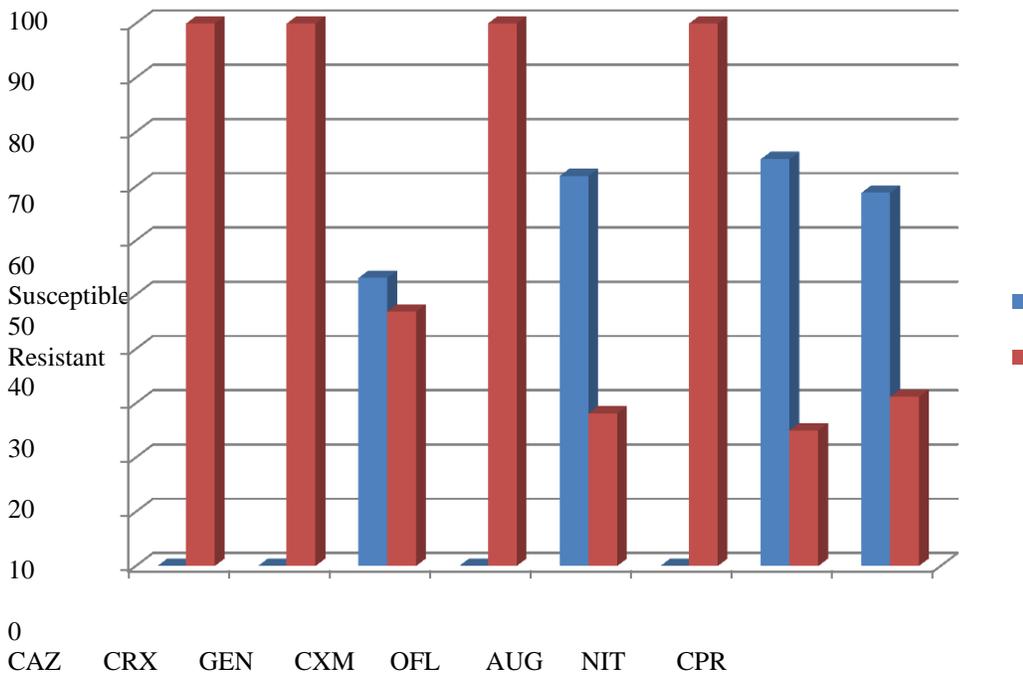
CAZ-ceftazidime, CRX-cefuroxime, GEN-gentamicin, CXM-cefixime, OFL-ofloxacin, AUG-augmentin, NIT-nitrofurantoin, CPR- ciprofloxacin, COT-cotrimoxazole, CXC-cloxacillin, ERY-erythromycin, STR-streptomycin, TET-tetracycline, CHL-chloramphenicol and NA – Not applied.

**TABLE 7: OVERALL SUSCEPTIBILITY**

ANTIBIOTICS	NUMBER TESTED	% SUSCEPTIBLE
GENTAMICIN	92	48.9
OFLOXACIN	80	67.5
AUGMENTIN	92	9.8
NITROFURANTOIN	80	68.8
CIPROFLOXACIN	80	68.8
CLOXACILLIN	12	16.7
CHLORAMPHENICOL	12	33.3

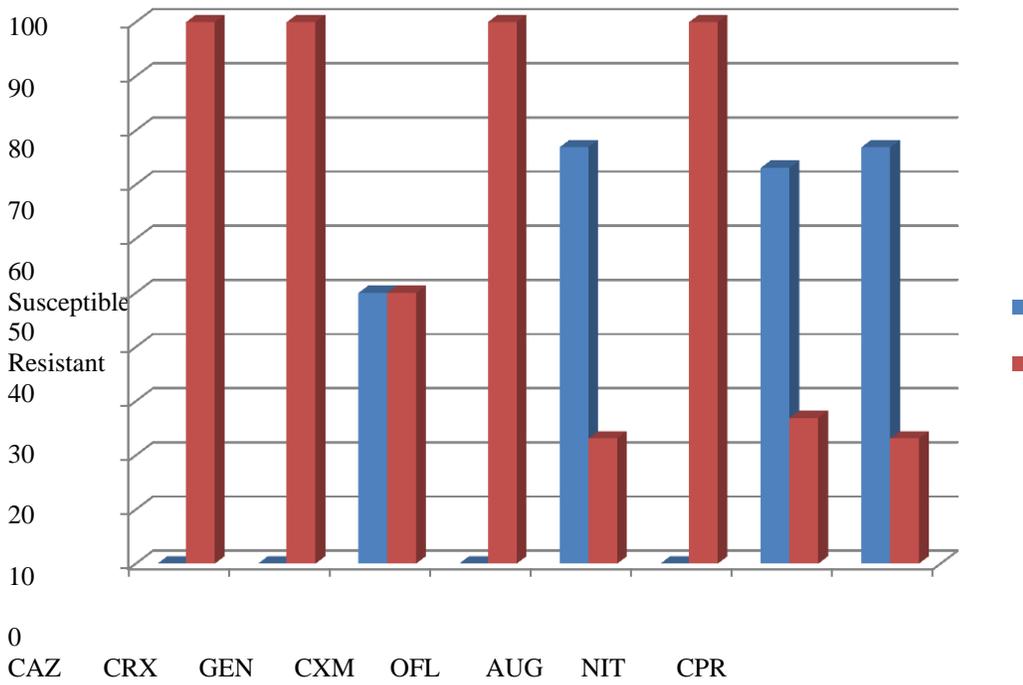


**FIG 1** – Percentage prevalence of different isolates.



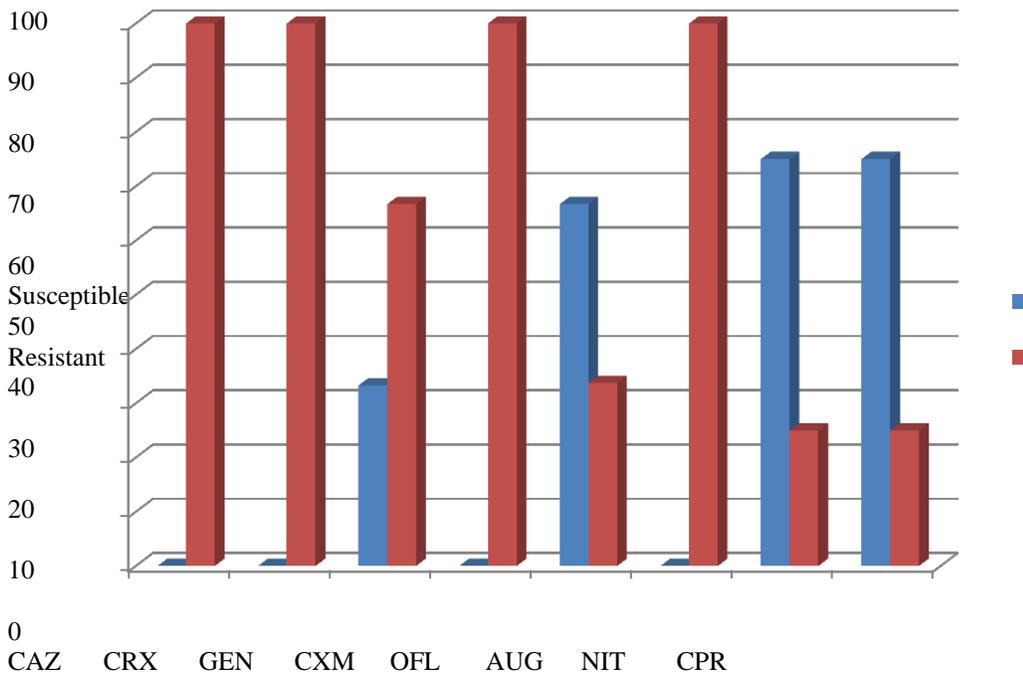
CAZ-ceftazidime, CRX-cefuroxime, GEN-gentamicin, CXM-cefixime, OFL-ofloxacin, AUG- augmentin, NIT- nitrofurantoin and CPR-ciprofloxacin.

**FIG 2** - Susceptibility pattern of *E coli*.



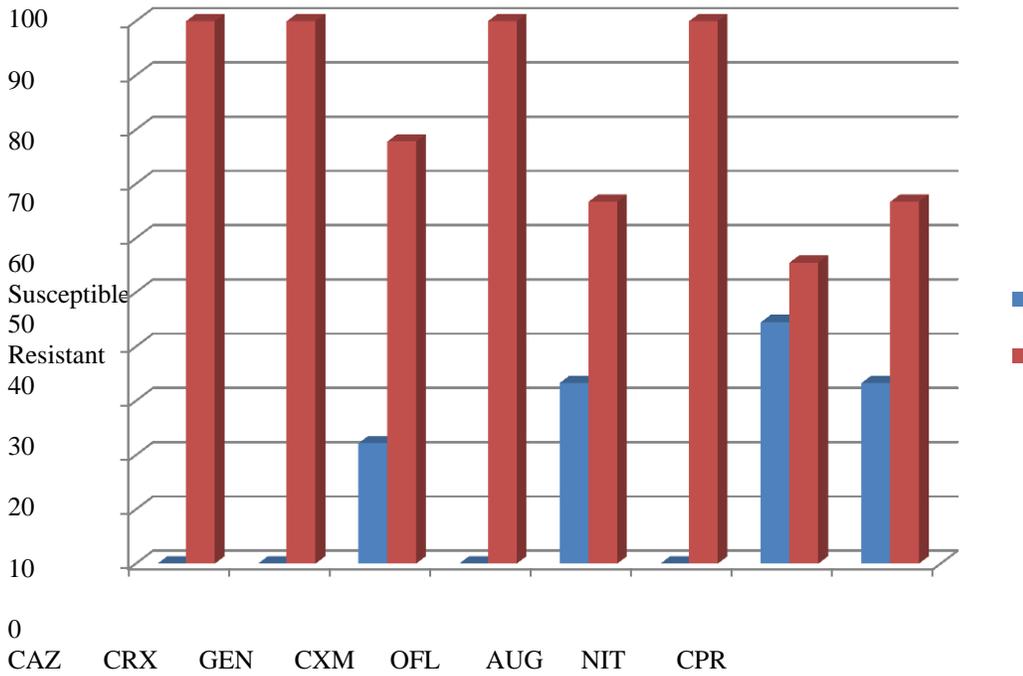
CAZ-ceftazidime, CRX-cefuroxime, GEN-gentamicin, CXM-cefixime, OFL-ofloxacin, AUG- augmentin, NIT- nitrofurantoin and CPR-ciprofloxacin.

**FIG 3** - Susceptibility pattern of *Salmonella* spp.



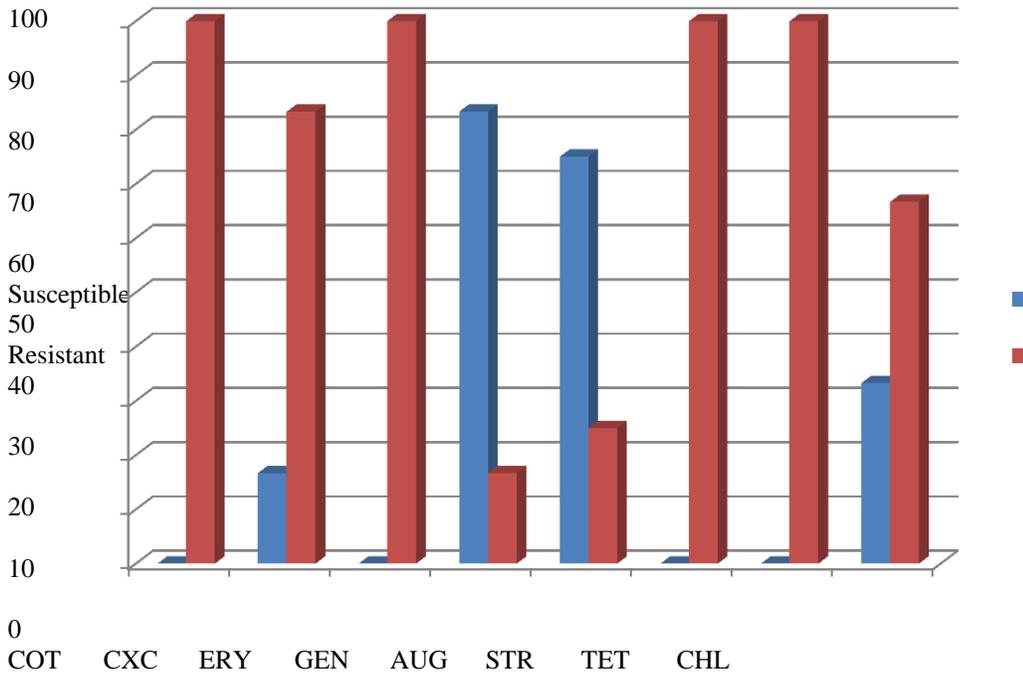
CAZ-ceftazidime, CRX-cefuroxime, GEN-gentamicin, CXM-cefixime, OFL-ofloxacin, AUG- augmentin, NIT- nitrofurantoin and CPR-ciprofloxacin.

**FIG 4** - Susceptibility pattern of *Shigella* spp.



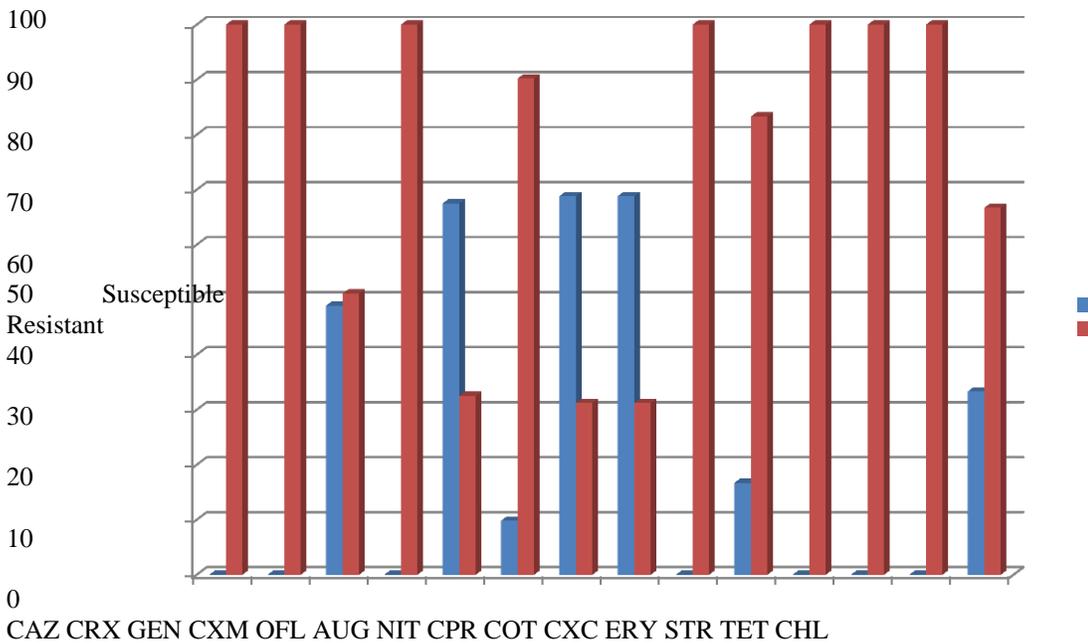
CAZ-ceftazidime, CRX-cefuroxime, GEN-gentamicin, CXM-cefixime, OFL-ofloxacin, AUG- augmentin, NIT- nitrofurantoin and CPR-ciprofloxacin.

**FIG 5** - Susceptibility pattern of *Klebsiella* spp.



COT-cotrimoxazole, CXC-cloxacillin, ERY-erythromycin, GEN-gentamicin, AUG-augmentin, STR-streptomycin, TET-tetracycline and CHL-chloramphenicol.

**FIG 6** - Susceptibility pattern of *staphylococcus* spp.



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CAZ-ceftazidime, CRX-cefuroxime, GEN-gentamicin, CXM-cefixime, OFL-ofloxacin, AUG- augmentin, NIT-nitrofurantoin, CPR-ciprofloxacin, COT-cotrimoxazole, CXC-cloxacillin, ERY- erythromycin, STR-streptomycin, TET-tetracycline and CHL-chloramphenicol.

**FIG 7** - Susceptibility pattern of all isolates.

## VIII. DISCUSSION

This study investigated the antimicrobial susceptibility profile of pathogenic bacteria isolated from poultry farms in Umuahia, Abia state, Nigeria. A total of 50 samples were collected, which includes 30 faecal samples, 20 drinking water samples. Appropriate microbiological procedures were carried and a total of 92 isolates were obtained. Findings from the present study show that poultry farms harbor pathogenic bacteria. There was high prevalence of *E coli* (34.8%). *E coli* are commonly used as the indicator for the surveillance and monitoring of the emergence of antimicrobial resistance (Kijima-Tanaka *et al*, 2003). From the present study, 48.9% of the isolates were susceptible to Gentamicin, 67.5% to Ofloxacin, 9.8% to Augmentin, 68.8% to Nitrofurantoin, 68.8% to Ciprofloxacin, 16.7% to Cloxacillin and 33.3% to Chloramphenicol but showed complete resistance to Ceftazidime, Cefuroxime, Cefixime, Cotrimoxazole, Erythromycin, Streptomycin and Tetracycline. Generally, the isolates showed higher susceptibility to Nitrofurantoin (68.8%), Ciprofloxacin (68.8%) and Ofloxacin (67.5%). The reason for the higher susceptibility to these antibiotics could be because they are broad spectrum antibiotics and they are hardly used by poultry farmers' thus minimal room for antibiotic resistance by these isolates. The rise in antibiotics resistance had been reported in the past years and still remains a global problem today. In intensively reared food animals, antibiotics are administered for therapeutic purpose and as Antimicrobial growth promoters (AMGPs) to the whole flock rather than individuals (Van der Bogaard and Stobberingh, 1999). Resistance to antibiotics can either be naturally occurring for a particular organism/drug combination or acquired resistance, where misuse of antimicrobials results in a population being exposed to an environment in which organisms that have genes conferring resistance (either spontaneously mutated or through DNA transfer from other resistant cells) have been able to flourish and spread. The resistance to some antibiotics may be attributed to constant contact between feed, poultry birds and faecal dropping as also reported by Vellinga and Van-loock (2002). The bacterial isolates showed high level of antibiotic resistance against most used antibiotics. The result is in agreement with Muhammad *et al* (2010) who reported that the abuse and misuse of antimicrobial agents for growth promotion and prevention of diseases has impressed a selective pressure that causes discovery of more resistant bacteria. This is true with the bacteria associated with poultry litter in this study. Thus, the antibiotic selection pressure for resistance by bacteria in poultry is high and as a result their faecal floor contains higher proportion of resistant bacteria (Van der Bogaard and Stobberingh, 1999).

In the light of this, there is probability that most pathogenic bacteria that threaten human health may soon be resistant to all known antibiotics (Scott, 2002). Certain antibiotics however are critical to human infections caused by multidrug resistant pathogens, or because alternative therapies are less effective or are associated with side effects (Akond *et al*, 2008). The determination of the effectiveness of antimicrobial agents against specific pathogens-either human or animal source is essential for proper therapy (Prescott *et al*, 2005). The development of resistance to antimicrobial drugs is a serious problem worldwide, which threatens the ability to treat infections in animals and humans (Adeleke and Omafuvbe, 2011). Most resistance problem probably arose from inappropriate use of antibiotics which exposes infectious agents to sub therapeutic doses of antimicrobial agents.

More so, the use of antimicrobials in agriculture especially as growth promoters, chemotherapeutic and prophylactic agents in food animal' s bacteria are of public health implication (Witte, 1998). Thus, it became imperative to provide information on the susceptibility profile of pathogenic bacteria isolated from poultry farms in Umuahia. Furthermore, in developing countries, including Nigeria, there is easy access to antimicrobials and owners of poultry farms may administer antimicrobial preparations to sick animals without recourse to professional advice. Chickens may also be directly exposed to antimicrobials through improper disposal of the containers of used antimicrobial agents. Contamination of the environment by resistant bacteria from poultry farms constitutes a public health hazard because of the possible transmission of these potential pathogens to humans through contact and consumption of contaminated food substances (Aubry-Damon *et al.*, 2004).

## IX. CONCLUSION

In conclusion, the present results provide evidence that poultry faecal materials and drinking water samples can serve as an environmental reservoirs of multiple antibiotics resistant bacteria and hence as potential route for the entry of multidrug resistant zoonotic pathogens into human population. These have very important implications for human health, as multidrug resistant infections are difficult to treat and often require expensive antibiotics and long-term therapy. This can substantially increase the cost of treatment and even mortality.

## X. RECOMMENDATIONS

1. Proper information dissemination to poultry farmers and poultry feeds producers on dangers of antibiotic resistant strains and indiscriminate use of antibiotics.
2. Improved feeding and keen health management practices involving prudent usage of antibiotics under professional advice.
3. Biosecurity plan should be employed in the poultry industry.

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# Challenges In The Methods And Practices Of Teaching Pupils With Hearing Impairments In Mombasa County, Kenya

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**Abstract-** Inclusion is a philosophy that focuses on the process of adjusting the home, school and the larger society to accommodate persons with special needs including disability. The success of provision of inclusive practices is contingent upon the quality of teaching in an inclusive setting and thus the purpose of this study was to investigate the pedagogical challenges teachers encounter in the implementation of special needs inclusive education for pupils with hearing impairments in public primary schools in Mombasa County, Kenya. The study investigated the challenges in the methods and practices of teaching and the availability of teaching/ learning resources for pupils with hearing impairments. This research was conducted in 20 schools in Mombasa County and it involved 210 teachers and 20 head teachers as the target population. It employed descriptive survey involving both qualitative and quantitative data. Descriptive statistics involving percentages and frequency distribution tables were used to present the results. The findings indicated that teachers' lack of sign language skills was a significant barrier to the implementation of inclusive education for pupils with hearing impairments. The study recommended sign language as a part of compulsory inclusive curriculum at both secondary and university education and introduction of sign language refresher courses to equip teachers with effective methods of teaching pupils with hearing impairments.

**Index Terms-** Inclusive Education, Hearing Impairments, Inclusive Strategies, Pedagogical Challenges.

## I. INTRODUCTION

The term inclusive education is derived from the philosophy of inclusion which dates back to the 1950s and focuses on the process of adjusting the home, school and the larger society to accommodate learners with special needs including disability (Alquraini, & Gut, 2012). The philosophy advocates that all individuals regardless of their differences should be accorded with the opportunity to interact, play, learn, work and experience the feeling of belonging. It also means identifying, reducing or removing barriers within and around the school that may hinder learning. For this to happen, teachers, schools, and education systems need to modify the physical and social environment so that they can adequately accommodate learners' diversity (KISE,

2007). Hearing impairment is a hidden disability because it is not clearly identifiable. Hearing Impairment or deafness according to Rosa et al. (2017) is a condition where an individual is impaired in processing linguistic information through hearing. The severity of a hearing impairment is measured by the amount of sound that can be heard using one's better ear which is measured using decibels (dB). Hearing loss can be caused by a number of factors including heredity, aging, loud sound exposure, diseases, infections, trauma, or ototoxic drugs (Lelan, 2013).

Statistics from the World Health Organization (2012) reveal that 120 million people globally live with hearing impairment. Sub Saharan Africa has 1.2 million children aged between 5- 14 years old suffering from moderate to severe hearing loss. Unless action is taken, it is likely that the number of people with disabling hearing loss will grow over the coming years. Projections show that the number could rise to 630 million by 2030 and may be over 900 million in 2050. According to the Kenya National Bureau of Statistics (2010), out of the country's population of 38.7 million, 800,000 live with hearing impairments. The number of primary school children in Kenya living with hearing impairments is considered to be a fifth of the population living with hearing impairments in Kenya and the number is rising due to different array of factors caused by high levels of poverty in some areas.

There has been an international effort to include children with disabilities in the educational mainstream. Jelas & Mohd (2014) suggest that inclusive education or mainstreaming is the key policy objective for the education of children and youth with disabilities. Internationally, inclusive education is supported by policies which include the United Nations Declaration of Human Rights and the Convention on the Rights of the Child which advocate for the right to education and full participation for all people in the society. The Jomtien Declaration (1990) amplified the need of taking all children to school and provision of the most suitable education. The Salamanca Statement and Framework for Action on Special Needs Education (UNESCO, 1994) adopted by the World Conference on Special Needs Education paved the way for inclusive education. It upheld the aim of 'education for all' by suggesting fundamental changes in programs and policies of the nations. It standardized rules on equalization of opportunities for persons with special needs including those with disabilities. The Statement (under the aegis of UNESCO) outlined the rights of all children to access education in the regular school environment and

the responsibilities of school systems to accommodate all pupils. The Salamanca Statement has also provided valuable reference points for inclusive education as it provides a framework for thinking about how to move from policy into practice. Recently, The United Nations has developed, The Convention on the Rights of Persons with Disabilities (UNCRPD), which reaffirms that all persons irrespective of any impairment must enjoy all human rights and fundamental freedoms. Kenya is a signatory to most of the policies.

Kenya has taken steps to formulate legislation and policies with a view of attaining nationwide inclusive education. The first commission after independence to address the issue of special needs education was the Kenya Education Commission (1964). It stated that education should be used as an instrument for a conscious change of attitudes and relationships and hence, strive to foster respect for human personality (Oketch, 2009). The Kenya Education Commission (1964) highlighted that children with mild disabilities should be allowed to continue learning in regular schools (Oketch, 2009). Teachers were asked to be sympathetic to learners with disabilities and it further recommended special training to enable teachers to work favourably with them. The Persons with Disabilities Act (2003) Section 18, prohibits discrimination against children with disabilities in accessing education institutions by virtue of their disability and further provides for the establishment of special institutions. (GoK, 2003). The key instrument in achieving nationwide inclusive education in Kenya is the 2009 Special Needs Education Policy Framework (Republic of Kenya 2009). The Ministry of Education in partnership with various stakeholders provided a guiding document that will help pupils with disabilities receive equal access to special education services and further boost the country's goal of achieving Education for All.

### Specific Objectives

- To verify how methods and practices of teaching influence the implementation of inclusive education for pupils with hearing impairments.
- To determine the adequacy of teaching / learning resources for pupils with hearing impairments.

## II. METHODOLOGY

This study adopted a descriptive survey design. Descriptive survey designs are used in preliminary and exploratory studies to allow the researcher to gather information, summarize, present and interpret the study for the purpose of clarification (Orodho, 2012). The descriptive design was preferred because it describes key features of an occurrence, people, society or a target population (Maxwell, 2012). The study was conducted under a mixed method design, combining both quantitative and qualitative approaches in the data collection and analysis (Creswell & Tashakkori, 2007). This mixed method design gives opportunity to collect detailed and comprehensive qualitative data in order to support the quantitative data in response to the objectives of the study. The objective of choosing this method was to obtain a deeper understanding from the quantitative data as well as use the qualitative data to support the quantitative findings. Quantitative data aimed at getting statistical data on teacher challenges in

implementing inclusive education and the availability of teaching/ learning resources for pupils with hearing impairments.

The target population comprised of two hundred and ten (210) teachers and twenty (20) head teachers from twenty (20) public primary schools in Mombasa County implementing inclusive education for pupils with hearing impairments. Teachers were selected for this study because they are the major agents in the implementation of inclusive education practices for pupils with hearing impairment. Teachers are also in direct contact with pupils with hearing impairment in public primary schools and hence, their responsibility in implementing special needs education inclusive practices in schools. The sample size for the study comprised 60 teachers and 20 head teachers. To ensure that all teachers had an equal and independent chance of being selected as members of the sample, simple random sampling technique was employed.

## III. RESULTS AND DISCUSSION

### *Sign language as a barrier*

When teachers were asked to identify the main challenges they encountered in implementing special needs inclusive education, 48 teachers (80%) identified lack of sign language skills as a major communication barrier. The respondents had not been professionally prepared to teach children with special needs including those with Hearing Impairments during their regular teacher education programmes. The finding was in concordance with the findings of a study by Mpfu and Chimhenga (2013) that attributed the findings to the fact that teachers are unlikely to effectively cater for the pupils with hearing impairments because they are not adequately trained in the art of communicating using sign language. Language is a tool that is used for communication and if the teacher cannot communicate with the pupils, then the pupils' education is likely to be hindered. Pupils with Hearing Impairment are mostly visual learners. This means that if the teacher continues to use word of mouth to communicate, the pupil will be disadvantaged and become distressed (Mpfu & Chimhenga, 2013). Teachers' lack of sign language skills act as a significant barrier which affect the teaching/learning process. In cases where a teacher aide conversant with sign language is employed, teachers must follow the hints for working with a sign interpreter. This proves to be very difficult for a pupil watching a signer to also take notes at the same time from an overhead projector or blackboard.

### *Adequacy of teaching/ learning resources*

Table 1: Adequacy of the Teaching/Resources

	Frequency	Percentage
Very Inadequate	3	5
Inadequate	45	75
Adequate	12	20
<b>Total</b>	<b>60</b>	<b>100</b>

Table 1 shows that majority of the respondents (75%) indicated inadequacy of teaching and learning resources (75%) in all the schools under study. The study revealed that all the classrooms lacked adequate resources, which hindered effective teaching and learning. This indicates lack of appropriate

instructional resources needed for learners with special needs which affects the access to all inclusive education for pupils with hearing impairment. The high cost of instructional resources for learners within inclusive classroom setting makes access to all inclusive education services to be a pedagogical challenge as they compete unfavourably with those of regular children. The findings of this study are in harmony with a study conducted by Angelides and Aravi, (2007) which revealed that insufficient relevant resources is a major pedagogical challenge to effective implementation of special needs inclusive education in many schools. Armstrong et al. (2016) suggest that teaching or learning materials should be selected according to the specific needs of the learners. When teachers fail to get such materials they resort to using only blackboards which are likely not effective for all pupils in inclusive classes. Pupils without learning aids and support materials have their mobility reduced and they feel inferior to their regular counterparts. They have to continuously play catch up. With the reason of not being able to hear, see and express themselves appropriately and writing slower than other children results in many of them failing in examinations. Kigotho (2016) observes that lack of teaching/ learning facilities in schools is a primary contributory factor to poor performance for learners with HI, which negatively impact on pedagogy. It is true that lack of reading books and other facilities manifest poor continuous teaching and learning especially in inclusive classroom setting. Ostrove, & Olivia (2010) asserts that teaching materials are necessary in promoting learning, maintain interest, add variety to the lesson and linking one subject to other subjects.

In Kenya, lack of school resources affects learning in both primary and secondary schools (Muiruri, 2015). Mutuku (2013) notes that, availability and use of teaching and learning materials as well as using specialized equipment is important in facilitating learning. Mariana (2015), states that variation in quality and quantity of teaching/learning and facilities suggests that pupils receive poorer education. Humphrey, & Alcorn, (2007) posits that hearing aids are a pre-requisite for those with hearing loss of between 40-55 decibels. The hearing aids are necessary in order to increase the loudness of sounds. This implies that the children's right to communicate and attain their potentialities is likely to be denied. Statistics has revealed that, on average educational and instructional materials for a pupil with hearing impairment include bone conductors, FM and DM systems, cochlear implants, hearing aids and sound field systems. Asif (2008) has observed that for an effective inclusion process, a professional relationship should be developed with an audiologist, hearing specialists, sign language interpreters, and speech and language therapists. In addition, communication lines should be kept open. Visual and tactile aids should be used as much as is possible, in the classroom. Language in-group activities should be encouraged by allowing time for pupils to start and finish communication. He further reiterates that Kenyan deaf adults should be involved as sign language instructors in inclusive settings as they are often the best teachers in sign language. Deaf and hearing children should be encouraged to use sign language for social interaction and for academic purposes.

It has been claimed that exclusion in most Kenyan schools comes about from a scarcity of resources. For example, Lelan, (2013) and Oosero, (2015) found that head teachers actively redirected pupils living with disability to special schools to avoid

pressure on their funding. This is consistent with Humphrey, & Alcorn, (2007) who observes that teachers believed that it was a lack of funding that contributed to a discrepancy between what was received and what was required to implement a curriculum package. It would appear that in some cases, resources are seen as a critical factor for successful inclusion, and when head teachers believe adequate resources are not available particularly when it comes to the enrolment of pupils with special needs in regular schools, they feel justified in legitimizing the exclusion of pupils with disabilities. This is contrary to Jelas, & Mohd Ali, (2014) observation that using a lack of resources as an excuse for excluding pupils on the basis of their disability is more of a statement about the values held by the excluder than a justification or explanation. Pupils with hearing impairments being excluded because of lack of resources is a myth, with the main forces of exclusion being attitudes, beliefs and systems that are not designed to meet the needs of pupils with hearing impairments.

#### IV. CONCLUSION

From the foregoing findings of the study, it is clear that there are various challenges encountered by teachers in implementing inclusive education for learners with HI. The challenges include teachers lacking sign language skills for effective communication with learners with hearing impairments and inadequacy of teaching/ learning resources. For teachers to successfully implement inclusive education for pupils with hearing impairment, it's imperative to embrace the best teaching methods and practices and also provide the supportive teaching and learning resources.

#### Recommendations

The following recommendations based on the findings of this study have been made:

- The Ministry of Education in collaboration with other stakeholders should ensure that teachers are adequately prepared during their pre-service teacher education programme to enable them to effectively teach pupils with hearing impairments in inclusive classroom settings.
- The Ministry of Education should ensure regular in-service training for all teachers implementing special needs inclusive practices to keep them abreast with strategies and methods on how to teach various categories of disabled pupils within an inclusive classroom setting.
- The government of Kenya through the Ministry of Education should ensure equity of funds allocation to facilitate the purchasing of specialized equipment and resources for effective implementation of inclusive education for pupils with hearing impairment.

#### Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article

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# Measurement Uncertainty in Princess Iman Center Chemistry Department

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**Abstract-** The approach described in this paper using the (top down) method, Bias should be eliminated, and we use QC results using third part control from BIO-RAD, to estimate the MU for the Haemoglobin A1C.

**Index Terms-** Coverage factor (k), Combined standard measurement uncertainty (uc)  
Expanded Measurement Uncertainty (U)

## I. INTRODUCTION

The aim of this study is to estimate the measurement uncertainty for a HA1C results, according to internal quality control (Third part control), expressed as a confidence level within a range, for the test results, so we can have a Confirmation that patients' results meet the quality goals set by our laboratory.

### Concept

Measurement uncertainty expresses the level of confidence a laboratory has of a test result.

It's a requirement in **ISO 15189:2012** Medical laboratories: requirements for quality and competence (**clause 5.5.1.4**)

**ISO 15189:2012** states that measurement uncertainty applies to each measurement procedure used to report measurement uncertainty for those falling into the quantitative and semi-quantitative category.

### Definitions of measurement uncertainty :-

1. The degree to which one is certain of results for a particular Measurement, Expressed as a confidence level within a range.

3. Parameter, associated with the result of a measurement that characterized the dispersion of the values that could reasonably be attributed to the measurand.

(Source: National Pathology Accreditation Advisory Council Requirements for estimation measurements Uncertainty). the

### USES

Measurement uncertainty is useful because:

- It provides quantitative evidence that measurement results meet the lab requirements .
- It can be used to compare results with previous results using the same measurement procedure.

- It can be used as evidence for improvement, and for achieving standardized measurements.

**Measurement uncertainty does not necessarily need to be reported to users of the laboratory, but shall be available if requested.**

## II. IDENTIFY, RESEARCH AND COLLECT IDEA

- How to calculate Measurement Uncertainty in medical Laboratory.

**Our lab use the top-down approach**, using available laboratory test performance information, such as Quality control (QC) DATA, to calculate estimate of the standard uncertainty associated with the result produced by the overall testing procedure.

### Determining Measurement Uncertainty by the top-Down Approach Using Interlaboratory Data.

1-The preferred method is that we use performance data from the (QC)

Programs our centre have a (unity Real time) program from BIO-RAD Company .

2-The lab (**PISC**) Use a **QC materials** from (BIO-RAD) a third part control that behaves a similar way to that of patient samples.

3-Imprecision is equivalent to the standard measurement uncertainty, assuming negligible or no bias.

4-A minimum of six months data is recommended (in order to ensure that variations due to multiple users, reagents and calibrator lots are captured).

5-The Mean Value and SD is calculated for each level of QC used in our chemistry Lab., (BIO-RAD) over 6 MONTH to encompass as many routine procedure changes as possible.

6-The parameter of **MU is 1 SD** (Standard measurement uncertainty, symbol  $\mu$  because the SD of the (QC) reflect the combined effect of all the individual uncertainties arising within the measuring system.)

7-To Define intervals that enclose larger fractions of expected dispersions of results, coverage factors (k) applied to ( $\mu$ ) to provide expanded measurement uncertainties (U). Usually  $k=2$  is chosen. So the result could be in the form  $x \pm y$  (95% confidence) Where  $y=2SD$ ,  $U=(2 * \mu c)$  .

8-For each level of QC MU should be calculated for each level.

**Date:31/3/2021FROM (4-2-2019 until 16-9-2019)**covering at least six month , the **number of control reading were :136point** ,which is sufficient to do the calculation, as un the table below:

### III. RESULTS

We use a **BIO-RAD** Control for Haemoglobin HA1c ,two levels were examined for lot no: **33980Exp**

QC	4-2-2019/16-9-2019	Mean (%)	SD( $\mu$ c)	2SD(U)(U=2* $\mu$ c)
Level 1	N=136	4.84	0.08	0.16
Level 2	N=138	9.67	0.14	0.28

For our laboratory test performance for release the HA1C result to doctors we must calculate the MU for each level (Normal/Abnormal) and decide that our test result have an MU as mention in the table above.

#### For Example:

**Patient 1: result: 4.20±0.16**

**(the 95% confidence level for this result is (4.04-4.36)%**

**Patient 2: result: 8.00±0.28**

**(the 95% confidence level for this result is (7.72-8.28)%**

### IV. CONCLUSION

1- In order to comply with accreditation requirements, medical laboratories must Estimate the measurement uncertainty associated with all quantitative measurement results.

2-Measurement uncertainty is to be expressed in this form: Measurand (result of laboratory test or examination): Value+/- U units

U is the expand uncertainty and units are typically SI or internationally accepted non-SI units.

#### Abbreviations

ISO: International Organization for Standardization, Geneva, Switzerland.

MU: measurement uncertainty

SD: standard deviation

PISC: Princess Iman for Research and Laboratory Science Center

### REFERENCES

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# Assessment of Shelf-life of Curry Leave Extract Added Paneer Made from Cow Milk

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**Abstract-** Historically curry leave (*Murraya koenigii L.*) has been used for centuries worldwide in food not only to increase its flavor and taste but also for its antioxidant properties. The antioxidant effect which facilitates the shelf life of the food product including dairy product. The present study was conducted to assess the different concentrations of curry leave extract on the shelf life of paneer for a storage period of 28 days at refrigeration temperature ( $7\pm 1^{\circ}\text{C}$ ). In this study, paneer was developed with five different concentration of curry leaves extract viz. 0.0% (control), 0.2%, 0.4%, 0.6% and 0.8%. The prepared samples of paneer were analyzed for chemical, physical and sensory evaluation at day 1, day 7, day 14, day 21 and day 28 storage at  $7^{\circ}\pm 1^{\circ}\text{C}$ . At the day one, the chemical attributes, such as ash ( $1.66\pm 0.02$ ), dry matter ( $49.60\pm 1.85$ ), acidity ( $0.20\pm 0.02$ ) and antioxidant activity at 593 absorbance (0.292) showed higher value in paneer treated with 0.8% curry leaves extract added paneer. On the other hand, pH ( $5.88\pm 0.01$ ) and free fatty acid ( $0.21\pm 0.02$ ) were higher in paneer made without curry leaves extract. At the day 7 of storage period, paneer treated with 0.8% curry leaves extract showed higher mean value for dry matter ( $51.28\pm 1.52$ ), ash ( $1.73\pm 0.01$ ), pH ( $5.85\pm 0.01$ ) and antioxidant activity at 593nm (0.295). While paneer treated without curry leaves extract showed higher mean value for titratable acidity ( $0.27\pm 0.01$ ) and free fatty acid ( $0.23\pm 0.00$ ). At the day 28 of storage period, paneer treated with 0.8% curry leaves extract received higher mean value for ash ( $1.96\pm 0.01$ ), dry matter ( $54.69\pm 0.30$ ), pH ( $6.10\pm 0.02$ ). Similarly, paneer made without curry leaves extract received higher mean value for titratable acidity ( $0.44\pm 0.00$ ) and free fatty acid ( $0.45\pm 0.21$ ). Both mineral content and antioxidant activity were increasing during storage period and increased with increasing of concentration of curry leaves. Sensory attributes were changed among the all types of paneer and paneer made from 0.6% curry leaves extract showed the highest preference of sensory attributes at day 14 and day 21 of storage

**Index Terms-** Antioxidant, Curry leaves, Paneer, Physicochemical properties, Shelf-life

## I. INTRODUCTION

Paneer the indigenous variety of soft cheese is obtained by heat and acid coagulation of milk at high temperatures [1]. Paneer is a traditional non-fermentative milk product result from coagulation of heated milk by using citric acid. Paneer can be prepared from cow milk, buffalo milk and mixture of them [2]. Paneer has become a popular milk product within consumers because of its high nutritive value. Proteins, fats, minerals especially calcium and phosphorus and fat soluble vitamins like nutrients are highly contain in paneer [3]. However, paneer is a suitable food for nursing mothers, infants, growing children, and adults due to its high

energy and it has a rich source of animal protein available at a comparatively lower cost and forms important source of animal protein for vegetarians [4]. Also it can be recommended for diabetic and coronary heart disease patients due to its high protein and low sugar content. Presence of essential amino acids of proteins origin from animal is another valuable reason for consuming paneer to vegetarians [3]. Major barrier of paneer production in commercial level is shorter shelf life. Shelf life of paneer is expressed as six days under refrigeration at 10°C, but its freshness is lost within three days [5].

In recent year's herbs, spices and their extracts have been used as an antioxidant and antimicrobial activities, which enhance shelf life of food and dairy products [6]. Curry leaves acts as a preservative in many food components because of its antioxidant and other functional properties [6]. In addition to that it has been used in food to increase its flavour [8-10]. Curry leaves has been identified as a herb in traditional medicine for treatment of various kind of diseases like heart diseases, kidney disorders and diabetes. Also it increase digestive secretion and reduce the risk of cancer [11]. Adding of the curry leaves to paneer may help to reduce the deterioration and increase the shelf life due to its antioxidant effect. Generally curry leaves are discarded from the dish while eating as a consequence, the nutrition potential of curry leaves remains underutilized. It is better to promote curry leaves in an edible form where larger quantities can be incorporated in paneer preparation [12]. The information on making of paneer using curry leaves extract is lacking. Therefore, this study was designed to make paneer by incorporation of different concentrations of curry leaves extract and to assess the physicochemical properties during the storage period.

## II. MATERIALS AND METHODS

### A. Preparation of Curry Leaves Extract

Curry leaves were sterilized by distilled water for 5 min and 1g of *Murraya koenigii* (L.) fresh leaves were grinded with 10 ml of distilled water (1:10, w/v) and the mixture was squeezed and filtered through muslin cloth and No. 1 Whatman Filter Paper, respectively.

### B. Preparation of Paneer

Paneer was prepared from after standardizing the cow milk to 4.5% fat and 8.5% SNF using method described by Gokhale *et al.* [1] with modifications. The standardized milk fat was heated to 95 °C for 5 min and cooled to 70 °C. Then Curry leaves extract 0%, 0.2%, 0.4%, 0.6 % and 0.8% was added after pasteurized milk. Then Citric acid (1.0% solution) was added with continuous agitation until the coagulation was complete. The coagulum was allowed to settle for 5 min for complete coagulation. Whey was drained through a muslin cloth and pressed for 20 min. Then the freshly prepared paneer sample was chilled in cold water at 4°C for 2 hours. The paneer removed from chilled water were allowed to drain for 5 min. Finally the paneer was stored for 28 days at 7-8°C in the vacuumed packed in Cryovac bags and panner was taken 1, 7, 14, 21 and 28 days after manufacture.

### C. Chemical analysis

The paneer samples stored at 7-8°C were analyzed for the chemical characteristics at a regular interval of 7 days during the storage. Moisture content in paneer was determined in triplicate for dry matter by oven drying at 105 °C to get constant weight according to method described by AOAC [13] and percentage of dry matter was calculated. Ash content was determined by using muffle furnace at 550 °C for 4 h as described by AOAC [13]. Titratable acidity of paneer samples was determined by following the method prescribed for cheese by the AOAC [14]. Free fatty acids content of paneer was estimated using the method described for cheese by Thomas [15]. The pH of paneer was determined by using a pH meter as the method described by Arora and Gupta [16].

#### *D. Determination of mineral content*

The type and concentration of specific minerals in yoghurt samples were determined by the use of a flame atomic absorption spectroscopy. According to official method 968.08 of AOAC [17]. Two gram of different types of yoghurt samples were ashes in a muffle furnace at 550 °C for 6 hours, followed by acid digestion of the ash. After ashing, the residue was quantitatively transferred to a digestion tube by using 2 washes each with 5 ml of 25% HCl. The digestion tubes were then placed onto a preheated (125 °C), digestion block and samples were digested for 30 min. The digests were removed from the digestion block, cooled to room temperature, diluted to a volume of 100 ml with deionized water, and finally analyzed for various mineral elements by flame atomic emission spectrometer.

#### *E. Determination of antioxidant activity*

The FRAP assay was done according to the procedure described by Benzie and Strain [18]. Briefly the FRAP reagent was prepared by mixing 1 ml of (10mmol/L) TPTZ solution in 40 mmol/L HCl, 1 ml of FeCl<sub>3</sub> (20mmol/L) and 10 ml of acetate buffer, (0.3 mol/L). Twenty microliters of 0.1 g /ml sample was mixed with 1 ml of FRAP reagent and the absorbance at 593 nm was measured spectrophotometrically after incubation at room temperature for 4 minutes.

#### *F. Sensory evaluation*

Each block of paneer was cut into rectangular pieces of approximately 1 cm × 2 cm. The prepared samples of paneer were subjected to sensory evaluation by a panel of 30 judges when fresh and at regular interval of 7 days during storage using 9-point hedonic scale according the methods Buch *et al.* [5]. The sensory characteristics, such as colour, flavour, taste, texture and overall acceptability of the paneer samples were judged by the panelists at day 1, 7, 14, 21 and 28 of storage period.

#### *G. Statistical analysis*

Samples were randomly collected; parametric data were analyzed by using Multivariate Analysis of Variance (MANOVA) and used to determine the significance level of the treatments, while the Duncan's Multiple Range Test (DMRT) was used for mean separation. The sensory analysis was carried out using Friedmans test for non-parametric data analysis.

### III. RESULTS AND DISCUSSION

A. *Nutritional Attributes and pH of Paneer Made from Curry Leaves Extract at Day One.*

The result is indicating in Table 1 that pH and titratable acidity did not show any significant changes among concentration at day 1. It might be due to that considerable amount of changes not occurred in biochemical and microbial reactions. Dry matter content of paneer increased with an increase in the level of curry leaf extract. High value of dry matter content (49.60±1.85%) was noticed in paneer treated with 0.8% curry leaf extract, where as the lowest (47.81±0.23%) was recorded in paneer without curry leaf extract. When adding various concentrations of curry leaves extract to paneer contributes to increase dry matter content of samples treated with different concentration of curry leaves extract. This result was supported with finding of Buch *et al.* [5]. Ash content of paneer was increased with increasing curry leaves extract. It could be due to that addition of higher concentration of curry leaves extract increases the ash contents in paneer. This result was agreed with finding of Buch *et al.* [5].

The pH (6.10±0.02) of 0% curry leaves extract added paneer showed high value than other treatments. The changes in the pH value differ according to the different concentration extracts added in the panner. The pH value of paneer samples were gradually decreased with increasing the curry extracts concentration due to acidic compound of curry leaves. Saini and Reddy [19] reported pH value of curry leaves as 6.3-6.4. Acid compounds like ascorbic acid, folic acid may reason for the acidity of curry leaves extract. When curry leaves extract was increasing, decrease the pH value of paneer due to increasing acidity. The lowest acidity (0.17±0.02%) was observed in paneer prepared without curry leaf extract and mean value of acidity increased with increase in the level of curry leaf extract due to acidic compound [20].

Free fatty acid (0.18±0.02%) of paneer with 0.8% curry leaves extract showed the lowest value than other treatments. Wahifiyah *et al.* [21] reported that caffeine like alkaloid neutralized the free fatty acid formed. So alkaloid like Murrayanine, Murrayastine, Murrayafoline contained in curry leaves extract are natural bases [22]. They have an ability to neutralize the free fatty acid formed as oil hydrolysis. Therefore, free fatty acid formation was reduced when increasing the concentration of curry leaves extract. The result was evidenced with the study conducted by Buch *et al.* [5].

Table I: Nutritional status and pH of paneer made from curry leaves extract at day one.

Attributes	Treatments				
	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	T <sub>5</sub>
Dry matter (%)	47.81±0.2 <sup>b</sup>	48.32±0.27 <sup>ab</sup>	48.63±0.42 <sup>ab</sup>	49.13±0.26 <sup>b</sup>	49.60±1.85 <sup>a</sup>
Ash (%)	1.53±0.01 <sup>d</sup>	1.57±0.06 <sup>cd</sup>	1.60±0.02 <sup>bc</sup>	1.64±0.01 <sup>ab</sup>	1.66±0.02 <sup>a</sup>
pH	5.89±0.01 <sup>a</sup>	5.89±0.02 <sup>a</sup>	5.88±0.01 <sup>a</sup>	5.86±0.01 <sup>b</sup>	5.86±0.02 <sup>b</sup>
Acidity (%)	0.17±0.02 <sup>b</sup>	0.18±0.07 <sup>b</sup>	0.20±0.01 <sup>ab</sup>	0.21±0.02 <sup>a</sup>	0.21±0.02 <sup>a</sup>
FFA (%)	0.21±0.02 <sup>a</sup>	0.21±0.01 <sup>a</sup>	0.20±0.01 <sup>ab</sup>	0.19±0.01 <sup>ab</sup>	0.18±0.02 <sup>b</sup>

T<sub>1</sub>-Paneer without curry leaves, T<sub>2</sub> – Paneer with 0.2% curry leaves extract, T<sub>3</sub>- Paneer with 0.4% curry leaves extract, and T<sub>4</sub>- Paneer with 0.6% curry leaves extract, T<sub>5</sub> –Paneer with 0.8% curry leaves extract. Values are means ± standard deviations of replicate determination means with same letters are not significantly different at (p> 0.05).

### B. Dry Matter Content and Ash Content in Paneer during Storage Period

The dry matter content in the paneer among the storage period is showed in Table 2. Dry matter content of paneer was ( $p < 0.05$ ) increased with the storage period. In present study, dry matter may increase due to loss of moisture content and whey drainage during storage period. At the end of storage period paneer treated with 0.8% curry leaves extract showed the highest value of dry matter content ( $54.69 \pm 0.30\%$ ) and paneer without curry leaves extract showed the lowest value of dry matter content ( $52.03 \pm 0.41\%$ ). When increasing concentration of curry leaves extract increases dry matter of panner. It due to increasing the concentration of curry leaves extract added in the paneer.

Ash content is an indicator of total amount of minerals present in the paneer. As shown in Table 2, at the day 7 of storage, 0.8% curry leaves extract added paneer exhibited ( $P < 0.05$ ) higher mean value ( $1.79 \pm 0.03\%$ ) than paneer made from without curry leaves extract ( $1.56 \pm 0.02\%$ ). At the day 28 of storage, 0.8% curry leaves extract added paneer also showed higher mean value ( $1.96 \pm 0.01\%$ ), and paneer made without curry leaves extract received lower mean value ( $1.73 \pm 0.01\%$ ). It could be due to that addition of higher concentration of curry leaves extract increases the ash contents in paneer. This value increased during storage period. The results agree with the finding of Buch *et al.* [5].

### C. pH Content and Titratable Acidity in Paneer during Storage Period.

The pH of paneer was ( $p < 0.05$ ) changed with different concentration of curry leaves extract added paneer while pH of the paneer was decreased with the storage period (Table 2). The changes in pH may due to the breakdown of lactose into the lactic acid during fermentation process by microorganism. During the storage period, pH significantly ( $P < 0.05$ ) varied among the treatments. However, at the day 28, paneer without curry leaves extract added paneer showed the lowest value of pH ( $5.53 \pm 0.01$ ) than other treatments. It might depend on incorporation of curry leaves extract in which has an antimicrobial property it leads to the slow rate of development of acidity during storage period. On the other hand, the titratable acidity of paneer differed ( $p < 0.05$ ) with different concentration of curry leaves extract added paneer. The titratable acidity of paneer was decreased with the storage period. At the day 28, paneer treated without curry leaves extract showed the highest value of titratable acidity ( $0.44 \pm 0.00\%$ ) than other treatments. Previously, Kumar and Bector [23], Venkateswarlu *et al.* [24] and Yellamanda *et al.* [25] suggested that normal range of titratable acidity is 0.47–0.59%. In this study, the contents of titratable acidity was little lesser than reported values. The titratable acidity was progressively increased with the storage period, it due to metabolism of lactose by lactic acid bacteria and produce acids. This result was agreed with finding of Pal *et al.* [20] and Shanaziya *et al.* [26]. Acidity level of paneer was also decreased with increasing of concentration of curry leaves extract added in the paneer.

### D. Free Fatty Acid in Paneer during Storage Period

The data obtained for changes in FFA content of paneer during storage at 7 °C are presented in Table 2. Free fatty was increased during storage due to lipids undergo hydrolysis (lipolysis) through the microbial enzymes thereby increasing the free fatty acids (FFA) content of the product. At the end of the storage period highest value of free fatty acid showed in paneer without curry leaves extract ( $0.45 \pm 0.21$ ). Results of the study were

Table II: Nutritional status and pH of paneer made from curry leaves extract during storage at 7°C.

Treatments	Day 7	Day 14	Day 21	Day 28
<b>Dry matter (%)</b>				
T <sub>1</sub>	48.15±0.05 <sup>f</sup>	48.32±0.59 <sup>ef</sup>	49.22±0.55 <sup>def</sup>	52.03±0.41 <sup>b</sup>
T <sub>2</sub>	48.88±0.71 <sup>fdef</sup>	49.46±1.14 <sup>de</sup>	51.52±0.41 <sup>b</sup>	53.81±0.64 <sup>a</sup>
T <sub>3</sub>	49.56±0.44 <sup>de</sup>	49.91±0.31 <sup>cd</sup>	51.9±0.29 <sup>b</sup>	54.09±0.26 <sup>a</sup>
T <sub>4</sub>	50.80±0.30 <sup>bc</sup>	51.01±1.32 <sup>bc</sup>	51.29±0.29 <sup>b</sup>	54.31±0.19 <sup>a</sup>
T <sub>5</sub>	51.28±1.52 <sup>b</sup>	52.03±0.93 <sup>b</sup>	53.77±0.63 <sup>a</sup>	54.69±0.30 <sup>a</sup>
<b>Ash (%)</b>				
T <sub>1</sub>	1.56±0.02 <sup>l</sup>	1.66±0.02 <sup>j</sup>	1.74±0.01 <sup>fgh</sup>	1.79±0.03 <sup>e</sup>
T <sub>2</sub>	1.61±0.02 <sup>k</sup>	1.69±0.02 <sup>i</sup>	1.76±0.02 <sup>f</sup>	1.82±0.02 <sup>d</sup>
T <sub>3</sub>	1.62±0.02 <sup>k</sup>	1.71±0.00 <sup>hi</sup>	1.81±0.02 <sup>de</sup>	1.91±0.01 <sup>b</sup>
T <sub>4</sub>	1.65±0.01 <sup>j</sup>	1.74±0.02 <sup>fg</sup>	1.85±0.01 <sup>c</sup>	1.94±0.01 <sup>a</sup>
T <sub>5</sub>	1.73±0.01 <sup>gh</sup>	1.75±0.02 <sup>fg</sup>	1.87±0.02 <sup>c</sup>	1.96±0.01 <sup>a</sup>
<b>pH</b>				
T <sub>1</sub>	5.83±0.01 <sup>abc</sup>	5.76±0.03 <sup>f</sup>	5.59±0.01 <sup>i</sup>	5.53±0.01 <sup>j</sup>
T <sub>2</sub>	5.84±0.01 <sup>a</sup>	5.79±0.01 <sup>de</sup>	5.65±0.01 <sup>h</sup>	5.60±0.01 <sup>i</sup>
T <sub>3</sub>	5.84±0.02 <sup>a</sup>	5.80±0.01 <sup>cd</sup>	5.72±0.01 <sup>g</sup>	5.67±0.01 <sup>h</sup>
T <sub>4</sub>	5.84±0.01 <sup>a</sup>	5.81±0.01 <sup>bcd</sup>	5.75±0.03 <sup>f</sup>	5.71±0.01 <sup>g</sup>
T <sub>5</sub>	5.85±0.01 <sup>a</sup>	5.83±0.01 <sup>ab</sup>	5.79±0.02 <sup>de</sup>	5.77±0.01 <sup>ef</sup>
<b>Titratble acidity (%)</b>				
T <sub>1</sub>	0.27±0.01 <sup>ef</sup>	0.32±0.03 <sup>cd</sup>	0.36±0.02 <sup>bc</sup>	0.44±0.00 <sup>a</sup>
T <sub>2</sub>	0.25±0.87 <sup>f</sup>	0.25±0.01 <sup>f</sup>	0.33±0.14 <sup>b</sup>	0.34±0.11 <sup>bcd</sup>
T <sub>3</sub>	0.25±0.02 <sup>f</sup>	0.25±0.09 <sup>f</sup>	0.32±0.00 <sup>cd</sup>	0.32±0.14 <sup>b</sup>
T <sub>4</sub>	0.24±0.87 <sup>f</sup>	0.24±0.09 <sup>f</sup>	0.30±0.11 <sup>bcd</sup>	0.30±0.01 <sup>de</sup>
T <sub>5</sub>	0.23±0.01 <sup>ef</sup>	0.24±0.03 <sup>cd</sup>	0.25±0.02 <sup>bc</sup>	0.25±0.00 <sup>f</sup>
<b>Free fatty acid (%)</b>				
T <sub>1</sub>	0.23 ± 0.00 <sup>jk</sup>	0.26 ± 0.02 <sup>fg</sup>	0.33 ± 0.01 <sup>cd</sup>	0.45 ± 0.21 <sup>a</sup>
T <sub>2</sub>	0.23 ± 0.01 <sup>hij</sup>	0.24 ± 0.00 <sup>ghij</sup>	0.29 ± 0.01 <sup>ef</sup>	0.37 ± 0.01 <sup>b</sup>
T <sub>3</sub>	0.22 ± 0.02 <sup>jk</sup>	0.24 ± 0.02 <sup>ghij</sup>	0.25 ± 0.01 <sup>ghi</sup>	0.30 ± 0.02 <sup>c</sup>
T <sub>4</sub>	0.20 ± 0.02 <sup>lk</sup>	0.23 ± 0.01 <sup>ijk</sup>	0.26 ± 0.01 <sup>gh</sup>	0.31 ± 0.03 <sup>de</sup>
T <sub>5</sub>	0.19 ± 0.00 <sup>lk</sup>	0.23 ± 0.01 <sup>hijk</sup>	0.24 ± 0.01 <sup>ghij</sup>	0.30 ± 0.01 <sup>e</sup>

T<sub>1</sub>-Paneer without curry leaves, T<sub>2</sub> – Paneer with 0.2% curry leaves extract, T<sub>3</sub>- Paneer with 0.4% curry leaves extract, and T<sub>4</sub>- Paneer with 0.6% curry leaves extract, T<sub>5</sub> –Paneer with 0.8% curry leaves extract. Values are means ± standard deviations of replicate determination means with same letters are not significantly different at (p> 0.05).

agreed with Kumar and Bector (1991) who reported that the free fatty acids content of paneer increased from 0.28 to 0.5 on 22 days of storage at 5 °C. Furthermore, FFA content among treatments is varied due to different concentration of curry leaves extract. Free fatty acid formation was reduced when increasing the concentration of curry leaves extract. Buch *et al.* [23], Bandyopadhyay [22] and Wahifiyah *et al.* [21] reported that alkaloid like murrayanine, murrayastine, murrayafoline in curry leave reduces the free fatty acid formation.

#### E. Mineral content of curry leaves extract added paneer

As mentioned in Table 3, mineral content of panner with different concentration of curry leaves extract at day 7 of storage at 7 °C. Minerals such as Calcium, Phosphorus, and Magnesium were higher than Zinc and Manganese but Cobalt was not present on the carry leave extract added panner. Gahlawat *et al.* [27] reported that the main minerals contained in curry leaves are calcium, phosphorus, iron and Magnesium, which reflect this finding.

Table III: Mineral content of curry leaves extract added paneer

Mineral content (mg/g)	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	T <sub>5</sub>
Ca	2717	6811.5	7556.7	7770.4	9309.6
P	3700	3948.7	4184.1	4262.7	4391.4
Mg	93.7	278.9	306	310	342.5
Cu	3.9	3.9	4.4	4.8	69.7
Zn	0.8	25.2	25.9	-	34.3
Co	-	-	-	-	-
Mn	1.9	2.6	2.9	2	5.8

T<sub>1</sub>-Paneer without curry leaves, T<sub>2</sub> – Paneer with 0.2% curry leaves extract, T<sub>3</sub>- Paneer with 0.4% curry leaves extract, and T<sub>4</sub>- Paneer with 0.6% curry leaves extract, T<sub>5</sub> –Paneer with 0.8% curry leaves extract

#### F. Antioxidant activity in paneer during storage period

Antioxidant activity of paneer was performed at day 1 and day 7 of storage at 7 °C (Table 4). Antioxidant activity was increasing during storage period. It might be chemical and biochemical reactions of antioxidant compound and released from curry leaves extract during storage. It may be a reason to increase antioxidant activity during storage period. Also antioxidant activity was increased with increasing curry leaves extract. It may be occurred due to increasing amount of antioxidant compound like flavonoid and phenolic with increasing concentration.

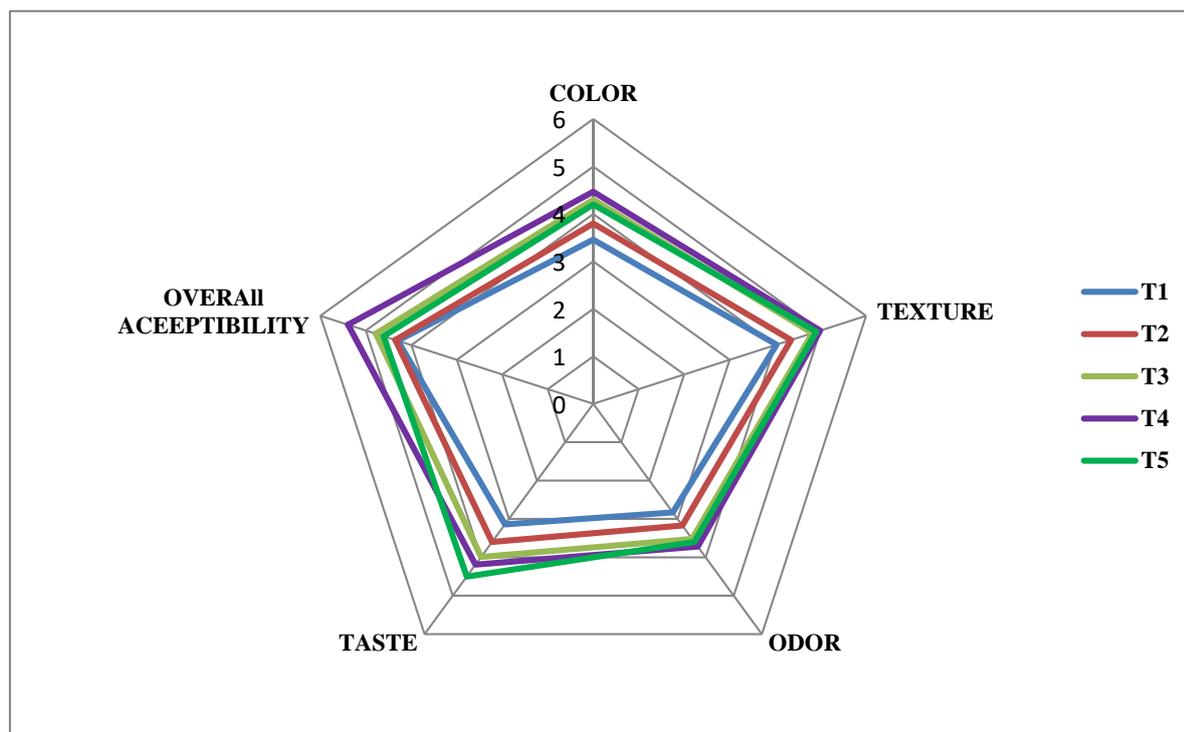
Table IV: Antioxidant activity in paneer during storage period

Treatment	Antioxidant activity absorbance at 593 nm	
	Day 1	Day 7
T <sub>1</sub>	0.103	0.106
T <sub>2</sub>	0.178	0.182
T <sub>3</sub>	0.245	0.248
T <sub>4</sub>	0.273	0.277
T <sub>5</sub>	0.295	0.298

T<sub>1</sub>-Paneer without curry leaves, T<sub>2</sub> – Paneer with 0.2% curry leaves extract, T<sub>3</sub>- Paneer with 0.4% curry leaves extract, and T<sub>4</sub>- Paneer with 0.6% curry leaves extract, T<sub>5</sub> –Paneer with 0.8% curry leaves extract

#### G. Sensorial Attributes of Curry Leave Extract Added Paneer

The sensory attributes of curry leaves extract added paneer samples were evaluated on the basis of colour, appearance, taste, flavor, texture and overall acceptability. Figure 1 depicts the data for sensory evaluation of curry leave extract added paneer packed under Cryovac bags and stored at 7 °C. At the day 1 and day 7 most of the panelists preferred to 0.0% curry leaves added paneer due to its white color appearances. The highest value of odor, taste, and overall acceptability were observed in 0.6% curry leaves extract added paneer at day 14 and 21. According to Singh *et al.* [28], reported that essential oil as pinene, sabinene, caryophyllene, cadinol and cadinene contained in curry leaves supply good aroma and flavor to paneer product. The sensory scores for colour, appearance, taste, flavor, texture and overall acceptability varying significantly declined after 21 days of storage in all types of paneer. The sensory attributes were significantly affected when increasing of concentration beyond 0.6% curry leaves extract, it due to it gives bitter taste for paneer and poor colour appearance. The paneer prepared using 0.6% curry leaves extract showed the highest preference of sensory attributes at day 14 and day 21 of storage.



T<sub>1</sub>-Paneer without curry leaves, T<sub>2</sub> – Paneer with 0.2% curry leaves extract, T<sub>3</sub>- Paneer with 0.4% curry leaves extract, and T<sub>4</sub>- Paneer with 0.6% curry leaves extract, T<sub>5</sub> –Paneer with 0.8% curry leaves extract

Figure I: Overall quality of product during storage period

## VI. CONCLUSION

Based on the results of this study incorporation of curry leaf extract can be used successfully for extending the shelflife of paneer. Curry leaf extract can be used make a panner with acceptable physicochemical properties and sensory attributes. However, panner made with 0.6% curry leaves extract showed the highest preference of sensory attributes at day14 and day 21 of storage.

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# Preparation and Characterization of Zinc-Copper Oxide Doped PMMA Films

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## ABSTRACT

In this work we present the synthesis of Zinc Copper Oxide (ZnCuO) nano-powder via sol-gel method using respective metal chlorides as precursors; and insertion of these nano-particles as dopant in poly-methyl-methacrylate (PMMA) solution to prepare ZnCuO-PMMA composite film using the solution cast method. The structural analysis of the prepared ZnCuO nanopowder and ZnCuO doped PMMA film has been carried out by XRD, FESEM, FTIR and photoluminescence Spectroscopy. From XRD studies the crystalline size of ZnCuO nanoparticles has been evaluated using Scherrer formula as approximately 35nm. FTIR studies revealed that the functional group present in the metal nano particles. The effect of insertion of the zinc-copper oxide nanoparticles on PL properties of poly (methylmethacrylate) has been also studied using from photoluminescence spectrometer it is seen that the intensity of emission as-well-as emission peak wavelength changes with solvent.

**Keywords:** PMMA, mixed metal oxides, ZnCuO, photoluminescence spectra

## 1. INTRODUCTION

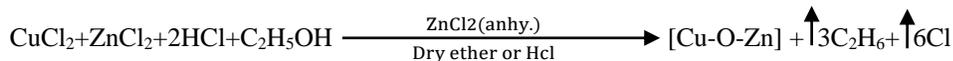
Polymer composite materials have steadily gained attention due to their ease of processing, ability to be molded in various shapes and sizes and being economically viable. Poly(methylmethacrylate) (PMMA) has been the most favoured polymer to be experimented for blending, co-polymerizing or insertion of nano-fillers by material scientists as it not only exhibits fascinating properties of being transparent and light weight but also is highly compatible with most organic and inorganic substances. PMMA also possess good tensile strength, insulating properties, ease of handling and processing. A rapid glance at the literature shows that due to presence of any other organic/inorganic material even in small quantities within the PMMA long chain molecule; drastically changes its optical [ 1-6], electrical [7-12 ], mechanical [13-14] or thermal properties [17]. Zinc-copper oxide nanoparticles are of interest as they have enormous ability to be used in variety of applications, “such as optical coatings, laser diodes and catalysts, field effect transistors, field emission arrays, ultraviolet lasers, light emitting diode, sensors, biosensors, catalyst, energy storage and solar cells” [15]. Several methods such as hydrothermal, sol-gel, electrochemical deposition, microwave, sonochemical have been adopted for formation of Zn-CuO nano-powders [22]. We have used the simple sol-gel approach. The method includes dissolution of metallic-ion precursors (metal chlorides) in a appropriate solvent and obtaining gel. So to investigate how the mixed metal oxide would affect the structural and fluorescence properties of PMMA we thought of incorporating Zinc copper oxide in PMMA. In the present work, we report the synthesis of Zinc Copper oxide nanopowder using the sol-gel technique and preparation of films by inserting this nano-powder into PMMA and the analysis of the investigated structural and photo-luminescence properties of these prepared sample films. The detailed synthetic process and characterization of sol-gel end products, pure and composite PMMA films are reported here.

## 2. EXPERIMENTAL WORK

**2.1 Chemical involved:** Zinc chloride (ZnCl<sub>2</sub>), copper chloride (CuCl<sub>2</sub>) and dichloromethane of analytical grade were purchased from Merck Specialties Pvt. Ltd, “Mumbai; PMMA granules were purchased from M/s Gadra Chemicals Bharuch”; hydrochloric acid (HCl) and ethyl alcohol (C<sub>2</sub>H<sub>5</sub>OH) were purchased from Himedia Laboratories, Mumbai. All these chemicals were used without further purification.

**2.2 Synthesis of Zinc-Copper oxide nano-particles by sol-gel technique:** Zn-CuO nano-structures were synthesized using the sol-gel method. The precursors, 4 gm of white anhydrous Zinc chloride and 10 gm of blue copper chloride were first powdered into a mortar with pestle for 20 minutes and then were kept in a beaker. Then 20ml of dilute hydrochloric acid was gradually poured into this mixture contained in the beaker kept on a magnetic stirrer for a continuous stirring. After an hour

when the mixture dissolved in the acid, we added ethanol (purity 99%) drop-wise into the beaker and the temperature was increased to 60°C to form sol. The reaction produced a solution of yellowish colour with a tinge of blue. We kept it stirring for another four hours at room temperature while the whole mixture got dissolved in ethanol during this process. The precursors react with OH group of ethanol likewise



The ZnCl<sub>2</sub> in the above reaction is anhydrous in nature and is the *Lucas reagent* that acts like a basic reactia.

After this we left the solution to cool down, within several minutes, a reaction occurred showing a rapid formation of a rigid bluish green colored gel. Then the gel was dried at the same temperature. The obtained products were then rinsed multiple times by deionized water so that residual impurities are laid off. The gel now obtained was heated in an oven for about one hour at 80 degree centigrade so that dried Zn-CuO powder is obtained.



Figure1: Prepared Zn-CuO sol gel product.

**2.3 Synthesis of pure and Zn-CuO doped PMMA Films:** We took two beakers of 100ml and in each a fixed amount of 1gm granule PMMA crystals were made to dissolve in 20ml dichloromethane and 5 ml of ethyl alcohol that acts as solvent. The molten PMMA is stirred uniformly in an ultra-sonicator for 6 hrs at room temperature to assure the homogenous dispersion of polymer particles without concentricity throughout the solvent. After this, solution of one of the beaker was poured into a flat bottom petri dish of radius 3cm. The petri dish is placed floating on a layer of mercury so that the solution spreads homogeneously and film of uniform thickness can be obtained. Then we added 100 mg of zinc-copper oxide nano-particles into the solution of another beaker and allowed this to stir on a magnetic stirrer for 18 hours. When the nano-particles got completely dissolved in to the PMMA solution, we poured this solution into another glass flat bottom petri dish kept floated over mercury and left for 24 hours. Now the solvent is made to evaporate at room temperature and is left to dry as film in the petri dish which are then peeled off later. We obtained transparent PMMA film and fluorescent yellow-green coloured Zn-CuO doped PMMA film of 120µm thickness as shown in figure 2. Now onwards we will refer the sample film of pure PMMA as P1 and that of Zn-CuO doped PMMA as PZCO. These films were then vacuum dried before proceeding for characterization.



Figure 2: Prepared film of pure PMMA and Zn-CuO doped PMMA

**2.4 Characterization:** The synthesized Cu-Zn oxide nano-particles and their doped PMMA films are studied using “X-ray” diffractometer “XRD” (PANalytical unit using software X’Pert<sup>o</sup>Pro3) equipped “with Cu-K<sub>α</sub> radiation” of wavelength λ = “1.5406Å” at accelerating voltage 30 kV. The composition of functional groups of our powdered samples and prepared films were examined by FTIR Perkin Elmer Spectrum Version 10.4.00 FTIR Spectrophotometer in the region 500-4000 cm<sup>-1</sup>. The surface structure of the composite samples was investigated using S-3700N FESEM field emission scanning electron microscope. The PL spectra was obtained using fluorescence emission spectroscopy

### 3. RESULTS AND DISCUSSION

**3.1 X-Ray Diffraction Studies :** In the available literature, the diffraction peaks of pure hexagonal wurtzite phase of ZnO have been indexed at  $2\theta = 31.64^\circ, 34.48^\circ, 36.38^\circ, 47.8^\circ, 56.5^\circ, 62.9^\circ, 68^\circ$  and  $69.2^\circ$  corresponding to  $(hkl)$  values of (100) (103) (112) and (201) planes matched with the file (PDF 13-7585) from software version 2.4, JCODS\_ICDD [18-19]. Similarly the prominent peaks of CuO are indexed to a monoclinic phase at  $2\theta = 35.5^\circ, 38.8^\circ, 48.6^\circ$  corresponding to  $(hkl)$  value of (100) (201) and (103) planes [19] matched with the JCPDS No 48-1548 [15]. In the XRD data of the mixed metal oxide nano powder of Zinc copper oxide, the zinc peaks become dominant as seen in figure 3(a). The smoothed out data has been depicted in the figure. In the obtained diffraction pattern we see the presence of slight broad peaks which can be used to the size of particle in nanometer scale. The average crystallite size evaluated for Zn-CuO powder using the well known Scherrer's equation;  $D = 0.9\lambda / \beta \cos\theta$ , where " $\lambda$  is the wavelength of the incident radiation, D is the grain size,  $\beta$  is the experimentally observed diffraction peak width at full width at half-maximum intensity (FWHM) and  $\theta$  is the Bragg angle". The average crystalline size of ZnCuO nano particles from the FWHM of the intense peaks is found to be around 34.05 nm.

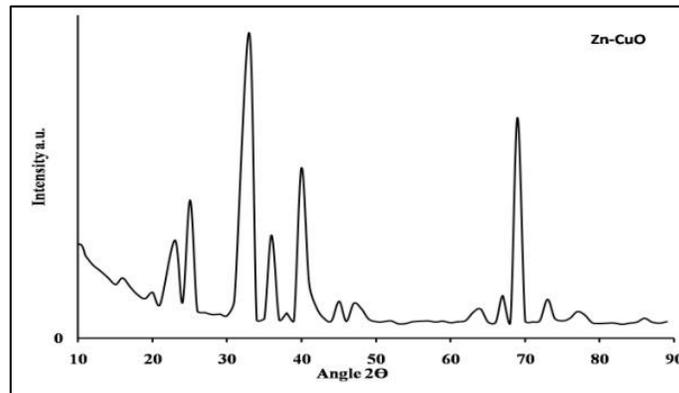


Figure 3(a): XRD pattern obtained for Zn-CuO nano-powder

The XRD data for pure PMMA depicted in figure 3(b). From the figure 3(b) we see the XRD data for pure PMMA depicts a broad high intense peak at  $2\theta = 13.89^\circ$  and low intense peaks at  $2\theta = 30^\circ$  and  $2\theta = 34^\circ$  to suggest the amorphous type structure of this polymer [23].

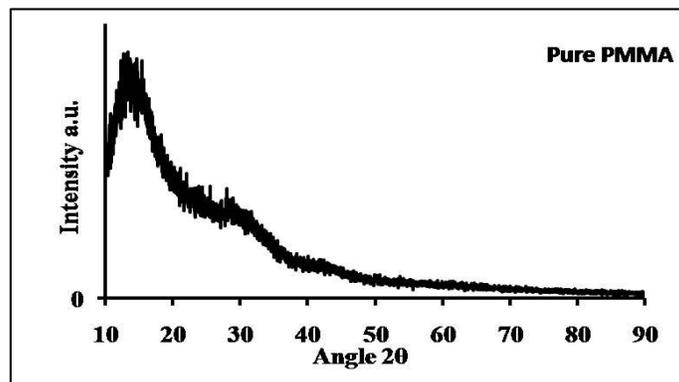


Figure 3(b): XRD pattern obtained for pure PMMA film

The XRD pattern of PCZO film obtained on doping Zn-CuO nanoparticles into PMMA, clearly shows that there is a low broad peak at  $13.8^\circ$  of PMMA and sharp peaks at  $31.7^\circ, 34.4^\circ, 36.2^\circ, 63.19^\circ, 63.24^\circ, 64.16^\circ$  due to zinc and peaks at  $2\theta = 35.5^\circ, 38.8^\circ$  along with low intensity peaks at due to copper oxide nanoparticles.

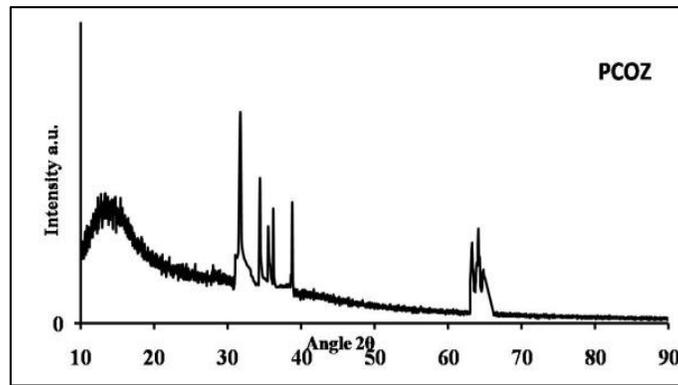


Figure 3(b): XRD pattern obtained for Zn-CuO doped PMMA film

**3.2 Analysis of SEM Images:** SEM images of sol-gel product Zn-CuO nanoparticles, pure PMMA film and Zn-CuO doped PMMA film are given in figure 4. The Zn-CuO doped PMMA film “possess smooth surface as compared to that for PMMA”. The addition of mixed metal oxide has smoothened the rough fractured surface of pure PMMA.

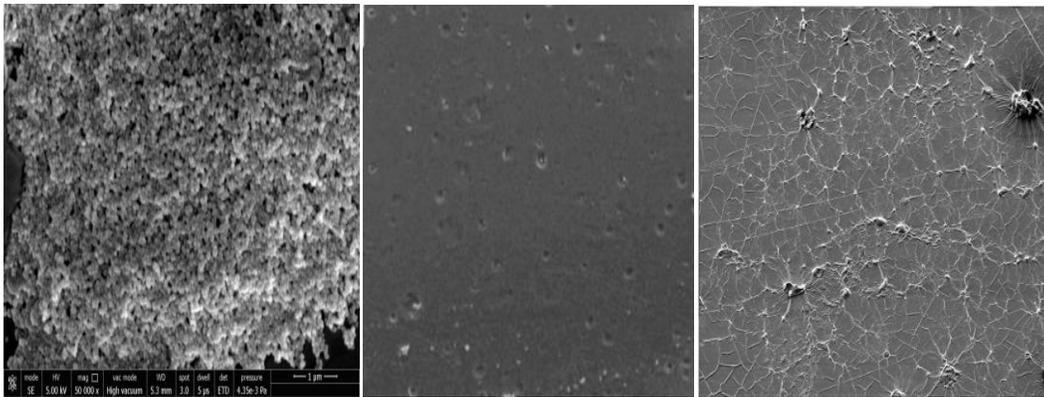


Figure 4: SEM images of ZnCuO nano powder, PMMA and Zn-CuO doped PMMA film .

**3.3 Analysis of FTIR Spectra:** The FTIR data obtained for sol-gel product Zn-CuO is shown in figure 5(a). The prepared films of pure PMMA and Zn-CuO doped PMMA were cut into very small pieces for FTIR investigations and the obtained spectra are shown in figure 5(b) and 5(c) respectively. The characteristic peaks in these figures represent the vibrational modes of the molecules. In figure 5(a), the peak at  $450\text{ cm}^{-1}$  is the characteristic absorption of Zn–O bond [20]. The peaks seen in between  $610$  and  $1045\text{ cm}^{-1}$  we observe intense absorption band corresponding to stretching mode of Cu-O in monoclinic phase [20]. The peak seen at  $2264\text{ cm}^{-1}$  corresponds to the presence of atmospheric  $\text{CO}_2$  [20 ]. Presence of humid environment resulting in hydrated CuO create peaks in the frequency band  $3000$  to  $3500\text{ cm}^{-1}$   $\text{H}_2\text{O}$  in the air and hydrated CuO samples are responsible for the creation of peaks[17].

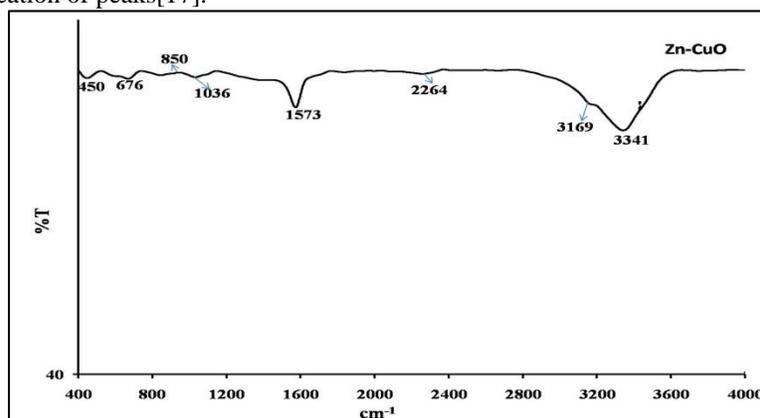
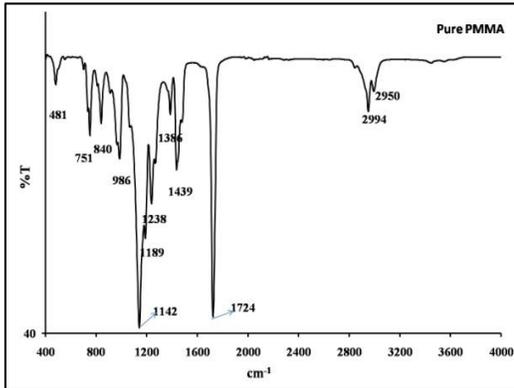


Figure 5(a): XRD pattern obtained for Zn-CuO powder

The modes obtained for the pure PMMA sample are listed in the Table 1 which is in good agreement with the reported ones [24].



Wave number (cm <sup>-1</sup> )	Mode
751	C-C stretching bands
840	CH <sub>2</sub> rocking mode
986	CH <sub>3</sub> -O rocking
1142	C-O anti symmetric stretching in C-O-C linkage
1189	CH <sub>2</sub> wagging mode
1238	C-C-O symmetric stretching
1386	CH bending
1439	CH <sub>3</sub> bending
1724	C=O stretching mode
2950	C-H symmetrical stretching
2994	C-H asymmetrical stretching

Figure 5(b): FTIR Spectrum obtained for PMMA film

Table 1: Vibration modes of PMMA

However with the incorporation of Zn-CuO in PMMA, we see **appearance of all these peaks** indicating the formation of the composite.

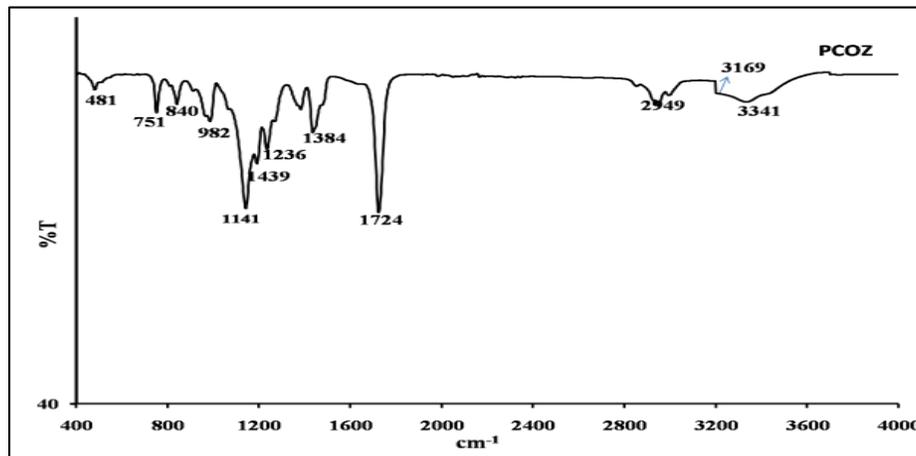


Figure 5(c): FTIR Spectra obtained for Zn-CuO doped PMMA film

**3.4 Study of Photo-luminescence properties:** “Photoluminescence is a popular spectroscopic technique to perform absorption studies on metal oxide particle systems. The excitation energies for these mixed metal oxides have been chosen on the basis of the most intense PL emission intensities”. Figure 6(a) and (b) show the PL spectra at room temperature for the pure PMMA and ZnCuO doped PMMA nano-composite films respectively.

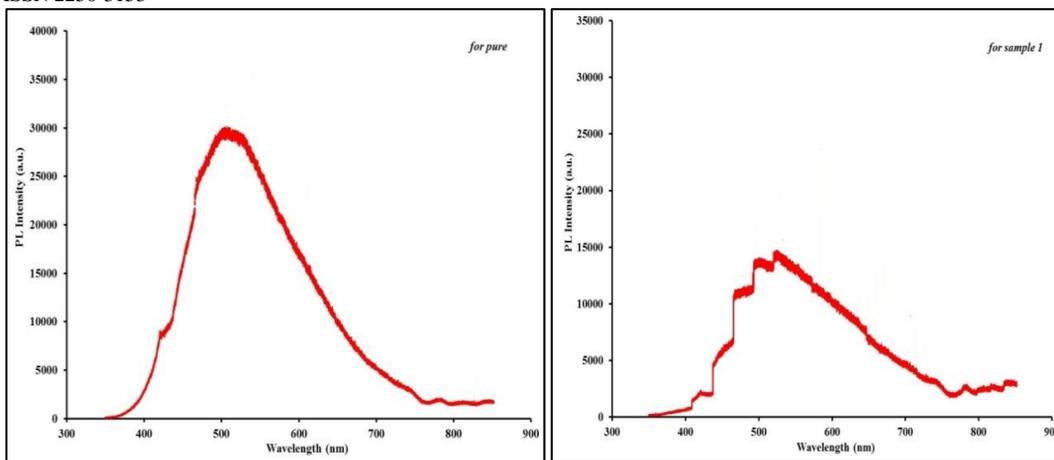


Figure 6: PL spectra of (a) Pure PMMA composite film (b) zinc-copper oxide nanoparticle doped composite film.

We can see that for the pure PMMA film there is only one wide visible emission centered at 510 nm with IR emission at 780 nm, while the PL spectra for Zn-CuO doped PMMA film shows emergence of visible emission peak at 545 nm, 525 nm, 510 nm and 410 nm and IR emission peak at 740, 780, 810, 845 nm respectively. From available studies we know that two emission peaks are obtained for ZnO nano particles; one about 371 nm and the other about 525 nm [21]. This 525 nm peak due to zinc oxide particles is dominantly seen in our PL spectra too. Further from literature it is known that emission peak at 545 nm arises the single ionized electron of CuO recombines with photogenerated hole, green coloured radiation at 545 nm are emitted. The visible emission peak at 510 and 410 nm are due to the excitonic recombination for PMMA. The visible emission peaks have low intensity compared with that for pure PMMA.

#### 4. CONCLUSION

Here we have explained the experimental procedure to synthesize zinc-copper oxide nano-powder through sol-gel process and insertion of it in PMMA to cast ZnCuO-PMMA film. The XRD, FTIR, SEM and PL pattern of such film shows that the metal particles get well blended into the long chains of polymeric material.

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# Association Between Child Clinical Characteristics And Retention To Scheduled Medical Appointment Among HIV Infected Children Aged 18 Months To Nine Years Attending HIV Care Services At KNH, Kenya:

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**Abstract:** Globally there is urgent need to retain children on HIV treatment to maximize the benefits of HIV treatment. This study determined the association between child clinical characteristics and retention to scheduled medical appointment among HIV infected children attending HIV care services at Kenyatta National Hospital, Kenya: This study is a repeated cross section survey conducted at twelve months interval during the month of July, 2018 to December 2018. The sample size was 221 participants among HIV infected children aged 18 months to nine years and their primary care givers seeking care in Comprehensive Care Centre. Data collection involved use of pretested questionnaire, review of standardized clinical notes on HIV clinic attendance and factors influencing clinic attendance. Children who had not received HIV care in other hospitals had 0.22 decreased odds of missing scheduled clinic appointment (95% CI 0.05 – 0.96) as compared to those who received HIV care in other hospitals. when children were compared with children who had missed treatment because HIV drugs had finished, children who had never missed treatment were less likely to miss scheduled medical appointments a OR 0.08 (95% CI 0.01 – 0.54). There was increased odds of missing scheduled clinic attendance with an increase in CD4 counts aOR 3.0 (95% CI 0.93 – 9.65 ) CD4 500 – 999; 19.32 (95% CI 2.73 – 136.78) CD4 1000 – 1499; 21.48 (95% CI 3.64– 126.62) CD4  $\geq$ 1500 when compared to children with  $<$ 500 CD4 count. The significant factors were; Child receiving treatment in another hospital, Child who had missed treatment because drugs had finished and CD4 counts. The Intervention focusing on children who miss HIV drugs and ensuring they have drug always by adhering to scheduled appointment are encouraged.

**Index Terms:** Retention, scheduled appointment, HIV infected children

## 1. INTRODUCTION

Globally there is urgent need to do follow up and retain children on HIV treatment in order to maximize the benefits of paediatric HIV treatment for example reduction of morbidity and mortality (Caroline et al.,2014, (Kunutsur et al .,2010). These benefits can only be achieved when the children are retained on regular scheduled medical appointment on HIV care where children complication can be identified early and intervention initiated early for example correction of anemia and nutritional support (Wamalwa et al., 2010). Retention of children in regular HIV care and treatment improves the quality of life in children infected with HIV Rosen and Fox, (2011) decreasing morbidity associated with HIV and increasing the likelihood of suppressing the virus and postponing the disease progression (Bastard, 2012).

Retention rate of children in Kenya on regular HIV care is approximately 61% at month 60. (Brainstein et al., 2011). In Kenya many strategies have been implemented and this has resulted to increased early diagnosis, good linkage and early initiation of HIV treatment and care among the children. (Brainstein et al., 2011). Retaining (HIV)–infected children in medical care at regular intervals

has been shown to be linked to positive health outcomes (Van der Kop, 2018). While most studies have focused on adherence to treatment (drugs), it is essential to provide holistic care to achieve good outcome. (Brennan et al., 2010).

The need to ensure that HIV-infected children are retained in regular care is a pressing public health issue and it affects multiple populations (Massavon et al., 2014). Studies has pointed out that it is the responsibility of the primary care giver to ensure their children are retained on HIV care and treatment. (Sunguya et al., 2018). Many factors influence caregiver decision to take their children to scheduled medical clinic (Mugevero et al., 2010). Little is known in Kenya on the association between children clinical characteristics and retention to scheduled medical appointments which this study addresses.

## II. METHODS

This study was carried out at Kenyatta National Hospital, Comprehensive Care Center (CCC) in Kenya. The Centre provides free comprehensive HIV care services. This study is a repeated cross section survey conducted at twelve months interval during the month of July, 2018 to December 2018. The sample size was 221 participants among HIV infected children aged 18 months to nine years and their primary care givers seeking care in Comprehensive Care Centre in KNH, Kenya. Pre-testing of semi-structured questionnaires was done among care giver in CCC KNH and the results were never included in the analysis. The grammatical errors found on questionnaires after pre-testing were corrected before being administered. Semi-structured questionnaires were administered to primary care givers to identify factors that might influence retention to HIV care services.

Data was abstracted from standardized case record forms completed by trained clinicians. The dependent variable was retention of children to scheduled medical appointment which was defined as a child not missing any scheduled medical appointments (allowing for  $\pm 5$  days of the appointment date) the children are rescheduled for refilling drug before their drugs are over. This included appointments for drug refills, medical review, nutritional counseling, psychosocial support and diagnostic/laboratory work-up. This study ensured restricted access to the information collected and coding of questionnaires was observed. The study was approved by the Kenyatta National Hospital / University of Nairobi Ethical Review Committee (KNH/UON ERC) to collect data from consenting primary care givers. The written informed consent was obtained and signed by primary care givers. The signed consent forms and filled questionnaires were stored under lock and key to ensure high level of confidentiality and privacy. The data collected was coded and entered into Statistical Package for Social Sciences (SPSS) version 20 for analysis. Part of methodology was published in my paper one by International organization of Scientific Research Journal. (Mwiti et al, 2020).

## III. RESULT

### Child Clinical Characteristic

The finding of this study show that the median Interquartile range (IQR) of CD4 count was 1077 (780-1592) and median (IQR) viral load 0 (0-47). Majority of children were classified in stage 1 or 2 of World Health Organization (WHO). 209 (96.8). Table 1

### Factors associated with retention to scheduled medical appointment among HIV infected

#### children at 12 months

Children who were not treated for opportunistic infections had 0.09 decreased odds of adhering to scheduled clinic appointment (95% CI 0.03 – 0.21) as compared to those treated for opportunistic infections. When compared to children who had missed treatment because drugs had finished, children who had never missed treatment were significantly less likely to miss scheduled clinic appointments ( 0.05 (95% CI 0.01-0.26). Children who had not received HIV care in other hospitals had 0.16 decreased odds of adhering to scheduled clinic appointment (95% CI 0.05 – 0.51) as compared to those who received HIV care in other hospitals.

Compared to those who had a low viral load (0-99 copies/ml) those with a high viral load  $>1000$  had 39 times (95% CI 7.62- 199.58) significantly increased odds of missing a scheduled appointment. Children with a high viral load ( $\geq 10\ 000$  copies/ml) were 48.7 times (95% CI 9.81- 242.18) more likely to miss the scheduled clinic appointments when compared to those with low viral load (0-99 copies/ml). Children who were on WHO stage 3 and 4 had 12.87 decreased odds of adhering to scheduled clinic appointment (95% CI 2.4 – 69.07) as compared to those who WHO stage 3 and 4. Other factors: CD4 count, psychosocial support during HIV care were not significantly associated with adhering to HIV care. Table 2

### Multivariate analysis on Missed Appointment at 12 months

Factors that predict adherence to clinic appointment were CD4 count, if child had missed treatment because drugs had finished and child receiving treatment in another hospital. At 12 months, there was an increasing trend for higher odds of missing scheduled clinic attendance with an increase in CD4 counts aOR 3.0 (95% CI 0.93 – 9.65 ) CD4 500 – 999; 19.32 (95% CI 2.73 – 136.78) CD4 1000 – 1499; 21.48 (95% CI 3.64– 126.62) CD4  $\geq 1500$  when compared to children with  $<500$  CD4 count. When compared to children who had missed treatment because drugs had finished, children who had never missed treatment were significantly less likely to miss

scheduled clinic appointments a OR 0.08 (95% CI 0.01 – 0.54) as compared to those who missed HIV treatment because drug got finished. Children who had not been treated for an opportunistic infection had a 0.32 (95% CI 0.09 – 1.17) decreased odds of missing a clinic appointment. Children who had not received HIV care in other hospitals had 0.22 decreased odds of missing scheduled clinic appointment (95% CI 0.05 – 0.96) as compared to those who received HIV care in other hospitals. HIV care treatment of opportunistic infection were not significantly associated with missing scheduled clinic appointment Table 3

#### IV. DISCUSSION

##### **Predictors for retention to scheduled medical appointment among HIV positive children**

###### **Child receiving treatment in another hospital**

Children who had not received HIV care in other hospitals had 0.22 decreased odds of missing scheduled clinic appointment (95% CI 0.05 – 0.96) as compared to those who received HIV care in other hospitals. The caregivers who utilize more than one HIV clinic for services are likely to fail to adhere to scheduled medical appointments hence difficult in assessing attrition (van der Kop et al. (2018). Study done by van der Kop et al., (2018) pointed out that it is important for health care workers to encourage care givers to utilize one medical Centre. The study result demonstrates that attending one clinic regularly reduces chances of missing scheduled appointment. Similar results were also reported by (Bastard et al, 2012).

###### **Child had missed treatment because drugs had finished**

The study pointed out that when children were compared with children who had missed treatment because HIV drugs had finished, children who had never missed treatment were less likely to miss scheduled medical appointments a OR 0.08 (95% CI 0.01 – 0.54). Children adhering to all scheduled clinic appointment are very essential in ensuring use of ART drugs (Brenman et al., 2010). Child caregivers are encouraged to take their children to scheduled medical appointments to have their HIV drugs and get other services. The study done by MChugh et al, (2017) pointed out that Missing clinic appointment is associated with missing treatment and hence a strong predictor for Virological failure.

###### **Child CD4 count**

Caregiver may not take their children to scheduled clinic appointments because their feel sick and may also attend because they feel sick (Rosen and Fox, 2011). The study found that at 12 months, there was an increasing trend for higher odds of missing scheduled clinic attendance with an increase in CD4 counts aOR 3.0 (95% CI 0.93 – 9.65 ) CD4 500 – 999; 19.32 (95% CI 2.73 – 136.78) CD4 1000 – 1499; 21.48 (95% CI 3.64– 126.62) CD4  $\geq$ 1500 when compared to children with  $<$ 500 CD4 count. This shows as the child improves while on care the CD4 Counts increases which trigger some caregiver to fail to take their children to clinic as they perceive their children has healed. Study done by Braintstein et al., (2011), Horstman et al., (2010) pointed out that being health is a risk factor of missing scheduled medical appointment. In contrast those children with low CD4 count are severely very ill and have higher chances of being admitted hence missing appointments (Massavon et al.,2014). Additionally these might be patients who are defaulters or non-adhering to treatment or might have some social issues.

#### V. CONCLUSION

The study has shown there is significant association between child clinical characteristics and retention to scheduled medical appointment. The significant factors include; Child receiving treatment in another hospital, Child who had missed treatment because drugs had finished and high CD4 counts. Children with high CD4 count and Child who had missed treatment because drugs had finished need to be targeted with intervention to ensure they adhere to scheduled medical appointments as they are at risk of missing medical appointment. Children receiving HIV treatment in more than one hospitals should be discouraged and support adhering to scheduled appointment.

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**Table 1 Child Clinical Characteristic**

Child Clinical Characteristic	At 12 months n ( % )
CD4 Count Median (IOR)	1077 ( 780-1592)
Viral Load Median (IOR)	0 (0-47)
WHO Stage 1 OR 2	209 (96.8)

3 OR 4	7 (3.2)
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**Table 2 : Factors associated with retention to scheduled medical appointment among HIV infected children at 12 months**

Variable	Missed appointment		OR (95% CI)	P value
	Yes (n=39)	No (n=177)		
CD 4 categories				
0	3(7.7)	11(6.2)	Ref	
500	18(46.2)	60(33.9)	1.10(-.-)	0.892
1000	6(15.4)	56(31.6)	0.39(0.09-1.81)	0.231
1500	4(10.3)	23(13.0)	0.64(0.12-3.36)	0.595
2000	7(17.9)	23(13.0)	1.12(0.24-5.16)	0.888
HIV care psychosocial support				
Yes	8(20.5)	18(10.2)	Ref	
No	31(79.5)	159(89.8)	0.44(0.18-1.10)	0.078
HIV care treatment OI				
Yes	16(41.0)	10(5.6)	Ref	
No	23(59.0)	167(94.4)	0.09(0.03-0.21)	<0.001
Child missed HIV treatment drugs finished				
Yes	7(17.9)	2(1.1)	Ref	
No	32(82.1)	175(98.9)	0.05(0.01-0.26)	<0.001
Received HIV care in other hospital				
Yes	7(17.9)	6(3.4)	Ref	
No	32(82.1)	171(96.6)	0.16(0.05-0.51)	0.002
Child treated for other illness OP not HIV				
Yes	21(53.8)	21(11.9)	Ref	
No	18(46.2)	156(88.1)	0.12(0.05-0.25)	<0.001
Viral load categories				
0	16(41.0)	156(88.1)	Ref	
100	5(12.8)	17(9.6)	2.87(-.-)	0.066
1000	8(20.5)	2(1.1)	39.00(7.62-199.58)	<0.001
10000	10(25.6)	2(1.1)	48.75(9.81-242.18)	<0.001
WHOstag_6				
1	34(87.2)	175(98.9)	Ref	
2	5(12.8)	2(1.1)	12.87(2.40-69.07)	0.003

**Table 3: Multivariate analysis on Missed Appointment at 12 months**

Missed appointment	Odds Ratio	95% Confidence interval		P value	LRT	0.055
CD 4 categories						
0 - 499	1.00					
500- 999	3.00	0.93	9.65	0.066		
1000 -1499	19.32	2.73	136.78	0.003		
>1500	21.48	3.64	126.62	0.001		
Child missed HIV treatment drugs finished						
Yes	1.00					
No	0.08	0.01	0.54	0.01		
HIV care treatment OI						
Yes	1					
No	0.39	0.11	1.47	0.167		
Received HIV care in other hospital						
Yes	1.00					
No	0.22	0.05	0.96	0.044		

# On $\pi g(\alpha g)^*$ – continuous maps and $\pi g(\alpha g)^*$ - irresolute maps in Topological Spaces

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**Abstract :** In this paper, we have introduced the concept of continuous, irresolute and homeomorphism maps of  $\pi g(\alpha g)^*$  closed set. Some of the fundamental properties of this set are studied. And their application also given namely,  $\pi g(\alpha g)^* - T_{1/2}$  - space.

**Keywords :**  $\pi g(\alpha g)^*$ - closed set,  $\pi g(\alpha g)^*$ - continuous map,  $\pi g(\alpha g)^*$ -irresolute map,  $\pi g(\alpha g)^* - T_{1/2}$  - space

## 1.Introduction

Levine[5] introduced the class of g-closed sets, a super class of closed sets in 1970. Dontchev and Noiri [19] have introduced the concept of  $\pi g$ -closed sets and studied their most fundamental properties in topological spaces. Also, Ekici and Noiri [21] have introduced a generalization of  $\pi g$ -closed sets and  $\pi g$ -open sets. Recently , a new class of  $\pi g(\alpha g)^*$ -closed sets in topological spaces introduced and studied by R.Savithiri , A.Manonmani and M.Anandhi [29]. In this paper , we have made a study on  $\pi g(\alpha g)^*$ - continuous map,  $\pi g(\alpha g)^*$ -irresolute map and  $\pi g(\alpha g)^*$ -homeomorphism. Also, Applications of  $\pi g(\alpha g)^*$ -closed sets are analyzed.

## 2.Preliminaries

For a subset H of a space  $(X, \tau)$ ,  $cl(H)$  and  $int(H)$  denote the closure and the interior of H respectively. The class of all closed subsets of a space  $(X, \tau)$  is denoted by  $C(X, \tau)$ . The smallest closed (resp.  $\alpha$ -closed) set containing a subset H of  $(X, \tau)$  is called the closure (resp.  $\alpha$ -closure) of H and is denoted by  $cl(H)$  (resp.  $\alpha cl(H)$ ).

**Definition 2.1 :** 1) A  $\pi$  open set [21] of X is a finite union of all r-open sets in  $(X, \tau)$ .

2) A subset H of a space X is called  $\alpha$ -generalized closed (briefly  $\alpha g$ -closed) [13] if  $\alpha cl(H) \subseteq U$  whenever  $H \subseteq U$  and U is open in X.

3) A subset H of a space X is called  $\pi$ - generalized closed set [21] (briefly  $\pi g$ -closed) if  $cl(H) \subseteq U$  whenever  $H \subseteq U$  and U is  $\pi$ -open in  $(X, \tau)$ .

4) A subset H of a space X is called  **$\pi$ -generalized- $(\alpha g)^*$  closed set [29] (briefly  $\pi g(\alpha g)^*$ - closed set)** if  $\alpha g cl(H) \subseteq U$ , whenever  $H \subseteq U$  and U is  $\pi$  open in X.

Diagram-I

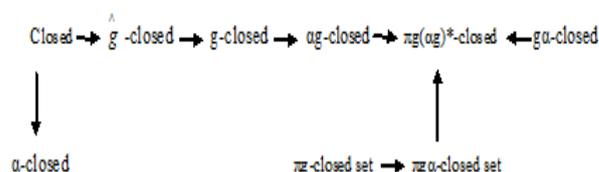


Diagram-I is obvious (see related papers).

**Remark 2.2 :**

$\pi g(\alpha g)^*$ -closed set is independent with the following closed sets:gp-closed set, rg-closed set, s-closed set, wg-closed set,  $w\pi g$ -closed set,  $b^*$ -closed set, b-closed set, gs-closed set, gs-closed set, gb-closed set and  $\pi gp$ -closed set .

**3. On  $\pi g(\alpha g)^*$ - continuous map.**

**Definition 3.1:**

A map  $\theta: (X, \tau_1) \rightarrow (Y, \tau_2)$  is called

- 1) continuous[5] if inverse image of every closed set of  $(Y, \tau_2)$  is a closed set of  $(X, \tau_1)$ .
- 2) g-continuous[5] if the inverse image of every closed set of  $(Y, \tau_2)$  is g- closed set of  $(X, \tau_1)$ .
- 3)  $\hat{g}$ -continuous[4] if the inverse image of every closed set of  $(Y, \tau_2)$  is  $\hat{g}$ - closed set of  $(X, \tau_1)$ .
- 4)  $\alpha g$ -continuous[13] if the inverse image of every closed set of  $(Y, \tau_2)$  is  $\alpha g$ - closed set of  $(X, \tau_1)$ .
- 5)  $g\alpha$ -continuous[13] if the inverse image of every closed set of  $(Y, \tau_2)$  is  $g\alpha$ - closed set of  $(X, \tau_1)$ .
- 6)  $\pi g$ -continuous[21] if the inverse image of every closed set of  $(Y, \tau_2)$  is  $\pi g$ - closed set of  $(X, \tau_1)$ .
- 7)  $\pi g\alpha$ -continuous [25] if the inverse image of every closed set of  $(Y, \tau_2)$  is  $\pi g\alpha$ - closed of  $(X, \tau_1)$ .
- 8) s-continuous [6] if the inverse image of every closed set of  $(Y, \tau_2)$  is s- closed set of  $(X, \tau_1)$ .
- 9) gp-continuous[23] if the inverse image of every closed set of  $(Y, \tau_2)$  is gp- closed set of  $(X, \tau_1)$ .
- 10) rg-continuous[28] if the inverse image of every closed set of  $(Y, \tau_2)$  is rg- closed set of  $(X, \tau_1)$ .
- 11) wg-continuous[15]if the inverse image of every closed set of  $(Y, \tau_2)$  is wg-closed set of  $(X, \tau_1)$ .
- 12)  $w\pi g$ -continuous[15]if the inverse image of every closed set of  $(Y, \tau_2)$  is  $w\pi g$ -closed of  $(X, \tau_1)$ .

- 13)  $b^*$ -continuous[26]if the inverse image of every closed set of  $(Y, \tau_2)$  is  $b^*$ - closed set of  $(X, \tau_1)$ .
- 14) b-continuous[16] if the inverse image of every closed set of  $(Y, \tau_2)$  is b- closed set of  $(X, \tau_1)$ .
- 15) gs-continuous[29]if the inverse image of every closed set of  $(Y, \tau_2)$  is gs- closed set of  $(X, \tau_1)$ .
- 16) gb-continuous[27] if the inverse image of every closed set of  $(Y, \tau_2)$  is gb-closed set of  $(X, \tau_1)$ .
- 17)  $\pi gp$ -continuous[24] if the inverse image of every closed set of  $(Y, \tau_2)$  is  $\pi gp$ - closed of  $(X, \tau_1)$ .
- 18)  $\alpha$ -continuous [11] if the inverse image of every closed set of  $(Y, \tau_2)$  is  $\alpha$ - closed set of  $(X, \tau_1)$ .

**Definition 3.2:**

A map  $\theta: (X, \tau_1) \rightarrow (Y, \tau_2)$  is called a  $\pi g(\alpha g)^*$ -continuous if the inverse image of every closed set of  $(Y, \tau_2)$  is  $\pi g(\alpha g)^*$ - closed set of  $(X, \tau_1)$ .

**Theorem 3.3:**

Every continuous map, g-continuous map,  $\alpha$ -continuous map and  $\alpha g$ -continuous map is  $\pi g(\alpha g)^*$ -continuous.

**Proof:**

- (i) Take  $\theta : (X, \tau_1) \rightarrow (Y, \tau_2)$  be continuous map. Let W be closed set of  $(Y, \tau_2)$  then inverse image of W is closed of  $(X, \tau_1)$ . Inverse image of W is  $\pi g(\alpha g)^*$ -closed of  $(X, \tau_1)$ , since closed  $\rightarrow \pi g(\alpha g)^*$ -closed. Hence  $\theta$  is  $\pi g(\alpha g)^*$ -continuous of  $(X, \tau_1)$ .
- (ii) Take  $\theta : (X, \tau_1) \rightarrow (Y, \tau_2)$  be g-continuous map. Let W be closed set of  $(Y, \tau_2)$  then inverse image of W is g-closed of  $(X, \tau_1)$ . Inverse image of W is  $\pi g(\alpha g)^*$ -closed of  $(X, \tau_1)$ , since g-closed  $\rightarrow \pi g(\alpha g)^*$ -closed . Hence  $\theta$  is  $\pi g(\alpha g)^*$ -continuous of  $(X, \tau_1)$ .
- (iii) Take  $\theta : (X, \tau_1) \rightarrow (Y, \tau_2)$  be  $\alpha$ -continuous map. Let W be closed set of  $(Y, \tau_2)$  then inverse image of W is  $\alpha$ -closed of  $(X, \tau_1)$ . Inverse image of W is  $\pi g(\alpha g)^*$ -closed of  $(X, \tau_1)$ , since  $\alpha$ -closed  $\rightarrow \pi g(\alpha g)^*$ -closed . Hence  $\theta$  is  $\pi g(\alpha g)^*$ -continuous of  $(X, \tau_1)$ .
- (iv) Take  $\theta : (X, \tau_1) \rightarrow (Y, \tau_2)$  be  $\alpha g$ -continuous map. Let W be closed set of  $(Y, \tau_2)$  then inverse image of W is  $\alpha g$ -closed of  $(X, \tau_1)$ . Inverse image of W is  $\pi g(\alpha g)^*$ -closed of  $(X, \tau_1)$ ,

since  $\alpha g$ -closed  $\rightarrow \pi g(\alpha g)^*$ -closed . Hence  $\theta$  is  $\pi g(\alpha g)^*$ -continuous of  $(X, \tau_1)$ .

The converse of the above theorem need not be true from the following example.

**Example 3.4:**

Take  $X = Y = \{a,b,c\}$  and  $\tau_1 = \{X, \Phi, \{a\}\}$ ,  $\tau_2 = \{Y, \Phi, \{a\}, \{b,c\}\}$ . Define  $\theta : (X, \tau_1) \rightarrow (Y, \tau_2)$  as  $\theta(a) = a$ ,  $\theta(b) = b$ ,  $\theta(c) = c$ . Here inverse image of all  $\tau_2^c$  are  $\pi g(\alpha g)^*$ -closed of  $(X, \tau_1)$  but not closed,  $g$ -closed,  $\alpha$ -closed and  $\alpha g$ -closed of  $(X, \tau_1)$ . This implies converse not true.

**Theorem 3.5:**

Every  $\hat{g}$ -continuous map and  $g\alpha$ -continuous map is  $\pi g(\alpha g)^*$ -continuous.

**Proof:**

(i) Take  $\theta : (X, \tau_1) \rightarrow (Y, \tau_2)$  be  $\hat{g}$ -continuous map. Let  $W$  be closed set of  $(Y, \tau_2)$  then inverse image of  $W$  is  $\hat{g}$ -closed of  $(X, \tau_1)$ . Inverse image of  $W$  is  $\pi g(\alpha g)^*$ -closed of  $(X, \tau_1)$ , since  $\hat{g}$ -closed  $\rightarrow \pi g(\alpha g)^*$ -closed . Hence  $\theta$  is  $\pi g(\alpha g)^*$ -continuous of  $(X, \tau_1)$ .

(ii) Take  $\theta : (X, \tau_1) \rightarrow (Y, \tau_2)$  be  $g\alpha$ -continuous map. Let  $W$  be closed set of  $(Y, \tau_2)$  then inverse image of  $W$  is  $g\alpha$ -closed of  $(X, \tau_1)$ . Inverse image of  $W$  is  $\pi g(\alpha g)^*$ -closed of  $(X, \tau_1)$ , since  $g\alpha$ -closed  $\rightarrow \pi g(\alpha g)^*$ -closed . Hence  $\theta$  is  $\pi g(\alpha g)^*$ -continuous of  $(X, \tau_1)$ .

The converse of the above theorem need not be true from the following example.

**Example 3.6:**

Take  $X = Y = \{a,b,c\}$  and  $\tau_1 = \{X, \Phi, \{c\}, \{b,c\}\}$ ,  $\tau_2 = \{Y, \Phi, \{a\}, \{b,c\}\}$ . Define  $\theta : (X, \tau_1) \rightarrow (Y, \tau_2)$  as  $\theta(a) = a$ ,  $\theta(b) = b$ ,  $\theta(c) = c$ . Here inverse image of all  $\tau_2^c$  are  $\pi g(\alpha g)^*$ -closed of  $(X, \tau_1)$  but not  $g\alpha$ -closed and  $\hat{g}$ -closed of  $(X, \tau_1)$ .

This implies converse not true.

**Theorem 3.7:**

Every  $\pi g$ -continuous map is  $\pi g(\alpha g)^*$ -continuous.

**Proof:**

Take  $\theta : (X, \tau_1) \rightarrow (Y, \tau_2)$  be  $\pi g$ -continuous map. Let  $W$  be closed set of  $(Y, \tau_2)$  then inverse image of  $W$  is  $\pi g$ -closed of  $(X, \tau_1)$ . Inverse image of  $W$  is  $\pi g(\alpha g)^*$ -closed of  $(X, \tau_1)$ ,

since  $\pi g$ -closed  $\rightarrow \pi g(\alpha g)^*$ -closed . Hence  $\theta$  is  $\pi g(\alpha g)^*$ -continuous of  $(X, \tau_1)$ .

The converse of the above theorem need not be true from the following example.

**Example 3.8:**

Take  $X = Y = \{a,b,c,d\}$  and  $\tau_1 = \{X, \Phi, \{a\}, \{b\}, \{a,b\}, \{b,c\}, \{a,b,c\}\}$ ,  $\tau_2 = \{Y, \Phi, \{a\}, \{a,b,d\}\}$ . Define  $\theta : (X, \tau_1) \rightarrow (Y, \tau_2)$  as  $\theta(a) = a$ ,  $\theta(b) = b$ ,  $\theta(c) = c$ ,  $\theta(d) = d$ . Here inverse image of all  $\tau_2^c$  are  $\pi g(\alpha g)^*$ -closed of  $(X, \tau_1)$  but not  $\pi g$ -closed of  $(X, \tau_1)$ . This implies converse not true.

**Theorem 3.9:**

Every  $\pi g\alpha$ -continuous map is  $\pi g(\alpha g)^*$ -continuous but not converse.

**Proof:**

Take  $\theta : (X, \tau_1) \rightarrow (Y, \tau_2)$  be  $\pi g\alpha$ -continuous map. Let  $W$  be closed set of  $(Y, \tau_2)$  then inverse image of  $W$  is  $\pi g\alpha$ -closed of  $(X, \tau_1)$ . Inverse image of  $W$  is  $\pi g(\alpha g)^*$ -closed of  $(X, \tau_1)$ , since  $\pi g\alpha$ -closed  $\rightarrow \pi g(\alpha g)^*$ -closed . Hence  $\theta$  is  $\pi g(\alpha g)^*$ -continuous of  $(X, \tau_1)$ .

**Remark 3.10:**

The composition of two  $\pi g(\alpha g)^*$ -continuous map is need not be a  $\pi g(\alpha g)^*$ -continuous map.

**Example:3.11**

Take  $X = Y = Z = \{a,b,c\}$  and  $\tau_1 = \{X, \Phi, \{a\}, \{b\}, \{a,b\}\}$ ,  $\tau_2 = \{Y, \Phi, \{a\}, \{a,b\}\}$  and  $\tau_3 = \{Z, \Phi, \{a\}, \{b,c\}\}$ . Define  $\theta : (X, \tau_1) \rightarrow (Y, \tau_2)$  and  $h : (Y, \tau_2) \rightarrow (Z, \tau_3)$  be an identity maps. Let  $\theta$  and  $h$  be a  $\pi g(\alpha g)^*$ -continuous maps. . But  $(h \circ \theta)^{-1}(\{a\}) = \theta^{-1}(h^{-1}(\{a\})) = \{a\}$  is not  $\pi g(\alpha g)^*$ -closed of  $(X, \tau_1)$ . Hence  $h \circ \theta$  is not  $\pi g(\alpha g)^*$ -continuous.

**Theorem 3.12:**

A map  $\theta : (X, \tau_1) \rightarrow (Y, \tau_2)$  is  $\pi g(\alpha g)^*$ -continuous and  $h : (Y, \tau_2) \rightarrow (Z, \tau_3)$  is continuous , then  $h \circ \theta : (X, \tau_1) \rightarrow (Z, \tau_3)$  is  $\pi g(\alpha g)^*$ -continuous.

**Proof:**

Take  $W$  be any closed set in  $(Z, \tau_3)$  and so  $h^{-1}$  of  $W$  is closed of  $(Y, \tau_2)$ , Since  $h$  is continuous.  $(h \circ \theta)^{-1}(W) = \theta^{-1}(h^{-1}(W))$  is  $\pi g(\alpha g)^*$ -closed  $(X, \tau_1)$ , Since  $\theta$  is  $\pi g(\alpha g)^*$ -continuous . Hence  $h \circ \theta$  is  $\pi g(\alpha g)^*$ -continuous.

**Theorem 3.13:**

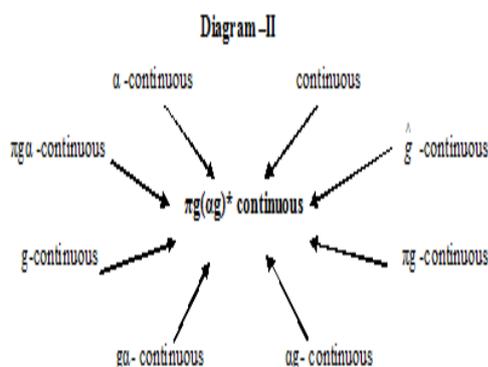
A map  $\theta : (X, \tau_1) \rightarrow (Y, \tau_2)$  is  $\pi g(\alpha g)^*$ -continuous if and only if inverse image of every open set in

$(Y, \tau_2)$  is  $\pi g(\alpha g)^*$ - open set in  $(X, \tau_1)$ .

**Proof:**

Take  $\theta: (X, \tau_1) \rightarrow (Y, \tau_2)$  be  $\pi g(\alpha g)^*$ -continuous map and  $W$  be open set in  $(Y, \tau_2)$  then  $W^c$  is closed in  $(Y, \tau_2)$ . Inverse image of  $W^c$  is  $\pi g(\alpha g)^*$ -closed of  $(X, \tau_1)$  since  $\theta$  is  $\pi g(\alpha g)^*$ -continuous. But  $\theta^{-1}(W^c) = (\theta^{-1}(W))^c$ . Hence inverse image of  $W$  is  $\pi g(\alpha g)^*$ -open of  $(X, \tau_1)$ .

Conversely, Assume, For every open set  $W$  of  $(Y, \tau_2)$ , inverse image of  $W$  is  $\pi g(\alpha g)^*$ -open of  $(X, \tau_1)$ . If  $W$  of  $(Y, \tau_2)$  be a closed set, then  $W^c$  of  $(Y, \tau_2)$  be a open set. By assumption, inverse image of  $W^c$  of  $(X, \tau_1)$  be a  $\pi g(\alpha g)^*$ -open set of  $(X, \tau_1)$ . But  $\theta^{-1}(W^c) = (\theta^{-1}(W))^c$ . Hence inverse image of  $W$  is  $\pi g(\alpha g)^*$ -closed of  $(X, \tau_1)$ . This implies  $\theta$  is  $\pi g(\alpha g)^*$ -continuous



**4. On  $\pi g(\alpha g)^*$ - open map.**

**Definition 4.1:**

A map  $\theta: (X, \tau_1) \rightarrow (Y, \tau_2)$  is called a  $\pi g(\alpha g)^*$ -open map if the image of every open set of  $(X, \tau_1)$  is  $\pi g(\alpha g)^*$ - open set of  $(Y, \tau_2)$ .

**Theorem 4.2:**

Every open map,  $g$ -open map,  $\hat{g}$ -open map,  $\alpha$ -open map,  $\alpha g$ -open map,  $g\alpha$ -open map,  $\pi g$ -open map and  $\pi g\alpha$ -open map is  $\pi g(\alpha g)^*$ -open map.

**Proof:**

Follows from the fact that “Every open set,  $g$ -open set,  $\hat{g}$ -open set,  $\alpha$ -open set,  $\alpha g$ -open set,  $g\alpha$ -open set,  $\pi g$ -open set and  $\pi g\alpha$ -open set is  $\pi g(\alpha g)^*$ -open set”.

The converse of the above theorem need not be true from the following example.

**Example 4.3:**

Take  $X = Y = \{a,b,c\}$  and  $\tau_1 = \{X, \Phi, \{a\}, \{b,c\}\}$ ,  $\tau_2 = \{Y, \Phi, \{a\}\}$ . Define  $\theta: (X, \tau_1) \rightarrow (Y, \tau_2)$  as  $\theta(a) = a$ ,  $\theta(b) = b$ ,  $\theta(c) = c$ . Here  $W = \{b,c\}$  be a open set of  $(X, \tau_1)$ . But image of  $W$  is  $\pi g(\alpha g)^*$ -open set of  $(Y, \tau_2)$  but not open set,  $g$ -open set,  $\alpha$ -open set,  $\alpha g$ -open set of  $(Y, \tau_2)$ . This implies converse of above theorem not true.

**5. On  $\pi g(\alpha g)^*$ - irresolute map.**

**Definition 5.1:**

A map  $\theta: (X, \tau_1) \rightarrow (Y, \tau_2)$  is called a  $\pi g(\alpha g)^*$ -irresolute if the inverse image of every  $\pi g(\alpha g)^*$ -closed set of  $(Y, \tau_2)$  is  $\pi g(\alpha g)^*$ - closed set of  $(X, \tau_1)$ .

**Theorem 5.2:**

Every  $\pi g(\alpha g)^*$ -irresolute map is  $\pi g(\alpha g)^*$ -continuous map.

**Proof:**

Take a map  $\theta: (X, \tau_1) \rightarrow (Y, \tau_2)$  be  $\pi g(\alpha g)^*$ -irresolute map. Let  $W$  be closed set of  $(Y, \tau_2)$  then  $W$  be a  $\pi g(\alpha g)^*$ -closed set of  $(Y, \tau_2)$ , since closed  $\rightarrow$   $\pi g(\alpha g)^*$ -closed. But inverse image of  $W$  is  $\pi g(\alpha g)^*$ -closed of  $(X, \tau_1)$ . Hence  $\theta$  is  $\pi g(\alpha g)^*$ -continuous.

The converse of the above theorem need not be true from the following example.

**Example 5.3:**

Take  $X = Y = \{a,b,c\}$  and  $\tau_1 = \{X, \Phi, \{a\}, \{b\}, \{a,b\}\}$ ,  $\tau_2 = \{Y, \Phi, \{a\}, \{a,b\}\}$ . Define  $\theta: (X, \tau_1) \rightarrow (Y, \tau_2)$  as  $\theta(a) = a$ ,  $\theta(b) = b$ ,  $\theta(c) = c$ ,  $\theta(d) = d$ . Here inverse image of all  $\tau_2^c$  are of  $\pi g(\alpha g)^*$ -closed of  $(X, \tau_1)$  so  $\theta$  is  $\pi g(\alpha g)^*$ -continuous. But inverse image of all  $\pi g(\alpha g)^*$ -closed of  $(Y, \tau_2)$  are not  $\pi g(\alpha g)^*$ -closed of  $(X, \tau_1)$  so  $\theta$  is not  $\pi g(\alpha g)^*$ -irresolute map.

**Theorem 5.4:**

A map  $\theta: (X, \tau_1) \rightarrow (Y, \tau_2)$  is  $\pi g(\alpha g)^*$ -irresolute and  $h: (Y, \tau_2) \rightarrow (Z, \tau_3)$  is  $\pi g(\alpha g)^*$ -continuous, then  $h \circ \theta: (X, \tau_1) \rightarrow (Z, \tau_3)$  is  $\pi g(\alpha g)^*$ -continuous.

**Proof:**

Take  $W$  be any closed set of  $(Z, \tau_3)$  and so  $h^{-1}$  of  $W$  is  $\pi g(\alpha g)^*$ -closed of  $(Y, \tau_2)$ , Since  $h$  is  $\pi g(\alpha g)^*$ -continuous.  $(h \circ \theta)^{-1}(W) = \theta^{-1}(h^{-1}(W))$  is  $\pi g(\alpha g)^*$ -closed of  $(X, \tau_1)$ , Since  $\theta$  is  $\pi g(\alpha g)^*$ -irresolute. Hence  $h \circ \theta$  is  $\pi g(\alpha g)^*$ -continuous.

**Theorem 5.5:**

A map  $\theta: (X, \tau_1) \rightarrow (Y, \tau_2)$  is  $\pi g(\alpha g)^*$ -irresolute and  $h: (Y, \tau_2) \rightarrow (Z, \tau_3)$  is  $\pi g(\alpha g)^*$ -irresolute, then  $h \circ \theta: (X, \tau_1) \rightarrow (Z, \tau_3)$  is  $\pi g(\alpha g)^*$ -irresolute.

**Proof:**

Take  $W$  be any  $\pi g(\alpha g)^*$ -closed set of  $(Z, \tau_3)$  and so  $h^{-1}$  of  $W$  is  $\pi g(\alpha g)^*$ -closed of  $(Y, \tau_2)$ . Since  $h$  is  $\pi g(\alpha g)^*$ -irresolute.  $(h \circ \theta)^{-1}(W) = \theta^{-1}(h^{-1}(W))$  is  $\pi g(\alpha g)^*$ -closed of  $(X, \tau_1)$ . Since  $\theta$  is  $\pi g(\alpha g)^*$ -irresolute. Hence  $h \circ \theta$  is  $\pi g(\alpha g)^*$ -irresolute.

**Theorem 5.6:**

A map  $\theta: (X, \tau_1) \rightarrow (Y, \tau_2)$  is  $\pi g(\alpha g)^*$ -irresolute if and only if inverse image of every  $\pi g(\alpha g)^*$ -open set in  $(Y, \tau_2)$  is  $\pi g(\alpha g)^*$ -open set in  $(X, \tau_1)$ .

**Proof:**

Similar to Theorem 3.13.

**6. On  $\pi g(\alpha g)^*$  - homeomorphisms.**

**Definition 6.1:**

A bijective map  $\theta: (X, \tau_1) \rightarrow (Y, \tau_2)$  is called a  $\pi g(\alpha g)^*$ -homeomorphism if a map is both  $\pi g(\alpha g)^*$ -continuous and  $\pi g(\alpha g)^*$ -open.

**Remark 6.2:**

For a bijective map  $\theta: (X, \tau_1) \rightarrow (Y, \tau_2)$ , the following statement are equivalent:

- (i)  $\theta^{-1}$  is  $\pi g(\alpha g)^*$ -continuous, (ii)  $\theta$  is  $\pi g(\alpha g)^*$ -open,
- (iii)  $\theta$  is  $\pi g(\alpha g)^*$ -closed.

**Theorem 6.3:**

Every homeomorphism is a  $\pi g(\alpha g)^*$ -homeomorphism.

**Proof :**

Follows from the fact that “Every continuous map is  $\pi g(\alpha g)^*$ -continuous map and Every open map is  $\pi g(\alpha g)^*$ -open map”.

The converse of the above theorem need not be true from the following example.

**Example 6.4:**

Take  $X = Y = \{a, b, c\}$  and  $\tau_1 = \{X, \Phi, \{a\}, \{b\}, \{a, b\}\}$ ,  $\tau_2 = \{Y, \Phi, \{a\}, \{a, b\}\}$ .

Define  $\theta: (X, \tau_1) \rightarrow (Y, \tau_2)$  as bijective map. Now  $\theta$  is  $\pi g(\alpha g)^*$ -homeomorphism but not a homeomorphism, Since  $\theta(\{b\}) = \{b\}$  is not in open set of  $(Y, \tau_2)$ .

**Remark 6.5:**

The composition of two  $\pi g(\alpha g)^*$ -homeomorphism map is need not be a  $\pi g(\alpha g)^*$ -homeomorphism map.

**Example 6.6 :**

Take  $X = Y = Z = \{a, b, c\}$  and  $\tau_1 = \{X, \Phi, \{a\}, \{b\}, \{a, b\}\}$ ,  $\tau_2 = \{Y, \Phi, \{a\}, \{a, b\}\}$  and  $\tau_3 = \{Y, \Phi, \{a\}, \{b, c\}\}$ . Define  $\theta: (X, \tau_1) \rightarrow (Y, \tau_2)$  and  $h: (Y, \tau_2) \rightarrow (Z, \tau_3)$  be an identity maps. Let  $\theta$  and  $h$  be a  $\pi g(\alpha g)^*$ -homeomorphism maps. . But  $(h \circ \theta)^{-1}(\{a\}) = \theta^{-1}(h^{-1}(\{a\})) = \{a\}$  is not  $\pi g(\alpha g)^*$ -closed of  $(X, \tau_1)$ . Hence  $h \circ \theta$  is not  $\pi g(\alpha g)^*$ -homeomorphism, Since  $h \circ \theta$  is not a  $\pi g(\alpha g)^*$ -continuous map.

**Theorem 6.7:**

If map  $\theta: (X, \tau_1) \rightarrow (Y, \tau_2)$  is bijective  $\pi g(\alpha g)^*$ -continuous map, then following statement are equivalent:

- (i)  $\theta$  is  $\pi g(\alpha g)^*$ -homeomorphism, (ii)  $\theta$  is  $\pi g(\alpha g)^*$ -open,
- (iii)  $\theta$  is  $\pi g(\alpha g)^*$ -closed.

**Proof :**

Follows from Remark 6.2.

**7. Applications of  $\pi g(\alpha g)^*$ -closed set.**

**Definition 7.1:**

- 1) A topological space  $(X, \tau)$  is called  $T_{1/2}$ -space [5] if every  $g$ -closed in  $(X, \tau)$  is closed in  $(X, \tau)$ .
- 2) A topological space  $(X, \tau)$  is called  $T_b$ -space [14] if every  $g_s$ -closed in  $(X, \tau)$  is closed in  $(X, \tau)$ .
- 3) A topological space  $(X, \tau)$  is called  ${}_a T_b$ -space [17] if every  $\alpha g$ -closed in  $(X, \tau)$  is closed in  $(X, \tau)$ .

**Definition 7.2:**

A topological space  $(X, \tau)$  is called  $\pi g(\alpha g)^*$ - $T_{1/2}$ -space if every  $\pi g(\alpha g)^*$ -closed set of  $(X, \tau)$  is closed of  $(X, \tau)$ .

**Theorem 7.3:**

Every  $\pi g(\alpha g)^*$ - $T_{1/2}$ -space is a  $T_{1/2}$ -space.

**Proof :**

Assume that  $(X, \tau)$  is a  $\pi g(\alpha g)^*$ - $T_{1/2}$ -space. Let  $H$  be a  $g$ -closed set. But every  $g$ -closed set is a  $\pi g(\alpha g)^*$ -closed. By assumption,  $(X, \tau)$  is a  $T_{1/2}$ -space.

**Theorem 7.4:**

Every  $\pi g(\alpha g)^*$ - $T_{1/2}$ -space is a  ${}_a T_b$ -space.

**Proof :**

Assume that  $(X, \tau)$  is a  $\pi g(\alpha g)^*$ - $T_{1/2}$ -space. Let  $H$  be a  $\alpha g$ -closed set. But every  $\alpha g$ -closed set is a  $\pi g(\alpha g)^*$ -closed. By assumption,  $(X, \tau)$  is a  ${}_a T_b$ -space.

**Remark 7.5 :**

$\pi g(\alpha g)^*$ - $T_{1/2}$ -space and  $T_b$ -space are independent spaces

**Theorem 7.6:**

A space  $(X, \tau)$  is a  $\pi g(\alpha g)^* - T_{1/2}$  - space if and only if every singleton of  $X$  is either  $\pi$ -closed set or  $\alpha g$  -open.

**Proof :**

Assume that  $(X, \tau)$  is a  $\pi g(\alpha g)^* - T_{1/2}$  - space. Let  $y$  be an element in  $X$  and  $\{y\}$  is not in  $\pi$ -closed, then  $X - \{y\}$  is not in  $\pi$ -open and then  $X - \{y\}$  is  $\pi g(\alpha g)^* -$ closed. By assumption ,  $X - \{y\}$  is  $\alpha g$ -closed. Hence  $\{y\}$  is  $\alpha g$ -open. The converse is similar.

**Theorem 7.7:**

A map  $\theta: (X, \tau_1) \rightarrow (Y, \tau_2)$  and  $h: (Y, \tau_2) \rightarrow (Z, \tau_3)$  be two maps and if  $\theta$  is  $\alpha g$ -irresolute and  $h$  is a  $\pi g(\alpha g)^* -$ continuous and  $Y$  is a  $\pi g(\alpha g)^* - T_{1/2}$  - space, then  $h \circ \theta: (X, \tau_1) \rightarrow (Z, \tau_3)$  is  $\alpha g$ -continuous.

**Proof :**

Take  $W$  be any closed set in  $(Z, \tau_3)$  . Here  $(Y, \tau_2)$  is a  $\pi g(\alpha g)^* - T_{1/2}$  - space and  $h^{-1}$  of  $W$  is  $\pi g(\alpha g)^* -$ closed of  $(Y, \tau_2)$ , Since  $h$  is  $\pi g(\alpha g)^* -$ continuous. But  $(h \circ \theta)^{-1}(W) = \theta^{-1}(h^{-1}(W))$  is  $\alpha g$ -closed  $(X, \tau_1)$ , Since  $\theta$  is  $\alpha g$ - irresolute. Hence  $h \circ \theta$  is  $\alpha g$ -continuous.

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# Value Addition of Some Minor Fruits of NE India-A Strategy for doubling farmer's income. (A review)

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**Abstract-** The north Eastern Region of India is rich in diversity of indigenous minor fruits. Minor fruits are known to play vital role in food and nutritional supplement of rural community from time immemorial. Many of the minor fruits are found in Assam which grows wild and found also in homestead garden. Minor fruits are hardy and can be grown in adverse condition and are also known for therapeutic, medicinal and nutritive value and can fulfill the demands of health conscious present generation. Many of minor fruits remained unexploited due to lack of awareness of market demand and knowledge of value addition. There are immense potentialities of preparation of high nutritive value products from these crops through processing and value addition such as jam, jelly, squashes, dried fruits, pulp etc.. Among the different indigenous minor fruits viz., Kordoi (*Averrhoa carambola* Linn.) Amlakhi (*Phyllanthus emblica* Linn.) and Bael (*Aegle marmelos* Correa) have high potential for value addition. Thus, value addition in minor fruits could be one of the appropriate options to enhance farmer's income.

**Index Terms-** Minor, Indigenous, Fruit, Income

## I. INTRODUCTION

The north eastern region of India is rich in diversity of minor fruits. Minor fruits play a vital role in rural areas by providing nutritional supplement and generating additional income to the poor people. Indigenous fruits are rich source of mineral, vitamins, fibers which provides health benefits to rural people. Minor fruits also have cultural importance (Arora, 1998). Minor fruits are not extensively cultivated and their consumption and trade is limited. These fruits to some extent help in fulfilling the demand of natural, nutritious, delicately flavored food of high medicinal value. In present day situation consumers are becoming more conscious about the health and nutritional aspect of the food and have tendency to avoid chemical and synthetic foods. The minor fruits like aonla, bael, carambola etc. provide livelihood to the poor people and play vital role in defeating malnutrition (Gajanana *et al*, 2010).

In NE India, minor fruits have a very big role in overall fruit production. There are various number of edible species of minor fruits are available in NE India. These fruits are mainly wild in nature though some fruits are recommended for commercial cultivation. The land holding pattern of NE India in general reveals that nearly 90% of the farmers are small and marginal;

hence, the minor crops are ideal for cultivation because of their low input requirement, less production cost, higher nutritive value and high yield

Fruit processing for value addition helps to ensure better economic condition of the growers. It can help to generate self employment for small and poor farmers and could be easiest and promising alternatives. Generally fruits are perishable in nature and there is huge post harvest losses occurred in their season time in case of minor fruits. Processing of these fruits is the main pathway through which these losses can be minimized. There is great scope for processing and value addition to the minor fruits into various products like jam, jelly, preserve, candy, confectionery, pickle, fruit drinks, dried products etc.

## II. {PROSPECT OF PROCESSING FOR VALUE ADDITION:

Minor fruits are rich in vitamins, minerals and dietary fibre and therefore, are essential ingredients of healthy diet. These fruits also have very good medicinal properties. NE India has a very long list of minor fruits having high potentiality of processing to high nutritive value products. Growers can get fair returns through value addition and it helps them to improve their economic condition and can solve the problem of unemployment during off season of agricultural sector. So, there is huge prospect of processing of minor fruits of the region to value added product like jam, jelly, squash, pickle, candy etc. Processing methods developed by some author for a few minor fruits of NE India are explained below.

### 2.1. Kordoi (*Averrhoa carambola* Linn.):

The fruit of **Kordoi** (*Averrhoa carambola* Linn.) is a rich source of reducing sugars, ascorbic acid, oxalic acids and minerals such as K, Ca, Mg and P. The star sections of the fruits are used in salads and on cakes. They are also used for preparing juice, preserves, jam, jelly and pickles. The juice of carambola fruit has good medicinal property against jaundice disease (Singh *et al*, 2006). Carambola fruits are packed with many nutrients which are essential for the daily upkeep of the body, nevertheless, they are only available when they are in season and because of ripening can get spoiled quickly (Joy & Abraham, 2013).

#### 2.1.1 Kordoi Product:

**Kordoi** (*Averrhoa carambola* Linn.) fruits are highly perishable items which need processing to make it durable. The

shelf life of kordoi is one week depending on temperature and humidity. Once ripe it should be eaten within two or three days (Bastin, 2004).

Kordoi fruits are processed into numbers of food products like Jam, jelly, nectar, Squash etc. (shinde VP 2016, Darkwar I *et.al.* 2016). Process flow chart of various carambola products are given in Fig: 1 & Fig: 2

## 2.2 Amlakhi (*Phyllanthus emblica* Linn.) :

Amlakhi or aonla fruit is highly nutritive with a great medicinal use and the richest source of [vitamin C](#). Chauhan *et.al.* stated that 100 gm pulp of amlakhi contains 500-1500 mg of [ascorbic acid](#). This is much more than the [vitamin C](#) content of guava, citrus and tomato fruits. The fruit juice contains nearly 20 times as much [vitamin C](#) as in orange juice (Shankar 1969). Its other constituents are phenols and tannins containing gallic acid, elegendic acid and glucose which prevent oxidation of [vitamin C](#). Fresh aonla juice is used for the treatment of several ailments like tuberculosis of lungs, asthma, bronchitis, scurvy, diabetes, anemia, weakness of memory, cancer, tension, influenza, cold, loss and grayness of hair etc. The consumers do not prefer this fruit in fresh form due to high acidic and astringent nature. Various ayurvedic products like Chayvanprash, Triphala, etc. are prepared from amlakhi.

### 2.2.1 Amlakhi Product:

The post harvest losses in aonla vary from 30% to 40% due to its perishable nature, which reduces the market value (V T Kore *et.al.* 2013). Value addition through processing would be the only effective tool for economic utilization of increased production of aonla in the future. Processing not only reduces the post harvest losses but also provides higher return to the growers. A number of products such as preserve, jam, jelly, candy, pickle RTS beverage, dried powder etc (Tandon *et.al.* 2003, Bhattacharyya *et.al.* 2011). Process flow chart of aonla products are given in Fig:3 and Fig: 4

## 2.3 Bael (*Aegle marmelos* Correa):

Bael fruit is an indigenous fruit of India belonging to the Rutaceae family. This is generally considered as a sacred tree by the Hindus. Bael fruit is truly popular to combat constipation. Its medicinal properties have been described in the ancient medical treatises in Sanskrit. The unripe bael fruit are used for pharmaceutical use (Hema and Lalitha Kumara, 1999, Patnayak and Mahapatra, 2008). The ripe fruit is good for treatment of dyspepsia (Parichha, 2004, Chowdhury *et.al.* 2008).

### 2.3.1 Bael fruit products:

Bael fruit can be processed to value added product like squash, fruit pulp, RTS juice, Fruit powder, Jam, Toffee etc. (Singh A.K. and Chaurasia A.K. 2014). Process flow chart of bael product given in Fig: 5 & Fig:6



*Fig1: Flow chart of carambola jam production.  
Source:Darkwar et. Al. 2016*

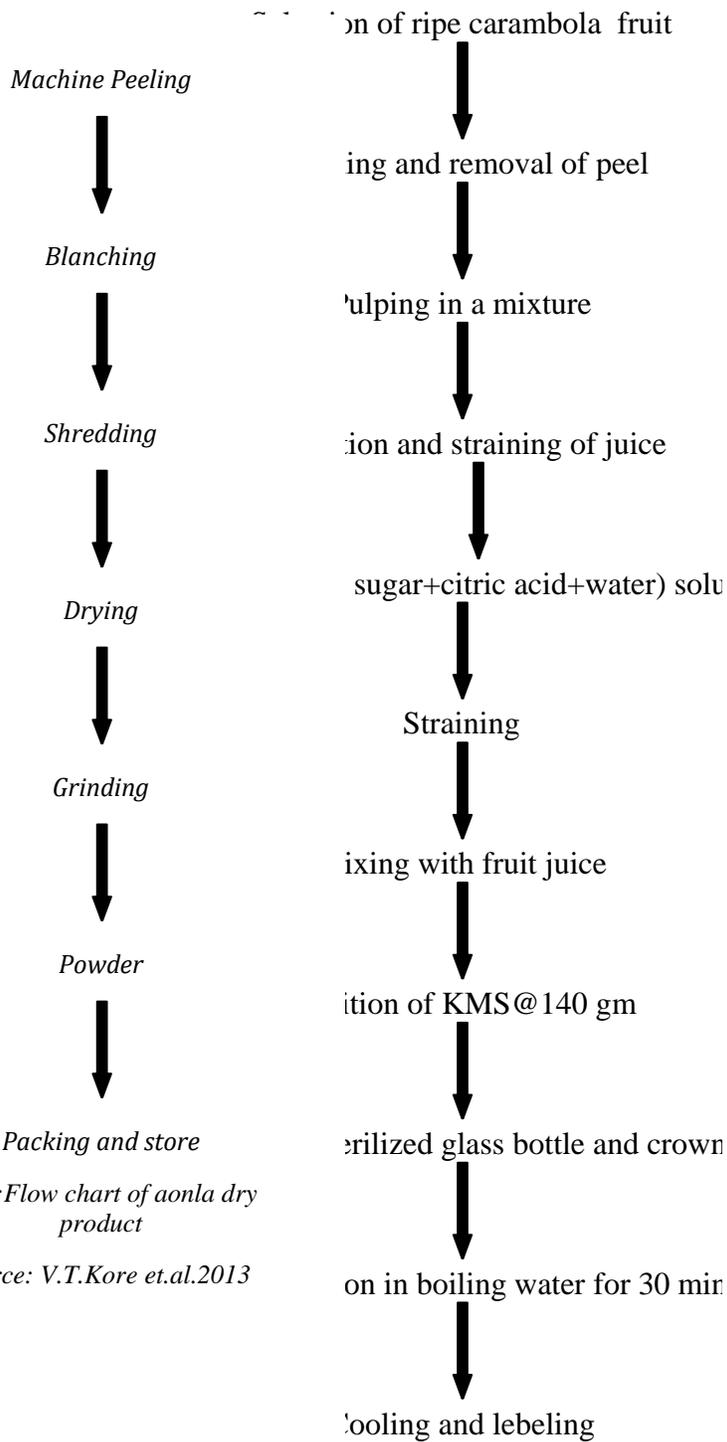


Fig3:Flow chart of aonla dry product

Source: V.T.Kore et.al.2013

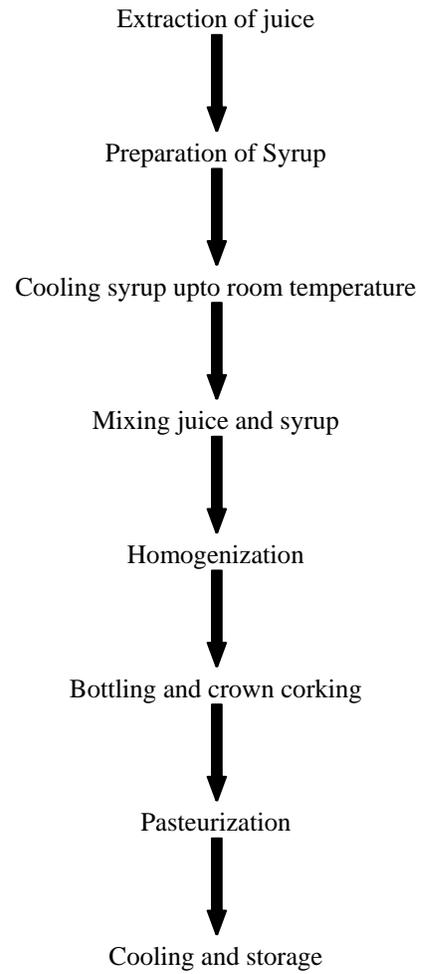


Fig4: Flow chart of RTS aonla Juice

Source: V.T.Kore et.al.2013

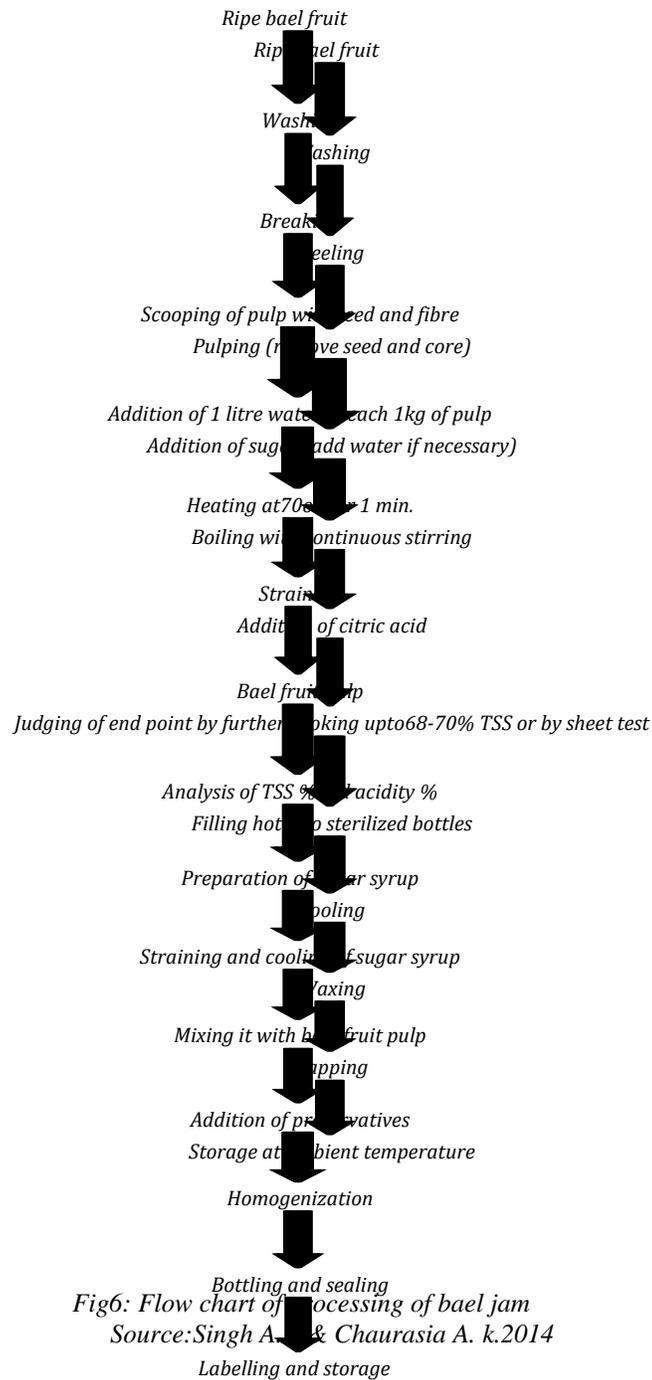


Fig5: Flow chart of processing of bael squash  
Source: Singh A.K. & Chaurasia A. K. 2014

### III. CONCLUSION

Minor fruits has vital role in the nutrition of people in rural and tribal communities. Minor fruits are excellent source of vitamins, carbohydrate, protein, fibers and minerals and enriched with medicinal value. Minor fruits can be cultivated in wastelands with very less care. Therefore, it is important to recommend for commercial cultivation of minor fruits like aonla, carambolla, bael, etc. to maximize their utilization. Now a day, the demand from new generation for nutritious, delicious and attractive food product is at peak. The potentialities of value added products through processing from some minor fruits are not exploited in the NE India. Excessive production of fruits produced during a season result in glut in the markets and leads to huge post harvest losses. However, various efforts have been made by some researcher in the globe for the development of processing technology for value addition of minor fruits. It will reduces the post harvest losses during the season and farming community will be able to get more income as it minimizes the wastage and due to higher price of value added products in present scenario.

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# A Fundamental Analysis to Plantation Industry Valuation in Indonesia

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**Abstract** - The purpose of this study was to determine the effect of macroeconomic fundamental factors and corporate fundamental factors on the value of the company in the plantation subsector which was listed on the Indonesia Stock Exchange (IDX) in 2014-2018. The number of samples in this study was 10 companies for 5 years and produced with purposive sampling method. This study used panel data regression regression with random effect model. Companies values variable was represented by Price Book Value (PBV). The macroeconomic fundamental factors were consist of inflation rate, exchange rate, and interest rate. While the company fundamental factors consisting of profitability and leverage. The results of this study showed that exchange rate, inflation rate, profitability and leverage had at significant effects on the value of the company, but the interest rate did not significantly effect on value.

**Index Terms** – Firm value, Random effect model, Price book value, Fundamental analysis

## I. Introduction

In Indonesia, there are many areas that have the potential for the development of the plantation sector. This is caused by ecological factors that are good for cultivating plantations. Generally plantation crops are very suitable to be planted in tropical and subtropical regions. Therefore, several types of plantation commodities are developing in Indonesia, including oil palm, tea, rubber, cocoa, sugar cane, quinine, and so forth. Plantation industry is the strength and support of the national economy. In 2016, the plantation industry contributed IDR 429 trillion to the national Gross Domestic Product (GDP). Revenue from the plantation sector has exceeded the oil and gas (oil and gas) sector, whose value is only Rp 365 trillion. Of 127 plantation commodities, only 15 commodities produce foreign exchange. Of the 15 commodities, the largest contribution came from oil palm, which reached Rp. 260 trillion.

From 2012 to 2014, plantation sub-sector companies experienced a decrease in net profit, which was one of the reasons, namely general expenses, sales expenses, funding costs and other expenses, which were followed by falling sales prices in each yield from the estate sub-sector. This decline in net profit occurred in almost all listed companies on the Indonesia Stock Exchange (IDX). For example, PT Sampoerna Agro Tbk (SGRO), whose profit fell by 64.20% from Rp336.29 billion in 2012 to Rp120.38 billion in 2013. The same thing happened to PT Tunas Baru Lampung Tbk (TBLA), a decrease Profits occurred by 64.85%, from Rp244.24 billion in 2012, plummeting to Rp85.84 billion in 2013. Likewise what happened to PT BW Plantation Tbk (BWPT) whose net profit fell 30.66% from Rp262.18 billion in 2012 to Rp181.78 billion in 2013.

At the end of April and the beginning of May 2017, many stocks are consolidating prices. Either the stocks that went up high then went down, or conversely the stocks that went down then went up. One of the causes is the financial statements for the first quarter of 2017 which indeed occur at the end of April and early May each year. In 2017 the plantation sector was the worst performing sector on the Indonesia Stock Exchange. This sector still recorded a decrease of 6.34% since the beginning of the year. Compare with the Composite Stock Price Index (CSPI) which rose 12.28% in the same period. However, the plantation sector was still challenging due to crude palm oil (CPO) prices that have the potential to rise and Indonesia still the main exporter of CPO.

Until 2018, there were 16 companies engaged in the plantation sub-sector and their derivative products listed on the Indonesia Stock Exchange (IDX). Stock market performance is a reflection of general economic and industrial conditions. Likewise, the performance of plantation-based companies in the plantation sub-sector should also be reflected in the share prices of plantation-based companies listed on the Indonesia Stock Exchange (IDX).

The capital market is an alternative funding for developing plantation land in Indonesia, because through the capital market, funds can be obtained in large amounts compared to banks. For investors themselves, the capital market aside from IDXng a vehicle for investment is also diversification. Each investor can choose a variety of existing investments, where each type of investment has its own characteristics in terms of return and risk. The capital market has also brought positive benefits to the development of the national economy in which the government sector and the private sector are the spearhead of the formation of the national economy, to increase the rate of growth in all fields and encourage companies to further develop in accordance with their respective businesses.

Besides the capital market developments described above, investment in the public sector has a high enough risk, therefore investments made must be based on rational considerations after previously obtaining various information that is very necessary

for decision making, investors can only determine what level of profit (expected return) desired and how far the possibility of actual results will deviate from the expected results.

According to Herlianto (2013: 23) the main purpose of investment for investors is to maximize returns, without forgetting the risk factors that must be faced. Return is one of the factors that motivates investors to invest and is also a reward for the courage of investors in taking risks on these investments

The analysis technique commonly used by investors is ratio analysis technique. Ratio analysis is done by comparing certain items in the balance sheet or individual income statement or a combination of both reports. From the analysis of the ratio will produce several financial ratios of companies that are useful in making investment decisions. Financial ratios are broadly grouped into five namely liquidity ratios, activity ratios, profitability ratios, solvency ratios (leverage) and market ratios (Robert, 1997: 18).

The value of a company shows the value of inclusion in the company and reflects the value of the company in the eyes of the community. if the stocks price of a company is high then the value of the company is also high and vice versa. High and low stock prices of a company is influenced by many factors such as the company's financial performance, demand and supply, interest rates, risk levels, inflation rates, government policies, macroeconomics, politics and security of a country.

Several factors of analysis that can affect the value of the company include fundamental analysis, both social-economic and political. Although there are many other analyzes that psychologically affect market power, fundamental analysis is the main factor for the market to determine the company's market price. Because fundamental analysis provides a clear picture that is an analysis of the achievements of company management in managing the company that is its responsibility.

Thus, the need for complete information that can be analyzed how the actual condition of the business analysis used can be various kinds of analysis including financial ratios. This ratio is very important to do an analysis of the company's financial condition. One of the financial ratios that can be used is the profitability ratio with the Return on Asset (ROA) approach and the Leverage ratio with the Debt to Equity Ratio approach.

An investor in conducting stock trading activities in a country must pay attention to the monetary situation and movement of macroeconomic variables such as interest rates, exchange rates and inflation. Economic conditions and the ups and downs of macro variables in a country can affect stock prices, including in the plantation sector. Bank Indonesia as the central bank is obliged to implement monetary policy, namely by controlling economic stability so as not to experience inflation or deflation. The exchange rate is the price in the exchange between two different types of currencies. There will be a comparison of the value or price between the two currencies.

There are several theories and also previous research that can be used to predict the effect of Profitability, Leverage, Inflation, Rupiah Exchange Rates and Interest Rates. According to the results of research (Hamidah, Hartini, and Mardiyati 2015) and (Marlina 2013) that Leverage proxied by Debt to Equity Ratio (DER) has a positive and significant effect on Company Value, While different results obtained by (Agustina and Ardiansari 2015) that Debt to Equity Ratio (DER) has a negative and significant effect on firm value. Another study conducted by (Suryantini and Arsawan 2014) produced inflation and the exchange rate had a positive and significant effect on firm value, while different results were obtained by (Sugiarto and Santosa 2017) resulted in the exchange rate of the rupiah having a negative and significant effect on firm value. Other research conducted by (Fuad and Wandari 2018) produced external factors consisting of interest rates, inflation and exchange rates that did not have a significant effect on firm value. Research conducted by (Sugiarto and Santosa 2017) and (Abidin 2017) produces interest rates that have a positive and significant effect on firm value while different results are obtained by (Idamiharti 2017) and (Noerirawan and Muid 2019) that interest rates have a negative and significant effect on The value of the company.

Based on the phenomena and some of the results of previous studies described above, researchers are interested in conducting research to analyze the influence of fundamental factors to plantation firms value, listed on the Indonesia Stock Exchange at 2014 - 2018. This study aims to determine the effect of each of the variables above.

## II. Literature Review

### 1. Signaling Theory

Signaling theory was developed by (Ross 1977) which states that information about high and stable profitability published by the company as an announcement will give a signal to investors in making investment decisions. Basically every investor who invests in the capital market wants to get a rate of return. If the higher the profit obtained by the company, it will indirectly cause the return obtained by investors is also high. Signaling Theory explains why companies have the urge to provide financial statement information to external parties. Company encouragement to provide information because there is information asymmetry between the company and outsiders because the company knows more about the company's profile and prospects to come than outside parties (investors and creditors) (Widyawati 2016).

### 2. Trade-Off Theory

In a study conducted by (Ogolmagai 2013), the trade-off theory explained that an increase in the debt ratio in the capital structure would increase the value of the company. Likewise with the opinion (Kusumajaya 2011) which states that the trade-off theory can predict a positive relationship between capital structure and firm value with the assumption that tax profits are still greater than the cost of financial pressures and agency costs. If the position of the capital structure is below the optimal point, each additional debt will increase the value of the company, but after passing the optimal point, increasing the use of debt can reduce the value of the company. The optimal point can be obtained by a balance between the benefits of the tax shield with financial distress and agency costs, due to the use of leverage, or a trade-off between benefits and costs (Myers 1977).

### 3. Agency Theory

Agency theory is the formulation of the problem that explains the conflict between the company owner (principal) and the company manager/agent (Sisharini 2013). Jensen and Meckling (1976) state that there are conflicts of interest that occur because of differences in agency relationships of each party. The manager of the company certainly has an interest in maximizing his own welfare. On the other hand, managers also have an obligation in carrying out their duties to maximize the welfare of the owners of the company (principal) both in the short and long term. The difference in objectives and the separation between ownership and management of the company causes managers to act according to their own desires without regard to the interests of the principal.

(Sisharini 2013) explained that the objectives of company managers often conflict with increasing shareholder prosperity through increasing company value. This creates a conflict of interest between managers and shareholders. To minimize these conflicts of interest, companies can implement a supervisory mechanism that can align related interests.

#### **4. Fisher Effect Theory**

(Sugiarto and Santosa 2017) explains the Fisher effect. Based on the principle of monetary neutrality, an increase in the rate of money growth will increase the rate of inflation but does not have an impact on the real variable. An important application of this principle focuses on the effect of money on the interest rate. The interest rate is an important variable for macroeconomic economists to understand because it connects the current economy and the future economy through its effects on savings and investment.

(Cecchetti and Schoenholtz 2015) in his book entitled "Money Banking and Financial Market said the central bank uses monetary policy to stabilize economic growth and inflation. An expansionary or accommodative policy is through a decrease in the interest rate that increases economic growth and inflation, on the contrary a strict or restrictive policy is to raise the short-term interest rate which will reduce economic growth and inflation.

#### **5. The value of the company**

The goal to be achieved by a company is not just to maximize the profits that can be obtained, but the main thing is how to maximize the value of the company. Company value is the main indicator considered by investors in the investment decision-making process in a company (Fuad and Wandari 2018). The value of a company for a company listed on the capital market is reflected by its share price, where the higher the share price, the higher the value of the company concerned. Besides based on the nominal share price per share, the company's value can also be measured using a number of valuation ratios. One of the valuation ratios of the company's value is the Price to Book Value (PBV), which is the ratio between the market price per share and book value per share. PBV illustrates how much the market appreciates the book value of company shares, with the criterion that the greater the PBV value shows the higher market confidence in the company concerned (Suryantini and Arsawan 2014). Thus, the greater the PBV value states the higher level of market confidence in the growth prospects of the company, thereby further strengthening the confidence of investors to invest their money in the company which pushes up the company's stock price, and ultimately increases the value of the company concerned.

#### **6. Profitability**

Return on Assets shows the effectiveness of the company to utilize its assets as well as possible so as to create profitability for the company. Profitability can show how the performance of the company. Referring to the signal theory, an increase in company profitability can be a positive signal used by investors to see the prospects of the company. With increased profitability and good prospects in the future, this can have an impact on increasing the value of the company in the eyes of investors.

In this study the ratio used is return on assets (ROA). This ratio Shows the company's ability to use all assets owned to generate profits after tax. A high ROA value will provide a positive signal for investors that the company can produce in favorable conditions. This is an attraction for investors to own company shares and will increase share prices so that the value of the company will also increase. Then, there will be a positive relationship between profitability and stock prices where the high share price will affect the value of the company. There are several previous studies that can be used to predict the effect of profitability on firm value, according to the results of the study (Widyawati 2016) profitability has a positive and significant effect on firm value.

#### **7. Leverage**

Leverage is a ratio that calculates how far the funds provided by creditors, as well as a ratio that compares the total debt to the overall assets of the company, therefore if investors see a company with high assets but also the risk of leverage is high, it will think twice about invest in the company. Because it is feared that these high assets can be obtained from debt which will increase investment risk if the company cannot pay off its obligations in a timely manner (Widyawati 2016).

Leverage is often symbolized by the debt to equity ratio (DER) which reflects the ratio between total debt and its own capital. This ratio illustrates the proportion of funds sourced from debt and shows the safe debt limit for the company. The greater leverage shows the greater investment risk. Therefore the company management strives to maintain and manage leverage always in a stable position, to reduce the risks that may be experienced by both investors and company management, so that in the eyes of investors the company's value will also increase. There are several previous studies that can be used to predict the effect of Leverage on Company Value, according to research results (Hamidah, Hartini, and Mardiyati 2015) and (Marlina 2013) that Leverage has a positive and significant effect on Company Value.

#### **8. Inflation**

Inflation is a condition of rising prices of goods in general and continuously, which is caused by disruption of the balance between the flow of goods and the flow of money. When there is high inflation, it can push up the price of raw materials or

operational costs incurred, which in turn erodes the value of the profits obtained by the company (Suryantini & Arsawan, 2014). The decline in the value of earnings due to the impact of inflation can lead to a negative assessment by the market that the company in question does not have good financial performance, subsequently reduces investor interest in investing, and ultimately results in a decline in the value of the company (Fuad and Wandari 2018).

In this study, the inflation rate uses the Consumer Price Index (CPI) data from the year-end inflation report published by Bank Indonesia. The CPI is a measure of the average price of goods and services by households, and is an indicator used by the government to measure inflation in Indonesia. Research conducted by (Suryantini and Arsawan 2014) produces inflation and the exchange rate has a positive and significant effect on company value.

### 9. Exchange Rates

The exchange rate (exchange rate) is the price of one currency against another, or is the price of one unit of foreign currency in the domestic currency or the price of one unit of the domestic currency in foreign currency (Levi, 2009; Hady, 2016). The degree of stability of a country's currency exchange rate is considered to show the economic situation of the country concerned, and can affect the confidence of investors, especially those from abroad to invest their capital in the country. The strengthening of the Rupiah (or IDR) exchange rate against foreign currencies will provide a positive signal for the development of the Indonesian economy; or vice versa, a weakening IDR value could signal a deteriorating national economy (Tandelilin, 2010; Mishkin, 2008). Research conducted by (Suryantini and Arsawan 2014) produced inflation and the exchange rate had a positive and significant effect on firm value, while different results obtained by (Sugiarto and Santosa 2017) resulted in the rupiah exchange rate having a negative and significant effect on firm value. The exchange rate did not influence the stock price (Pandelake and Farida, 2017).

### 10. Interest rate

The interest rate is the cost of the loan or the price to be paid on the loan, or is the price of the resources used by the recipient of the loan (debtor) to the lender (creditor). (Noerirawan&Muid, 2012). Specifically, the transaction process that occurs within the banking sector cannot be separated from this element of interest rates, both related to savings products and loans that generate interest-based income for banks (Mishkin, 2008). In this study, interest rates are represented using the BI Rate or interest rates from year-end reports published by Bank Indonesia. BI Rate is the interest rate determined by Bank Indonesia on a quarterly basis as a signaling for other interest rates (Mishkin, 2008). In a sense, all monetary and banking quantities refer to this BI Rate including the general banking interest rate. The BI Rate is the benchmark interest rate or basis for banks in Indonesia in setting the interest rates for savings products and loans that they will offer to their prospective customers.

The condition of interest rates is also an external condition that can affect the company. Rising interest rates will encourage people to save, and lazy to invest in the real sector. An increase in the interest rate will also be borne by investors, in the form of an increase in interest costs for the company. The public does not want to risk investing in high costs, as a result the investment becomes undeveloped. Many companies have difficulty maintaining their lives, and this causes the company's performance to decline. The decline in company performance can result in a decrease in stock prices, which means the value of the company will also decline. Companies that use credit or debt in their funding will have an impact on changes in interest rates that occur and of course this will also affect the value of the company. In accordance with research conducted by Noerirawan 2012) that interest rates have a negative and significant effect on firm value.

## III. Research Method

This type of research is a causal conclusive research that aims to obtain evidence of a causal relationship between Profitability, Leverage, Inflation, Rupiah Exchange Rates, and Interest Rates on Company Value in plantation sub-sector companies listed on the Indonesia Stock Exchange during 2014-2018. The study uses quantitative research data with data on financial statements of plantation sub-sector companies and it was obtained from Indonesia Stock Exchange, Bank of Indonesia and the Central Bureau of Statistics.

The population is plantation sector companies listed on the Indonesia Stock Exchange (IDX) for 5 years during 2014 to 2018. The sample selection was carried out using the purposive sampling method and selected for 6 companies. Model analysis used multiple linier regression with panel data. The model is  $Y_{it} = \beta_0 + \beta_1 X_{it} + \dots + \beta_t X_{it} + \mu_{it}$ , where  $Y_{it}$  is dependend variable representing companies values. This study used price book value for firm value (Farida et al, 2019). Independent variables are represented for profitability, leverage, the inflation rate, the exchange rate and the interest rate.

## IV. Result and Discussion

### 1. Model Selection or Suitability Test

There are 3 kinds of approaches in panel data regression analysis. Therefore, we need to choose which approach is the best that we will use to predict the regression model from the research conducted. And here are some tests conducted to get the best approach in panel data regression analysis:

- a. The F statistical test used to choose between the Common Effect Model or Fixed Effect Model is called the Chow Test (Chow - Test).
- b. The F statistical test used to choose between the Fixed Effect Model and the Random Effect Model is called the Hausman Test.

c. The statistical test F used to choose between the Common Effect Model and the Random Effect Model is called the Lagrange - Muptiplier Test (Lagrange - Multiplier Test).

The result of model selection is in table 1 as follows;

Table 1  
 Model Selection Test Results

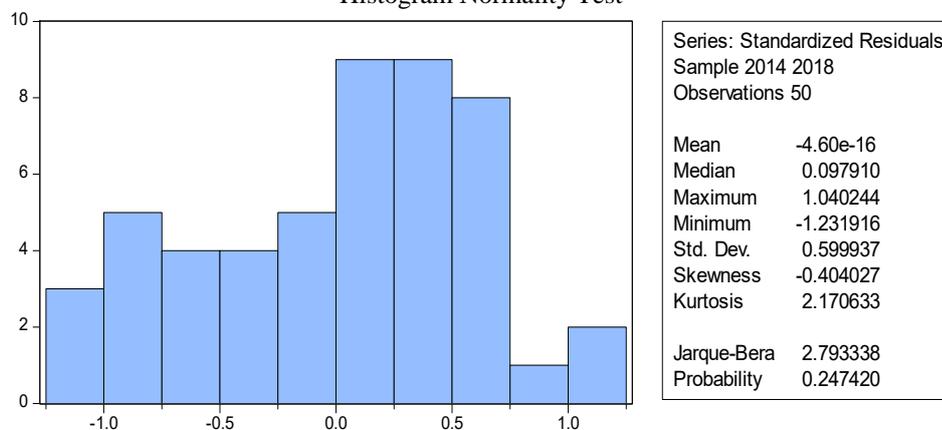
Model Selection Test	Test results	Selected Model
Chow Test H0 : Common Effect Model Ha : Fixed Effect Model	Cross-section probability F is smaller than alpha (0.0000 <0.05), then H0 is rejected and Ha is accepted	Fixed Effect Model
Hausman Test H0 : Random Effect Model Ha : Fixed Effect Model	$\chi^2_{\text{calculate}} = 0.000000$ with p-value (Prob value) greater than alpha (1.0000 > 0.05) then Ha is rejected and H0 is accepted	Random Effect Model
Lagrange Multiplier Test H0 : Common Effect Model Ha : Random Effect Model	Pagan Breusch cross section 27.71810 with p-value (Prob value) smaller than alpha (0.0000 <0.05) then Ha is accepted	Random Effect Model

Based on the results of the three test estimation models above, the Random Effect Model was selected on two tests, it can be determined that the best panel data regression model is the Random Effect Model (REM) to determine the effect of Profitability, Leverage, Inflation Rate, Rupiah Exchange Rates and Interest Rates on Firm Value of the Plantation Sub Sector listed on the Indonesia Stock Exchange for the 2014-2018 Period.

**2. Classic assumption test**

In the multiple linear regression model must meet several tests of classical assumptions, namely data normality test, data multicollinearity test, data autocorrelation test and data heterocedasticity test. If the assumptions are fulfilled, the regression equation will be accurate and good (Sofiamira and Haryono, 2017). The normality test aims to test whether in the regression model, the disruptive variable or residual has a normal distribution or not. Normality Test is carried out with the Jarque-fallow test. Decisions are normally distributed whether or not residuals are simply by comparing the JB Probability (Jarque-Bera) count with an alpha level of 0.05 (5%). If the Probability of JB counts > 0.05, it can be concluded that the residuals are normally distributed, which means that the classical assumptions about normality have been fulfilled in table 2.

Table 2  
 Histogram Normality Test



In this study the Jarque-Bera probability value is 0.247420 > 0.05. Then it can be concluded that the data is normally distributed which means the classic assumptions about normalcy have been fulfilled.

Multicollinearity testing is carried out to test whether there is a correlation between independent variables. A good model is if there is no strong correlation between the independent variables. Multicollinearity Test with Eviews can be done by looking at the

correlation matrix table, if the correlation matrix table does not have a value of more than (>) 0.90, it can be concluded that there is no multicollinearity in the model. So that the linear regression model is free from the presence of multicollinearity.

Table 3  
 Variable Independent Correlation Matrix

	ROA	DER	INFLASI	KURS	SB
ROA	1.000000	-0.222111	0.268975	0.014618	0.140120
DER	-0.222111	1.000000	-0.094725	0.082385	-0.079745
INFLASI	0.268975	-0.094725	1.000000	-0.148203	0.549978
KURS	0.014618	0.082385	-0.148203	1.000000	0.329278
SB	0.140120	-0.079745	0.549978	0.329278	1.000000

In the correlation matrix table between the independent variables (Independent) in this study there was no value > 0.90. So it can be concluded that there is no multicollinearity in the model. So the classic assumptions about the absence of multicollinearity have been fulfilled. The next assumption is for heteroscedasticity test is a test to see whether there is an inequality of the variance from one residual to the other observations. Regression models that meet the requirements are there are similarities from the residuals of one observation to another that is fixed or called homoscedasticity. A good regression model is homoscedasticity or heteroscedasticity does not occur. The decision whether or not heteroscedasticity occurs in the linear regression model with Eviews is to look at the value of Obs\*R-square probability. If the probability of Obs\*R-square is smaller than (<) alpha 0.05 (5%), H0 is rejected, which means heteroscedasticity occurs. Meanwhile, if the Obs \* R-square probability value is greater than (>) alpha 0.05 (5%), H0 is accepted, which means that there is no heteroscedasticity. So it can be concluded that the linear regression model is free from the presence of heteroscedasticity.

Table 4  
 Heteroscedasticity Test

Heteroskedasticity Test: White

F-statistic	1.182104	Prob. F(5,44)	0.3333
Obs*R-squared	5.921117	Prob. Chi-Square(5)	0.3140
Scaled explained SS	4.412890	Prob. Chi-Square(5)	0.4916

In table 4, the probability of Obs\*Rsquared is 0.3140. This shows that the Obs \*Rsquared probability value is greater than 0.05, it can be concluded that there is no heteroscedasticity in the research data. So the classic assumption test about the absence of heteroscedasticity in the linear regression model has been fulfilled.

The last classic assumption test is autocorrelation. The autocorrelation test aims to test whether in a linear regression model there is a correlation between interruption errors in the previous period. If there is a correlation, there is an autocorrelation problem. In detecting the presence or absence of autocorrelation can be done with the Breusch-Godfrey Serial Correlation LM Test on Eviews program, by looking at the probability value of Obs\*R-square. If the probability of Obs\*R-square is smaller than (<) alpha 0.05 (5%) then H0 is rejected, which means that Autocorrelation occurs. Meanwhile, if the Obs\*R-square probability value is greater than (>) alpha 0.05 (5%), H0 is accepted, which means that there is no autocorrelation. So it can be concluded that the linear regression model is free from the existence of autocorrelation.

Table 5  
 Autocorrelation Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.869465	Prob. F(2,41)	0.1671
Obs*R-squared	4.095036	Prob. Chi-Square(2)	0.1291

In table 5, the probability of Obs \* Rsquared is 0.1291. This shows that the Obs\*Rsquared probability value is greater than 0.05, it can be concluded that there is no Autocorrelation in the research data. So the classic assumption test about the absence of autocorrelation in the linear regression model has been fulfilled.

### 3. Multiple Linier Regression Analysis

After going through the classical assumption test, the regression model is worthy used as a measurement tool to detect the relationship between proposed variables, namely the independent variable Profitability, Leverage, Inflation Rate, Rupiah Exchange Rates, Interest Rates and the Company's dependent variable. The following is a random effect model that has been tested classic assumptions.

Table 6  
 Random Effect Model

Dependent Variable: PBV?  
 Method: Pooled EGLS (Cross-section random effects)  
 Date: 02/04/20 Time: 03:15  
 Sample: 2014 2018  
 Included observations: 5  
 Cross-sections included: 10  
 Total pool (balanced) observations: 50  
 Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.029498	0.263654	-3.904734	0.0003
ROA?	1.582217	0.651022	2.430357	0.0192
DER?	0.237448	0.079831	2.974378	0.0048
INFLASI?	9.417736	2.453347	3.838730	0.0004
KURS?	-2.008725	0.906667	-2.215505	0.0319
SB?	6.019672	4.107222	1.465631	0.1499
Random Effects (Cross)				
_AALI—C	0.662522			
_BWPT—C	0.203371			
_GZCO—C	-0.965440			
_JAWA—C	-0.482803			
_LSIP—C	0.431089			
_PALM—C	0.455394			
_SGRO—C	0.132203			
_SIMP—C	-0.679432			
_SMAR—C	0.215630			
_TBLA—C	0.027465			

Effects Specification		
	S.D.	Rho
Cross-section random	0.378065	0.6868
Idiosyncratic random	0.255312	0.3132

Weighted Statistics			
R-squared	0.550202	Mean dependent var	0.001521
Adjusted R-squared	0.499088	S.D. dependent var	0.406462
S.E. of regression	0.287674	Sum squared resid	3.641274
F-statistic	10.76433	Durbin-Watson stat	1.536325
Prob(F-statistic)	0.000001		

Unweighted Statistics			
R-squared	0.269514	Mean dependent var	0.005261
Sum squared resid	17.63629	Durbin-Watson stat	0.317197

Then the regression equation model can be written as follows

$$PBV = -1.029498 + 1.582217*ROA + 0.237448*DER + 9.417736*INFLASI - 2.008725*KURS + 6.019672*SB$$

Estimation results can be interpreted as follows:

- From the regression equation above it can be explained that the constant or intercept is equal to -1.029498 meaning that when the independent variables are zero, then the Company Value (PBV) is equal to -1.029498
- The value of the Profitability regression coefficient (ROA) is 1.582217, which means there is a positive influence on the Profitability variable (ROA) on the Company Value variable (PBV) where each increase in Profitability (ROA) by 1% will increase the Company's Value (PBV) by 1.582217%. Assuming the other independent variables are fixed (ceteris paribus).
- Leverage regression coefficient value (DER) is 0.237448, which means there is a positive influence on the Leverage variable (DER) on the Company Value variable (PBV) where every Leverage increase (DER) by 1% will increase the Company's Value (PBV) by 0.237448%. Assuming the other independent variables are fixed (ceteris paribus).

- d. The value of the inflation rate regression coefficient (INFLATION) is 9,417736 which means that there is a positive influence on the Inflation Rate variable (INFLATION) to the Company Value variable (PBV) where each increase in the Inflation Rate (INFLATION) by 1% will increase the Company's Value (PBV) by 9.417736 %. Assuming the other independent variables are fixed (ceteris paribus).
- e. The regression coefficient value of the Rupiah Exchange Rate (KURS) is - 2.008725, which means there is a negative influence of the Rupiah Exchange Rate variable (KURS) on the Company Value variable (PBV) where each increase in the Rupiah Exchange Rate (KURS) by 1% will reduce the Company's Value (1%) PBV of -2.008725%. Assuming the other independent variables are fixed (ceteris paribus).
- f. The interest rate regression coefficient (SB) value is 6,019672, which means that there is a positive influence on the Interest Rate variable (SB) on the Company Value variable (PBV) where every 1% increase in Interest Rate (SB) will increase the Company's Value (PBV) amounting to 6,019672%. Assuming the other independent variables are fixed (ceteris paribus).

**Partial Significance Test Parameters or Test T**

The testing criteria are as follows:

- H0 is accepted: If  $t_{count} < t_{table}$  or significance value (p-value) > 0.05
- Ha or H1, H2, H3, H4, H5 accepted: If  $t > t_{table}$  or significance value (p-value) < 0.05

To find the table, the researcher uses the real level  $\alpha = 5\%$ , or the level of confidence  $(1 - \alpha) = 95\%$ , because the greater the level of confidence the more accurate the results obtained. Here is a table of T test results that have been processed with Eviews:

Table 7  
T Test

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.029498	0.263654	-3.904734	0.0003
ROA?	1.582217	0.651022	2.430357	0.0192
DER?	0.237448	0.079831	2.974378	0.0048
INFLASI?	9.417736	2.453347	3.838730	0.0004
KURS?	-2.008725	0.906667	-2.215505	0.0319
SB?	6.019672	4.107222	1.465631	0.1499

**a. Effect of Profitability (X1) on Company Value (Y)**

The hypothesis to be tested is as follows:

- H0: There is no effect of profitability on company value.
- H1: There is an effect of profitability on company value.

From the results of data processing Eviews 9 with the REM model in table 6 the significance value of 0.0192 < 0.05 is obtained so that H0 is rejected and H1 is accepted, which means that the variable X1 namely Profitability (ROA) has a significant effect on the value of plantation subsector companies listed on the Indonesia Stock Exchange in the period 2014 - 2018. From the results of the regression equation above it can be seen that the regression coefficient for the profitability variable (ROA) has a positive value of 1.582217, meaning that the profitability variable (ROA) has a positive and significant effect on firm value (PBV). This means that increasing company profitability will increase company value and vice versa. The results of this study are in accordance with the signaling theory developed by Ross (1977) which states that information about high and stable profitability published by the company as an announcement will give a signal to investors in making investment decisions. Basically every investor who invests in the capital market wants to get a rate of return. If the higher the profit obtained by the company, it will indirectly cause the return obtained by investors is also high. This condition will provide a positive signal for investors in making investment decisions to buy shares. The results of this study are in line with the results of research conducted by (Bidhari, et al 2013), (Widyawati 2016) and (Vaeza and Hapsari 2015), which states that Profitability (ROA) has a positive and significant effect on Company Value.

**b. Effect of Leverage (X2) on Company Value (Y)**

The hypothesis to be tested is as follows:

- H0: There is no effect of Leverage on Company Value.
- H2: There is an effect of Leverage on Company Value.

From the results of data processing Eviews 9 with the REM model in table 6 obtained a significance value of 0.0048 < 0.05 so that H0 is rejected and H2 is accepted, which means that the variable X2 namely Leverage (DER) has a significant effect on the value of plantation subsector companies listed on the Indonesia Stock Exchange for the period 2014 - 2018. From the results of the regression equation above it can be seen that the regression coefficient for the Leverage variable is positive at 0.237448, meaning that the Leverage variable (DER) partially has a positive and significant effect on Company Value. This means that an increase in corporate leverage will increase the value of the company and vice versa. The results of this study support the trade-off theory (Myers 1977) which explains that increasing the ratio of debt to capital structure will increase the value of the company. Likewise with the opinion of Kusumajaya (2003) which states that the trade-off theory can predict a positive relationship between capital structure and firm value with the assumption that tax profits are still greater than the costs of financial pressures and agency costs.

If the position of the capital structure is below the optimal point, each additional debt will increase the value of the company, but after passing the optimal point, increasing the use of debt can reduce the value of the company. The results of this study are in line with the results of research conducted by (Marlina 2013) and (Vaeza and Hapsari 2015) which states that Leverage (DER) has a positive and significant effect on Company Value.

**c. Effect of Inflation Rate (X3) on Firm Value (Y)**

The hypothesis to be tested is as follows:

- H0: There is no effect of the Inflation Rate on Company Value.
- H3: There is an influence of Inflation Rate on Company Value.

From the results of the REM model in table 6 obtained a significance value of 0.0004 <0.05 so that H0 is rejected and H3 is accepted, which means the variable X3 namely Inflation Rate (INFLATION) has a significant effect on the value of plantation subsector companies listed on the Indonesia Stock Exchange in the period 2014 - 2018. The results of this study support the Fisher Effect Theory (Sugiarto and Santosa 2017) explaining the Fisher effect (Fisher Effect). Based on the principle of monetary neutrality, an increase in the rate of money growth will increase the rate of inflation but does not have an impact on the real variable. An important application of this principle focuses on the effect of money on the interest rate. The interest rate is an important variable for macroeconomic economists to understand because it connects the current economy and the future economy through its effects on savings and investment. From the results of the regression equation above it can be seen that the regression coefficient for the Inflation Rate variable is positive at 9.417736, meaning that the Inflation Rate variable partially has a positive and significant effect on Company Value. This means that increasing the level of inflation in a country will increase the value of the Company and vice versa. The results of this study are in line with the results of research conducted by (Suryantini and Arsawan 2014) which states that the level of inflation has a positive and significant effect on Company Value.

**d. Effect of Rupiah Exchange Rate (X4) on Company Value (Y)**

The hypothesis to be tested is as follows:

- H0: There is no effect of Rupiah Exchange Rate on Company Value.
- H4: There is an influence of Rupiah Exchange Rate on Company Value.

From the results of the REM model in table 6, it is obtained that the probability value of significance is 0.0319 <0.05 so H0 is rejected and H4 is accepted, which means that the variable X4, namely the Rupiah Exchange Rate (KURS) has a significant effect on the Value of Plantation Subsector Companies listed on the Indonesia Stock Exchange for the period of 2014 - 2018. From the research results above the regression equation shows that the regression coefficient for the variable Rupiah Exchange Rate is negative at -2.008725, meaning that the Rupiah Exchange Rate variable (KURS) partially has a negative and significant effect on Company Value. This is because companies in the plantation sector tend to export their plantation products more often abroad. The weakening of the rupiah against the US dollar would have a positive impact on the exporter due to exporters receive greater revenue. The results of this study are in line with the results of research conducted by (Sugiarto and Santosa 2017) as well as (Ogato, et al 2018) which states that exchange rates have a negative and significant effect on firm value.

**e. Effect of Interest Rates (X5) on Company Value (Y)**

The hypothesis to be tested is as follows:

- H0: There is no influence of the Interest Rate on the Value of the Company.
- H5: There is an interest rate effect on the value of the company.

In table 6, it is obtained the significance probability value of 0.1499 > 0.05 so that H0 is accepted and H5 is rejected, which means that the variable X5, namely the Interest Rate (SB), does not affect the value of plantation subsector companies listed on the Indonesia Stock Exchange in the period of 2014 - 2018. The results of this study are in line with the results of research conducted by (Faridah 2016) and (Hamidah, et al 2015), which states that the Interest Rate has no effect on Company Value.

**d. Test the Significance of Regression Parameters simultaneously or Test F**

The F statistical test aims to determine the effect of the independent variables together on the dependent variable by looking at the significance value F. The criteria for the F test are as follows:

1. If the significance value of significance <0.05 then H0 is rejected and Ha is accepted, which means that the independent variable simultaneously influences the dependent variable.
2. If the significance value of > 0.05 then H0 is accepted and Ha is rejected, which means that the independent variable simultaneously has no effect on the dependent variable.

Table 8  
 Test F  
 Weighted Statistics

R-squared	0.550202	Mean dependent var	0.001521
Adjusted R-squared	0.499088	S.D. dependent var	0.406462
S.E. of regression	0.287674	Sum squared resid	3.641274

F-statistic	10.76433	Durbin-Watson stat	1.536325
Prob(F-statistic)	0.000001		
Unweighted Statistics			
R-squared	0.269514	Mean dependent var	0.005261
Sum squared resid	17.63629	Durbin-Watson stat	0.317197

To find the F table, researchers used the real level  $\alpha = 5\%$ , or the level of confidence  $(1 - \alpha) = 95\%$ , because the greater the level of confidence the more accurate the results obtained. From the results of data processing for REM model in table 8 obtained a significance probability of  $0.000001 < 0.05$  so that  $H_0$  is rejected and  $H_6$  is accepted, which means the variable Profitability, Leverage, Inflation Rate, Rupiah Exchange Rates, and Interest Rates influence simultaneously (simultaneously) on Value of Plantation Subsector Companies that are listed on the Indonesia Stock Exchange for the period 2014 – 2018.

#### e. Determination Coefficient Analysis (R<sup>2</sup>)

Based on the results of data processing in table 8 this study produces a coefficient of determination (R-squared) of 0.550202, this shows together the contribution of the variable Profitability (ROA), Leverage (DER), Inflation Rate (INFLATION), Rupiah Exchange Rate (KURS) ), and Interest Rates (SB) that can explain the relationship with Company Value (PBV) in plantation sub-sector companies listed on the Indonesia Stock Exchange in the period 2014 - 2018 amounted to 55.0202%, while the remaining 44.9798% explained by others variables were not included in this study.

### V. Conclusion

Based on the results of research and discussion above, it can be concluded that partially profitability, leverage, inflation rate has a positive and significant effect on the company value of plantation sectors listed on the Indonesia Stock Exchange (IDX) for the period 2014 – 2018. Rupiah exchange rate partially has a negative and significant effect on the company value of the plantation sector listed on the Indonesia Stock Exchange (IDX) in 2014 – 2018. Only interest rate does not effect on the company value. The company that has the greatest sensitivity to Company Value (PBV) during the period 2014 - 2018 is showed in table 6 is PT Astra Agro Lestari Tbk (AALI) and the Company which has the least sensitivity to Company Value (PBV) during the period 2014 - 2018 is PT Gozco Plantations Tbk (GZCO).

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# The Structure Problem Solving Approach to Solve Product Quality Issue

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**Abstract-** This paper explores the contribution that can be made by Eight-step problem solving to deal with the problem of product quality degradation that causes customers to complain. Specifically analyzing the application of Eight-step problem solving in the woodworking industry which located in Central Java Indonesia. The research method used is through field observation, following Eight-step problem solving analysis (Toyota Model), preparing recommended actions and monitoring communication progress and results. The available literature lacks papers that explore preparation before implementing Eight-step problem solving, where Initial planning especially related to the selection and formation of team members of problem solving is needed to support this Eight-step problem solving approach. It is important to build the team which consisting of cross functional member. Empirical evidence adds to the existing literature on this problem by showing a structured Eight-step problem solving approach that significantly influences organizational performance in terms of improving product quality as customer need.

**Index Terms-** Problem solving, Product quality, Customer complaint, Problem, Quality.

## I. INTRODUCTION

The Eight-step problem solving are problem solving process tools which developed to solve problems. Focusing on the process stage, clarify the problem, find the root cause of the problem and set a standard to prevent recurring problems.

In this paper, we present a case of Eight-step problem solving application at woodworking industry which located in Central Java-Indonesia through the illustration of an overall Eight-step problem solving implementation to furnish an insight into the potential impact of Eight-step problem solving in the woodworking industry about improving product quality to avoid recurrence of customer complaints in the future.

## II. LITERATURE REVIEW

The implementation of the problem solving process varies between companies and or organizations. Some companies have adopted PPSP over the past decade, but they have failed to achieve success as achieved by Toyota (Liker, 2004).

The eight-step is effective because, it links methods to results by running trials to determine countermeasures (Marksberry et al, 2010). The main reason is that the 8 steps process should be applied as a systematic way of thinking instead of a template or a document that needs to be completed (Marksberry et al, 2010).

Toyota Manufacturing introduces a practical problem solving process (PPSP) as part of its TPS tool; PPSP is a systematic process for achieving a robust solution for differences and problems (Marksberry et al, 2010).

The team leader, supervisor, manager, operation manager, coordinator, and engineer responsible for the zone or area where the problem occurred will take the lead in the problem solving process. This concept is based on the reasoning that this individual or team is the primary concerned party and the expert in the area or work zone for resolving the problem (Liker, 2004).

The Kaizen approach through 8 PDCA cycles involves all components in the company both management and employees to get optimal results (Darmawan, Hasibuan, Hardi Purba, August -2018).

Toyota Business Practices (TBP). It is an action to practice The Toyota Way then to realize continuous achievements efficiently for all positions or functions and to enhance quality in order to make company growth in the mid to long term. TBP consists of eight steps of concrete actions and processes (Abdulmouti, 2018).

The Toyota PPSP is based on the PDCA continuous improvement process and it follows a structured sequence of 8-steps that a problem solver must conduct in order to identify and eventually eliminate a problem (Zhang & Liang, 2010).

The problem solving model is seen as very important in solving problems and maintaining performance improvements. It begins with the leaders' commitment to genchi genbutsu when problems are discovered (Shang & Sui, 2013).

Toyota overcomes the problem by using eight step based on the PDCA, which enforces scientific and methodical procedures by carefully identifying successful processes and the exact root of any problem, the 8 Toyota problem-solving Steps (Schweitzer & Capstone, 2012).

A proven and correct way to identify and solve problems is eight steps towards solving practical problems developed by Toyota. This system is structured, but simple and practical enough to handle the smallest problems, to the most complex problems (Holland, 2013).

In many organizations, the problem solving process is often rushed, focusing on finding the quickest and easiest solution rather than the one that adds the most value. Toyota, on the other hand, uses a systematic problem solving process by carefully describing the problem, finding the real root of the problem and using experiments to test preventive actions to ensure the problem is corrected once and for all (Lean Enterprise Academy, 2014).

As a standard problem solving process, it is excellent and widely applicable (Miller, 2009)

One of the main reasons is thought to be management's focus on the hard side of Lean (tools like 8-step problem solving, kaizen, kanban systems, etc.), making a recognizable mistake by ignoring the soft side of culture, respect for people (Vadnais, 2015).

The period of time spent depends on the complexity of the problem and all those involved in completing the 8 PPS steps (P. Arunagiria and A. Gnanavelbabu, 2014).

The performed literature overview on the selected topic showed that mostly the research in principles shows that Eight-step problem solving give benefits in solving complex problems that occur in the product or processes which can prevent bad effect on customers. The available literature lacks papers that explore preparation before implementing eight-step problem solving, where Initial planning especially related to the selection and formation of team members of problem-solving is needed to support this Eight-step problem-solving approach.

This paper is to add the basis for preparation before starting the Eight-step problem solving as stated on the term of reference team evaluation plan.

### III. IDENTIFY, RESEARCH AND COLLECT IDEA

The Eight-Step problem solving is a process step for problem solving which follow Plan, Do, Check, Act (PDCA) cycle. Plan for step 1 to 5, Do for step 6, Check for step 7, Act for step 8.

The type of research used is descriptive qualitative research where the Eight-Step problem solving approach used as the basis in this study. The step of Eight-Step problem solving is as follow:

#### **1.Step1 (Clarify the problem).**

Key Points for Problem Statements. A problem statement i.e.: not containing a cause, not containing the solution, factual, within scope, short, focused on the current situation and the gap, measurable, descriptive of the desired situation, clear and understandable.

#### **2.Step2 (Break Down the Problem).**

Break the big vague problem down to its smaller specific problems i.e.: go see the actual problem process or situation, look at various inputs and outputs in order to select the problem to solve, narrowing the scope and prioritizing helps root cause analysis (step 4) significantly.

#### **3.Step3 (Set a Target).**

Clear define with these: "What we will do" with the target, "How we will do it" with the target, the "Ideal situation" with the target to be achieved.

#### **4.Step4 (Analyze the Root Cause).**

Consist of: Step1 (assumptions): Brainstorm all possible, Step2 (Prioritize): Categorize and display possible, Step3 (Analyze): Gather data to determine the root cause

**5.Step5 (Develop Countermeasures).**

Follow the process i.e.: a proper root causes analysis will point to the action needed: remove the root cause, make a plan that includes who, what, when, pursue multiple countermeasures – not just one, explore as many countermeasures as possible at once, build consensus rather than promote/defend solutions, prevents decisions from being made too quickly, fosters dialog and responsibility for understanding the problem more deeply.

**6.Step6 (see countermeasures through).**

Narrow Down Countermeasures i.e.: which factors have the greatest impact (Pareto analysis) then prioritization matrix and create Gantt chart.

**7.Step7 (Evaluate Both Results and Process).**

Follow up, i.e.: check the results, check the process, ask, “Was it an effective countermeasure or just luck?”, what worked and what didn’t? (which factors contributed?), which actions in “Do” phase gave us results? (what does the data tell us?), where did we deviate from the plan? (What did we learn?).

**8.Step8 (Standardize Success, learn from Failures).**

Consist of: successes: Look for similar problems and share learning, failures: Identify unresolved issues, set next targets, there is never a perfect resolution.

IV. STUDIES AND FINDINGS

Before implementation of the Eight-step problem solving, the selection and formation of team members is carried out which is adjusted to the complexity of the problem and then the planning of activities was created. It is important to build the team which consisting off cross functional member.

Terms of Reference: Quality Improvement (Daily)			
<b>Aim of the Review</b>	To review quality performance and improvement effectiveness to improve product quality level		
<b>Hari</b>	Monday to Friday	<b>Participants</b>	
<b>Duration</b>	30 mins	1. FM	5.Prod. Plan.
<b>Frequency</b>	Daily	2. Prod. Mgr	6.Purc.
<b>Day/ Time</b>	09.00 - 09.30 PM	3. HR. Mgr	7.Ka Shift
<b>Location</b>	Learning & Development room	4. Mech. Mgr	
<b>Objectives :</b>		<b>Inputs</b>	<b>Outputs</b>
- To evaluate quality issues, problem solving steps & quality improvement		- Updated communications board	- Update board performance
- To identify areas of concern for improvement		- Top 1 issues from Ka Shift	- Update Roll Out Actions
- Ensuring areas of concern for repairs and regular monitoring			
<b>Agenda</b>	<b>KPI's</b>	<b>Ground Rules</b>	
- Review product grading & complain	- Performance Product quality level	- Start & finish on time	
- Review production performance	- Performance production	- All participants (according to the list are present and ready to update the information)	
- Delivery Concern		- Fair and open discussion, all participants have the right to issue ideas	
- Review Open Actions		- Silence means AGREE	
		- Participants are responsible for the agreed action. The person responsible for the action must be the person present at the meeting	
		- Commit to achieving results on target	

Table 1. Team evaluation plan of TOR

**1.Step1 (Clarify the problem).**

The decrease in product quality (bare core board) as indicated by complaint from customers. Voice of customer: “Our factory feedback again about the quality for A grade, compared with before, there are more burls and pith. I also advise your factory to reduce use of putty, it's better not to use putty”.



Figure 1. Picture of product defect

**2.Step2 (Break Down the Problem).**

Detail issue as shown on below table.

No	Falcata Barecore	Defect related with customer complain
1	Knot (live, dead)	Dead knot has relation with putty
2	Center Pith (hard, soft)	Soft center pith has relation with putty
3	Gap on butt joint	No issue
4	Gap (wane) on back face, front face	Gap (wane) has relation with putty
5	Not to arrange	No issue
6	Defect within 10 cm from end	No issue
7	Split, peeled	No issue
8	Water stain	No issue
9	Pinhole	No issue
10	Slight hairy/ unflat	No issue
11	Decay	No issue
12	Lamina pitch	No issue
13	Packing	No issue
14	Both side must use FJ on face	No issue

Table 2. Defect related complain

**3.Step3 (Set a Target).**

The target as shown on below table.

No	Falcata Barecore	Grade A	Grade B
1	Knot (live, dead)	Accept max Ø 30mm, no loose knots, to apply wood dust glued on gap (+/-10%)	Accept putty, loose knots on back face
2	Center Pith (hard, soft)	If hard accept (+/-5%)	If soft accept need putty or to be place on back face
3	Gap (wane) on Front face	< 3x150 mm (rp 500 coin) accept (need putty)	< 6 mm x 200 mm accept (need putty)
		< 5x20 mm accept (need putty)	< 10 mm x 50 mm accept (need putty)
	Gap (wane) on Back face	< 3x150 mm (rp 500 coin) accept (need putty)	< 15mm x 300 mm accept
		< 5x20 mm accept (need putty)	< 6 mm depth/thickness accept
Putty on A grade to be limited (+/-5%)			

Table 3. Defect requirement

**4.Step4 (Analyze the Root Cause).**

- Correlation raw materials and grading finish product

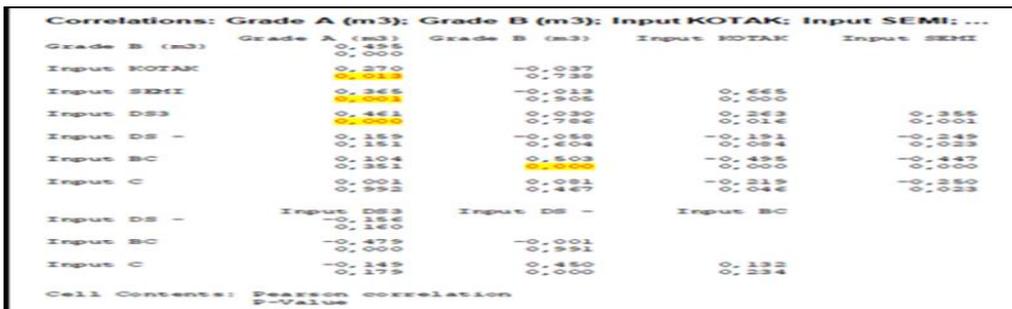


Figure 2. Correlation analysis raw material & grading finish product

Explanation from Figure 2:

- 1) The input of raw material “Box Shape” has a positive significant effect to grade A
- 2) The input of raw material “Semi-Box Shape” has a positive significant effect to grade A
- 3) The input of raw material “DS3” has a positive significant effect to grade A
- 4) The input of raw material “BC” has a positive significant effect to grade B

- Correlation raw materials and WIP (Pelos – carrier for grade B)

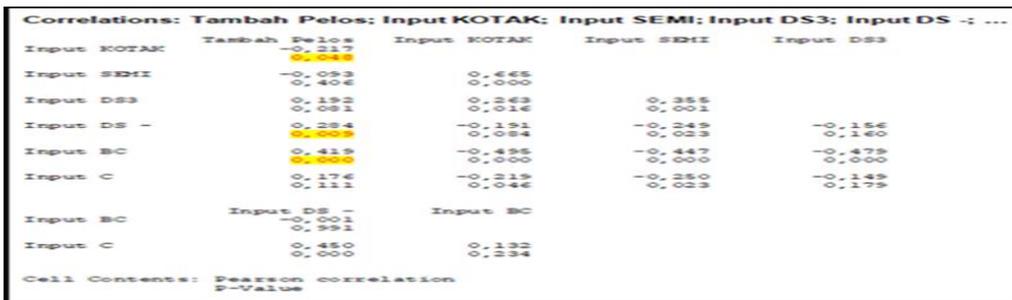


Figure 3. Correlation analysis raw material & WIP (Pelos – carrier for grade B)

Explanation from Figure 3:

- 1) The input of raw material “Box Shape” has a negative significant effect on increasing “Pelos”.
- 2) The input of raw material “DS-” has a positive significant effect on increasing “Pelos”.
- 3) The input of raw material “BC” has a positive significant effect on increasing “Pelos”.

- Correlation raw materials and WIP (sorting activity on conveyor)

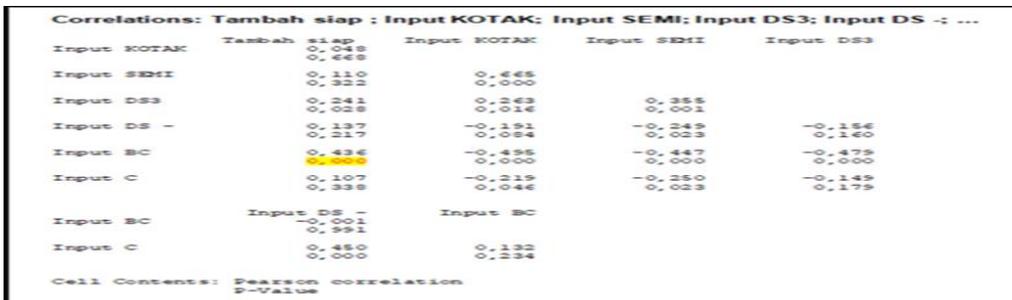


Figure 4. Correlation analysis raw material & WIP (sorting activity on conveyor)

Explanation from Figure 4:

The input of raw material “BC” has a positive significant effect on increasing “sorting activity”.

**5.Step5 (Develop Countermeasures).**

Use cause & effect matrix to identify the correlation between input & output, the importance of output and level of control.

Cause & Effect Matrix								
Type Rating of Importance to Customer in this Row		10	10	8	6			
		1	2	3	4			
Type Outputs in this row		Finish product Grade A	Finish Product Grade B	Work In Process	Putty			
↓	Type Inputs to be prioritized in the Column below	Relate the inputs to the Outputs and enter your numerical rankings in the				Listed below are the Prioritized List of Inputs	Level of control	Control of priority
1	Raw material “Box Shape”	9	5	5	1	186	3	56
2	Raw material “Semi-Box Shape”	9	5	5	3	198	3	59
3	Raw material “DS3”	5	5	5	3	158	3	47
4	Raw material “BC”	3	9	9	5	222	3	67
5	Raw material “DS-”	5	9	5	3	198	3	59
6	Skill of sorter	9	5	9	9	266	3	80
7	Machine performance	5	3	5	5	150	3	45
8	Raw material storage	5	5	9	5	202	3	61

Table 4. Cause & Effect Matrix of Barecore Board process

Explanation from Table 4.:

- 1) Cause & Effect Matrix used for identifying the importance of input to output (score 1 to 10), the highest score is more important.
- 2) Cause & Effect Matrix used for identifying the correlation of input to output (score 1,3,5,9), the highest score is having a stronger correlation.
- 3) Rating of controlling the input (score 1,3,9), the highest score is more difficult to control.

**6.Step6 (see countermeasures through).**

To prioritize attention in the problem and follow up with an action plan as follow:

Rank	Input	Severity	Control of Priority
1	Skill of sorter	266	100
2	Raw material “BC”	222	83
3	Raw material storage	202	76
4	Raw material “Semi-Box Shape”	198	74
5	Raw material “DS-”	198	74
6	Raw material “Box Shape”	186	70
7	Raw material “DS3”	158	59
8	Machine performance	150	56

Table 5. Prioritization Matrix

Action taken:

- 1) Set up strategic of new employee’s recruitment & training plan, pic: HR Mgr.
- 2) Do refreshment training especially ‘falcata barecore’ knowledge to sorter, pic: HR Mgr.
- 3) Optimizing production group composition, pic: Prod. Mgr.

- 4) Optimizing layout, the raw material storage area, pic: Prod. Planner
- 5) Coverage raw material storage area from water rainy, pic: Facility Leader
- 6) Arrange % composition of raw material to be input in production, pic: Prod. Mgr.
- 7) Improve machine capability, focus on Double Planner & Multi rip, pic: Mech. Mgr.

### 7.Step7 (Evaluate Both Results and Process).

After some action is taken, the result shown on the below figure.



Figure 5. % Finish product grade A achievement

Explanation from Figure 5:

From the above figure shown that the corrective action has taken give significant improvement in product quality. Comparing trend before and after, in the area of 'after' improvement the trend of grade A is increased and more stable.

### 8.Step8 (Standardize Success, learn from Failures).

To sustain the performance increasing grade A of finish product barecore board have to be followed by standardization of the action especially treatment to new employee, arrange % composition of raw material to be input in production & machine maintenance.

## V. CONCLUSION

In this paper shows the Eight-step problem-solving in solving deterioration product quality, by following the eight stages, the problem of deterioration product quality of barecore board in woodworking company can finally be reduced and the customer's interests can be saved.

Benefit of The Eight-Step problem solving implementation:

- 1) Customers are more trusting because improving quality product
- 2) Improve knowledge of structured problem solving technique
- 3) The lowest level in the organization have better ownership in keeping quality of product
- 4) Increased sustainable results through behavior changes in processes and people.

The key factors of successful the Eight-Step problem solving mainly are:

- 1) The Eight-Step Problem Solving is one of the key elements to solve a complex problem. The aim is to clarify, explore and solve problems, and is useful in improving products and processes. Introducing this structured approach will provide clear direction to the representative's employee on solving problems that arise.
- 2) The team's goals and membership roles been clarified which will the team require to function effectively. In the case of complex problems and give an impact on the customer's interests, the selection of the right team members makes the key in solving problems effectively.
- 3) In the review meeting there is a chance to discuss related problem solutions and very good for the learning process in the whole organization.

The Eight-step problem solving is a method used to approach and to resolve problems. Initial planning especially related to the selection and formation of team members of problem solving is needed to support this Eight-step problem solving approach. It is important to build the team which consisting off cross functional member.

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# Senior Secondary School Students' Attitude to Inquiry-based learning in Chemistry

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**Abstract-** This study investigated 359 senior secondary school chemistry students' attitude to learning after being exposed to three inquiry-based learning strategies. The samples were randomly drawn from nine secondary schools in two Education Districts, Lagos State, Nigeria. The learning strategies were Investigate-Discuss (ID), Predict-Discuss-Investigate-Discuss (PDID) and Teacher Demonstration (TD) and sampled schools were assigned to the learning groups. The chemistry teachers in the sampled schools were trained on implementation of the learning strategies using the learning packages. Quasi experimental research design was used to determine the effects of the learning strategies on students' attitude to chemistry. The students' gender and mathematical ability and their interaction effects on chemistry students' attitude were also examined. The research instruments which were Mathematical Ability Test (MAT) and Chemistry Attitude Inventory (CAI) were validated and reliability coefficient values were high and positive. Both the MAT and CAI were pre-administered and CAI post-administered to the students after engaging them in eight weeks of practical activities. The students MAT scores were used to classify the students to low, medium and high mathematical ability levels. The data analysis using ANCOVA showed that there are significant main effects of treatment on students' attitude in favour of PDID. There are no significant main and interaction effects of gender and mathematical ability on attitudes. The study recommends the use of PDID strategy to promote students attitude in chemistry.

**Index Terms-** Inquiry learning, mathematical ability, gender, attitude, chemistry.

## I. INTRODUCTION

Learning in science education involves more than students just listening and jotting down facts from the teacher. For students to meaningfully learn in science, especially chemistry, students must be motivated to actively engage, explore, gather information, analysis data, construct knowledge and solve problems in the learning environment. These activities are related to the three learning domains namely knowledge, skills and attitude which are goals of learning process (Bloom, 1956). Inquiry-based learning is adjudged as one of the methods of instruction for active learning because students are engaged in "doing things and thinking about the things they are doing" (Bonwell and Eison, 1991). Learners may be excited and developed interest in the learning if they are involvement in the learning process. However, the most common instruction mode in science and particularly in chemistry in

Nigeria schools is lecture method which is often employed for easy coverage of syllabus. Sometimes, chemistry teachers employed teacher demonstration for quantitative analysis toward external examinations periods but this is hardly utilised in teaching chemistry. Consequently, the teacher demonstration and lecture methods do not promote students' achievement and attitude in chemistry (Adesoji, 2008; Cheung, 2009; Adeoye, 2016 and Adeoye, 2019).

Teacher's attitude, teaching method, students' gender and career interest have been reported to influence the students' attitude to learning and achievement in science (Adesoji, 2008; Cheung, 2009; Sesen and Tarhan, 2013 and Heng and Karpudewan, 2016). The studies of Cheung (2009) and Hashim, Ababkr and Eljack (2015) found positive relationship between chemistry students' attitude and achievement. Asabe (2013) investigated the relationship between science laboratory environment and students attitude. The study showed students positive attitude to science laboratory environment. Ibrahim and Karpudewan (2013) indicated that positive laboratory learning improved students' attitude in chemistry. The analysis of students' attitudes in chemistry in Chile by Montes, Ferreira and Rodriguez (2018) indicated that attitude towards were neither positive nor negative but showed significant effects of year group and chemistry achievement on attitude towards chemistry. The study indicated no effects of school type, gender or interaction between factors on students' attitude to chemistry. Their follow-up analyses revealed that as the students advance through schooling, their attitudes decline, but that the higher the chemistry scores, the more positive were their attitudes. This indicates that scoring high in chemistry could be a motivation to learning of chemistry. This can be effectively achieved if students are actively engaged in teaching and learning process (Adeoye, 2016; Delmang and Gongden, 2016; Adeoye, 2017; and 2019).

The abstract nature of chemistry and the students' learning difficulty necessitate the use of guided inquiry for teaching chemistry. The effects of the guided inquiry have been reported by many researchers in science. Inquiry was found to promote students scientific creativity, attitude, skills acquisition and achievement in chemistry (Yager and Akcay, 2010; Sesen and Tarhan, 2013 and Adeoye, 2019). However, in inquiry learning, Aktamis and Ergin found no significant difference on students' attitudes towards science but there were significant differences on students' scientific creativity, process skills and academic achievement. Yunus and Ali (2012) and Achor and Kalu (2014) revealed that majority of the students have positive attitude towards chemistry learning when they conducted experiments in

the laboratory. Yunus and Ali (2012) further showed that students have negative attitude because they lack interest towards chemistry and chemistry syllabus. Chairam, Klahan and Coll (2015) also found that inquiry-based learning strategies improved students' understanding of chemical concepts, The students also made significant progress in drawing concepts, identifying variables, designing experiments, presenting data, analysing results and drawing conclusions. Furthermore, the study found that the students in practical classes enjoyed practical activities and were interested in learning chemical concepts.

Chua and Karpudewan (2015) and Heng and Karpudewan (2016) found that gender and grade level have a significant effect on attitude towards chemistry learning. The findings further indicated that gender and grade level have a significant interaction effect on secondary school students' attitudes towards chemistry. Achor and Kalu (2014) also significant difference in mean attitude towards chemistry learning between experimental and control groups. However, there was no significant difference between the mean of attitude of boys and girls in chemistry practical. Zudonu and Njoku (2018) examined the effect of laboratory methods on students' attitudes in some chemistry concepts. Their results showed that both guided discovery and demonstration methods had higher gain mean rating for female students than male counterparts. The findings further indicated that male students had better positive attitude on lecture method than female in practical chemistry. Sakariyau, Taiwo and Ajagbe (2016) analysed students' attitude to science and found that was high proportion of students displayed positive attitude to science. However, the study showed no significant difference between the attitude of male and female towards science.

Besides the teacher teaching methods and students' gender, students' mathematical ability has been found to correlate with attitude and performance in chemistry Akinoso (2017). Mazana, Montero and Casmir (2019) investigated students' attitude towards learning mathematics. The findings indicated that initially the students exhibited a positive attitude towards mathematics but their attitude became less positive as the students moved to higher levels of education. Based on this finding, it is likely that those that are mathematical incline would have positive attitude in learning chemistry since chemistry is mathematically oriented.

### 1.2 Statement of Problem

The statistical analyses of May/June results showed that in 2017, the percentage of candidates with five credits and above including English language and Mathematics was 48.15 % while in 2018 it was 33.81 % (National Bureau of Statistics, 2019). The decline in the performance of the Nigeria Senior Secondary School Students in West African Examination Council was worrisome and there is need to investigate the causes. Students' attitude to learning, interest, mathematical ability, teacher methods of instruction, teachers' qualifications, adequacy of learning facilities and other may influence students' performance both in internal and external examinations. Attitude is one the keys that propel any individual to good success. Students' attitude to science learning is enhanced when students are active participants in teaching and learning (Yunus and Ali, 2013 and Zudonu and Njoku, 2018). There several studies and findings on students' and teachers' attitude to chemistry teaching and learning. However, limited studies exist on the attitude of students towards inquiry-

based learning strategies. The study examined the attitude of chemistry students to inquiry-based learning strategies; Investigate-Discuss (ID), Predict-Discuss-Investigate-Discuss (PDID) and Teacher Demonstration (TD). The effect of students' gender and mathematical ability and their interactions with factors were further determined.

### 1.3 Purpose of the Study

The main purposes of this study was to determine (i) the effect of ID, PDID and TD learning strategies on senior secondary school students' attitudes and skills' acquisition in chemistry (ii) influence of gender and mathematical ability on senior secondary school chemistry students' attitudes and skills' acquisition and (iii) interaction effects of learning strategies, gender and mathematical ability on senior secondary school chemistry students' attitudes and skills' acquisition in inquiry-based learning.

### 1.4 Research Questions

The research questions for the study are as follows:

1. What are the effects of ID, PDID and TD learning strategies on senior secondary school chemistry students' attitude learning chemistry?
2. How does mathematical ability of senior secondary school chemistry influence students' attitude to learning chemistry?
3. What is the influence of gender on senior secondary school students' attitude to learning chemistry?

### 1.5 Research Hypotheses

The null research hypotheses for the study are:

$H_0^1$  There is no significant main effect of treatment on senior secondary school students' mean scores in chemistry attitudes inventory.

$H_0^2$  There is no significant effect of mathematical ability on senior secondary school students' mean scores in chemistry attitudes inventory.

$H_0^3$  There is no significant effect of gender on senior secondary school students' mean scores in chemistry attitude inventory.

$H_0^4$  There is no significant interaction effect of treatment and mathematical ability on senior secondary school students' mean scores in chemistry attitude inventory.

$H_0^5$  There is no significant interaction effect of treatment and gender on senior secondary school students' mean scores in chemistry attitude inventory.

$H_0^6$  There is no significant interaction effect of mathematical ability and gender on senior secondary school students' mean scores in chemistry attitude inventory.

$H_0^7$  There is no significant interaction effect of treatment, mathematical ability and gender on senior secondary school students' mean scores in chemistry attitude inventory.

### 1.6 Methodology

Quasi experimental research of pre-test post-test was used for the study. The samples were the Senior Secondary School (SSS) form two chemistry students that were randomly sampled in their intact classes in two education districts in Lagos State, Nigeria. The total samples comprised of male and female students were three hundred and fifty nine (359) of which male students were 214 and 145 female students.

Three approaches to inquiry-based learning were used to engage the sampled students in six weeks of practical activities in concepts of redox, chemical kinetics, equilibrium and electrolysis. These were Investigate-Discuss (ID), Predict-Discuss-Investigate-Discuss (PDID) and Teacher Demonstration (TD). In the ID approach, the students were actively engaged in practical activities, discussions and solving problems related to the practical activities in small groups. The ID and PDIP were student-centred learning approaches. The PDID differs from ID in that the students made predictions and discuss the predictions before carried out the investigations. This allowed the students to modify their misconceptions on the concepts for meaningful learning. The TD strategy is teacher-dominated, where the teacher carried out the practical activities and discusses the underlying principles and concepts related to the demonstrated activities. The trained chemistry teachers in the various sampled school who were certified to have the competency of the teaching strategies before engaged the students in practical activities.

The Mathematical Ability Test (MAT) contained twenty (20) items which were structured on logarithms, probability, simple percentages, mean, median and modes topics. The knowledge of

these topics is required for understanding some contents in chemistry. The instrument was administered to the students at the start of the research. The instrument was used to categorise the students into high, medium and low mathematical ability based on their scores.

The Chemistry Attitude Inventory (CAI) was to explore students' attitude to the teaching and learning of chemistry using the inquiry learning strategies. The instrument contained 20 attitudinal statements comprised 10 positive and 10 negative statements in order to discourage guess work. A 4 – point Likert type scale was attached to each of the statements: Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD) and were scored on a four point scale (1 – 4). The research instruments and the learning packages were validated and they were found reliable for the study. The CAI was pre-post administered to the students to determine their attitudes before and after engaging them in inquiry learning strategies.

The collected data were analysed using mean and Analysis of Covariance (ANCOVA).

### 1.7 Result

The results of students' responses to CAI by treatment are presented on Table 1.

**Table 1: Pre-test and Post-test Mean Scores in CAI by Treatment**

Treatment	N	Learning Outcome	Mean ( $\bar{x}$ ) and Standard Deviation (SD)				Mean Gain
			Pre-test ( $\bar{x}$ ) (SD)		Post-test ( $\bar{x}$ ) (SD)		
ID	114	CAI	51.66	5.74	62.28	6.91	10.62
PDID	123	CAI	53.47	6.03	67.98	6.67	14.51
TD	122	CAI	56.02	5.91	58.31	6.81	2.29

The students in PDID had the highest mean score (14.51) in CAI followed by ID (10.62) and then TD (2.29) with the pattern of PDID > ID > TD. Results of further analysis are presented in Table 2 using mean and standard error scores.

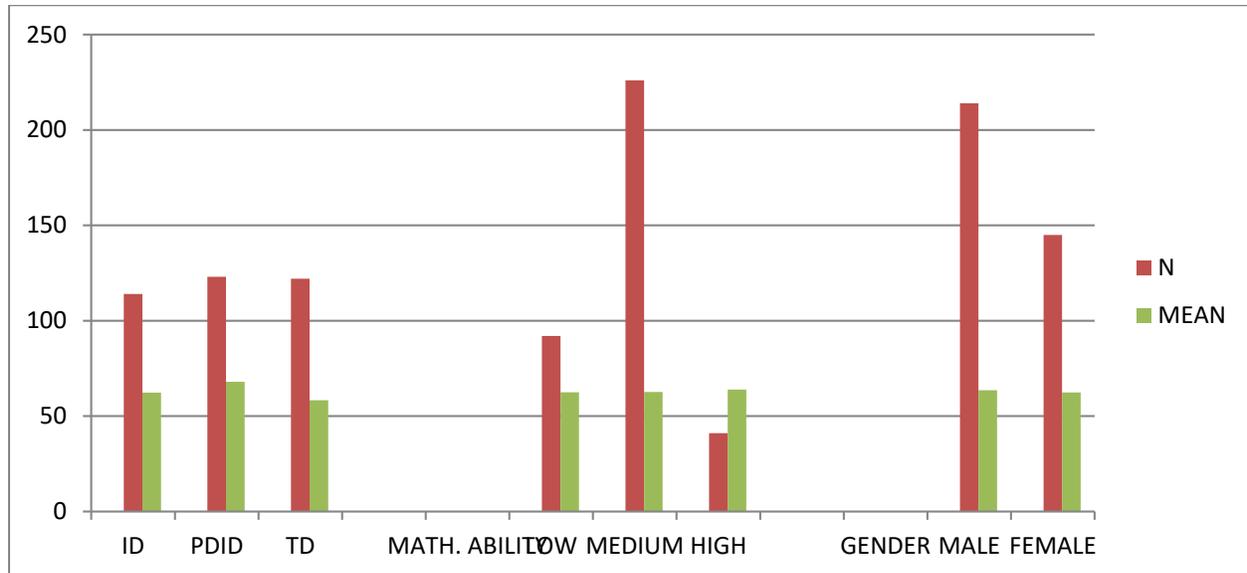
**Table 2: Post Mean and Standard Error Scores in Chemistry Attitude Inventory by Treatment, Mathematical Ability and Gender.**

Category	N	CAI	
		Mean	Std. Error
Treatment	ID	114	62.28 .636
	PDID	123	67.98 .613
	TD	122	58.31 .615
Mathematical Ability	Low	92	62.48 .922
	Medium	226	62.60 .481
	High	41	63.90 1.336
Gender	Male	214	63.58 .676
	Female	145	62.40 .909

Table 2 shows that students in the PDID had the highest score of 67.98 followed by ID, 62.28 and TD with the least of 58.31 score on chemistry attitude inventory.

The post mean scores of the students based on their mathematical ability as shown on Table 2 were slightly different from one another. The students with high mathematical ability had 63.90 while that of medium mathematical ability was 62.60 and 62.48 for low mathematical ability in attitude inventory. These are further explained with the use of bar chart in Figure 1.

**Figure 1: The Descriptions of Treatment, Students' Mathematical Ability and Gender by Number Sampled and Mean Scores on Chemistry Attitude Inventory**



ANCOVA was used to test for main significant effects of treatment, mathematical ability, gender and their interactions of students' scores in attitude inventory.

**Table 3: Summary of ANCOVA on Attitude by Treatment, Gender and Mathematical Ability**

Source	Type III Sum of Squares	Df	Mean Square	Partial Squared	Eta F	Sig.
Corrected Model	6197.668	18	344.315	.279	7.306	.000
Intercept	12694.499	1	12694.499	.442	269.364	.000
PRECAI	80.532	1	80.532	.005	1.709	.192
Treatment	1697.276	2	848.638	.096	18.007	.000*
Gender	50.884	1	50.884	.003	1.080	.300
Math. Ability	43.296	2	21.648	.003	.459	.632
Treatment*Gender	24.415	2	12.208	.002	.259	.772
Treatment*Math.Ability	49.880	4	12.470	.003	.265	.901
Gender*Math.Ability	7.425	2	3.713	.000	.079	.924
Treatment*Gender*Math. Abil	113.461	4	28.365	.007	.602	.662
Error	16023.419	340	47.128			
Total	1441805.000	359				
Corrected Total	22221.086	358				

R = .279; R<sup>2</sup> = .241 \*Significant at P < .05 Sources: Adeoye (2016)

The results on Table 3 indicated only a significant effect of treatment on students attitude to chemistry learning ( $F_{(2,340)} = 18.007$ ;  $p < .05$ ). The direction of significant difference was determined using Scheffe post hoc tests and the results are presented on Table 4.

**Table 4: Scheffe Post Hoc Tests of Attitude by Treatment Groups**

(I) Treatment	N	(J) Treatment	Mean Difference (I-J)	Std. Error	Sig.
ID	114	PDID	-5.69	.883	.000*
		TD	3.97	.885	.000*
PDID	123	ID	5.69	.883	.000*
		TD	9.66	.868	.000*
TD	122	ID	-3.97	.885	.000*
		PDID	-9.66	.868	.000*

\*Pairs of groups significantly different at  $P < .05$  Source: Adeoye (2016).

The results show on Table 4 that the PDID learning strategy is significantly different from the ID and TD learning strategies and the ID also differ significantly from the TD learning strategy on the students' attitude towards chemistry learning.

### 1.8 Discussion of Result

The findings of the study show significant main effect of the treatment on students' attitude to chemistry learning. The pattern of students' attitude towards chemistry learning after treatment was the PDID > ID > TD. The students in the PDID differ significantly than those in the ID and the TD treatment groups in their attitude to chemistry learning. The ID students also differ significantly from those in the TD treatment group in attitude towards chemistry. The superiority of the Predict-Discuss-Investigate-Discuss learning strategy over the Investigate-Discuss and the Teacher Demonstration in promoting students attitude to chemistry learning may be as a result of the nature of the learning strategy which allowed the students to take total charge of the teaching and learning process. The characteristics nature of the PDID which include making predictions, confirmation of predictions by investigations, dialogue with peers, expression views and ideas, modification of ideas and active collaboration with peers and learning materials may have promoted the students' positive attitude in chemistry. The superiority of the Investigation-Discuss over the Teacher Demonstration may be due to the opportunity that the students in the ID learning group had in active participation in investigation, discussion of the underlying principles and collaboration with peers might prompted their positive attitude towards chemistry learning. The students' inactive participations, inability to question and reflect on the teacher's demonstration in the TD group might be the major reasons for the students' low attitude to chemistry learning. This finding is in support with significant effect of inquiry-based learning strategy on students' attitude to chemistry established by Cheung (2009), Sesen and Tarhan, (2013) and Zudonu and Njoku (2018). They showed significant effect of inquiry learning on students' attitude to chemistry learning.

The positive attitude to chemistry learning showed by high mathematical ability may be that their ability in mathematics motivated the students' interest in chemistry since the subject is mathematical in nature. The male students having better positive attitude to chemistry learning than female may be that the male students are more motivated in the inquiry than their female counterparts. However, significant effects of students' mathematical ability and gender do not exist in the study. Furthermore, treatment, mathematical ability and gender have no significant interactions on students' attitude to chemistry. This means that, the teaching strategies have great impact on students'

attitude to chemistry learning. Active learning strategies such as PDID and ID are good motivators of students' attitude to learning of chemistry.

### 1.9 Implication of the Study

The implication of this study is that if inquiry-based learning strategies of PDID and ID are effectively implemented by chemistry teachers would promote students' positive attitude in the subject. Inquiry is scarcely used as learning method in science. This may be as a result of difficulties science teachers have in structuring inquiry learning. Time allotted for science teaching in most schools may not be sufficient for inquiry learning. The pressure of contents coverage for the purpose of both internal and external examinations may also be a factor. Inadequate laboratory materials may be another factor for lack of utilization of inquiry in Nigerian schools.

### 1.10 Conclusion

From the results of the study, it can be concluded that:

- PDID and ID learning strategies are effective in motivating students towards chemistry learning.
- Students' gender has no significant effect on students' attitude towards chemistry learning. However, students' good knowledge of basic mathematical knowledge may promote their attitude to chemistry learning.
- Students' mathematical ability has no significant effect on students' attitude towards chemistry learning. However, students' good knowledge of basic mathematical knowledge may promote their attitude to chemistry learning.
- There is no interaction effect of treatment, gender and mathematical ability on students' attitude in chemistry.

### 1.11 Recommendation

The inquiry-based learning of ID and PDID learning are strongly recommend for learning of chemistry. However, there must be learning facilities for implementation of inquiry-based learning strategies. Training and retraining of teachers are very important for inquiry to thrive in science classrooms. Science teachers should do away with conventional methods of lecture and demonstration of scientific concepts to the students to promote their interest in science. They should embrace learning by inquiry which allows students to observe phenomena, build a bridge between what they can see and handle rather than seeing phenomena as end.

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# To evaluate AI for Hypochromic Anaemia based on RBC morphology in Leishman stained blood smears: A pilot study

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**Abstract- Introduction:** Microscopy is the simplest and the most important step in diagnosis of anemia. But the microscopy requires considerable experience and is bound to human errors. Artificial intelligence (AI) based microscopy can be an answer to this problem. AI can be used even where expert microscopists are not available. Sevamob provides artificial intelligence enabled healthcare platform to organizations. It uses deep learning for image recognition, machine learning for triaging and computer vision for object counting. AI models of various medical conditions are first trained in the software from anonymized image data procured from various sources. To determine the accuracy of AI based point-of-care screening solution for sputum, following were used: Android Smartphone / tablet with Sevamob app, tripod and a simple microscope. The system was operated by a nurse or a technician with minimal training.

**Methods:** 150 MI Leishman stained smears of blood samples from clinically suspected anemia cases were included in the study.

**Results:** Out of these 150 smears, 94 were microcytic hypochromic on morphology and remaining 56 smears were normocytic normochromic or macrocytic in morphology when examined by expert microscopist. These smears were also analyzed by AI system. Out of these only 12 smears were found to be false positive for microcytic hypochromic blood picture. Thus, overall accuracy of AI was 81.88%. The sensitivity and specificity of AI based microscopy was 87% and 80% respectively.

**Conclusion:** This shows that Sevamob's AI based microscopy system can be very useful to find microcytic hypochromic anemia and has potential to replace the requirement of expert microscopist in the coming future. Sensitivity and specificity also depend on the threshold used by our AI system.

**Index Terms-** Microcytic hypochromic anemia, artificial intelligence, microscopy

## I. INTRODUCTION

Microscopy is first and foremost step in the diagnosis of microcytic hypochromic anemia. But the microscopy requires considerable experience and is bound to human errors [1]. Also, in remote areas, due to lack of expert microscopist, timely diagnosis at initial level is not possible, which may lead to increased morbidity. Artificial intelligence (AI) based microscopy can be an answer to overcome this problem. AI can be used even in the remotest areas where expert microscopists are not available.[3] The use of artificial intelligence in medicine is currently of great interest.[2,4,5,6] The diagnostic and predictive analysis of medical photos, for instance, photographs of retina[8] and skin lesions, microscopic pathological images[10-12] and radiological images. are

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one of the clinical practice fields where artificial intelligence is expected to have a major influence.[7-15].This potential usefulness is largely due to advances in deep learning with artificial deep neural networks (NN),which consist of a stack of multiple layers of artificial neuronal links that loosely simulates the brain's neuronal connections, and methods specialized for analysis of images, such as the convolution neural network, a particular form of deep neural network that conceptually mimics the visual pathway [13,16,18]. Adoption of artificial intelligence tools in clinical practice requires careful, meticulous confirmation of their clinical performance and utility before the adoption.[17] Based on the urgent need for data standardization and interoperability in digital microbiology, we launched a cross-departmental prospective quality improvement project to incorporate artificial intelligence digital microbiology technology and outline the resource requirements for implementation. The solution presented here empowers microbiologists and pathologist to gain an appreciation of and enable the assessment of the appropriateness of the AI system for diagnosis. We have also shown that current AI systems can aid in the timely diagnosis of infections in resource constraint setting of developing countries like India. The use of artificial intelligence-based diagnosis and data regarding the same is scarce to our best knowledge. Sevamob provides artificial intelligence enabled healthcare platform to organizations. It uses deep learning for image recognition, machine learning for triaging and computer vision for object counting. AI models of various medical conditions are first trained in the software from anonymized image data procured from various sources. The software can then be used to screen for these medical conditions in new samples. The system can work fully off line in last mile, low resource settings. We therefore planned this study with the aim to evaluate AI for identification of microcytic hypochromic anemia based on peripheral smear findings.

## II. METHODS

This study is a retrospective observational study and this study was done at three Sevamob pop-up clinics at Lucknow, Jharkhand and Rajasthan, India. Blood samples from 150 clinically suspected iron deficiency anemia patients were taken to do this study. To determine the accuracy of AI based point-of-care screening solution for peripheral blood, following were used: Android Smartphone/tablet with Sevamob app, tripod and a simple microscope. The system was operated by a nurse or a technician with minimal training. The user first prepared peripheral blood smears from blood samples of suspected iron deficiency anemia patients. To perform blood smear microscopy 2ml blood was collected from disinfected site in EDTA vial. First drop of the blood was poured on clean sterile glass slide followed by spreading the drop at 45o angle by the spreader slide to create a monolayer blood smear. Smear was stained by Leishman stain. CBC was done within 2 hours of blood collection. Smear was analyzed by expert microscopist and also by the AI based system.

The user then used the smart phone app to analyze camera feed of microscopic images of various sections of the slide. The app confirmed if the sample had microcytic hypochromic RBC's and even marked it on alive camera feed. Detection of microcytic hypochromic RBC's was done on site by Sevamob AI which worked fully offline on mobile and could be synced on cloud once network was available. AI was trained to detect microcytic hypochromic RBC's and it showed the percentage probability of the detected microcytic hypochromic RBC's. 70% was taken as the threshold to be considered as positive by AI. The images were confirmed by the expert microscopist as microcytic hypochromic RBC's or not. The evaluation of true positive, true negative, false positive and false negative was done based on the result of the comparison between the expert and the AI result. Inclusion criteria for Blood smear examination: We included 150 patients who came for routine Complete blood count (CBC) evaluation in haematology at our site,Consent was taken from the patient/ patient attendant when they came for routine CBC in hematology lab.

Exclusion criteria: All the patients of Aplastic anaemia, patients on chemotherapy and radiotherapy.

## III. RESULTS

We analyzed 150 peripheral blood smears from clinically suspected anemia cases, as shown in table 1.

Out of 150 peripheral smears 94 were found to be microcytic hypochromic and 56 were normocytic or macrocytic as negative by expert microscopist. Based on these findings sensitivity, specificity, positive predictive value, negative predictive value, likelihood ratio of AI based microscopy was calculated. These are depicted in table 1&2.

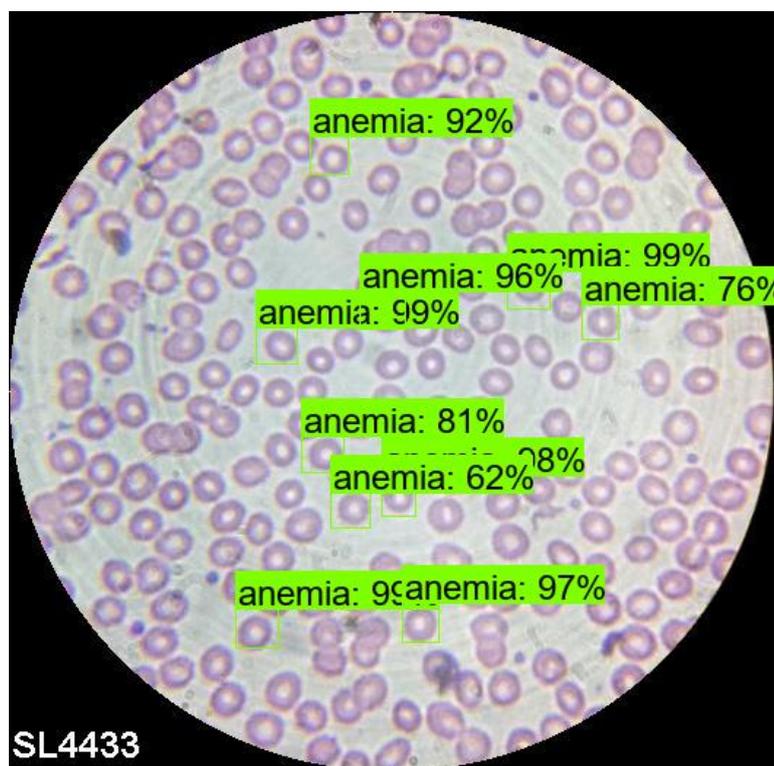
**Table 1. Results of peripheral blood smears examined by expert microscopist and by Artificial Intelligence (AI) method**

Model Info		Testing Input		Testing output				Accuracy	
Model Name	Concept name	Positive cases	Negative cases	Positive Cases Result		Negative Cases Result			
				Correct	Incorrect	Correct	Incorrect		
Blood	Hypochromic RBC(Anemia - Iron deficiency)	94	56	82	12	45	11	<b>81.88976</b>	APP
		94	56	89	5	33	23	<b>77.0492</b>	Web

**Table 2: Results of 150 smear samples by AI-system**

Diagnostic parameters	Value
Sensitivity	87%
Specificity	80%
Positive Likelihood Ratio	4.35
Negative Likelihood Ratio	0.23
Disease prevalence	
Positive Predictive Value	88%
Negative Predictive Value	78.9%
Accuracy	81.88%

Image 1 and 2 shows the % probability of AFB by AI system. % probability of AI images ranged from 51% to 99% in a microscopicfield.



**Image 1:** Shows the marked area with % probability by the AI based software

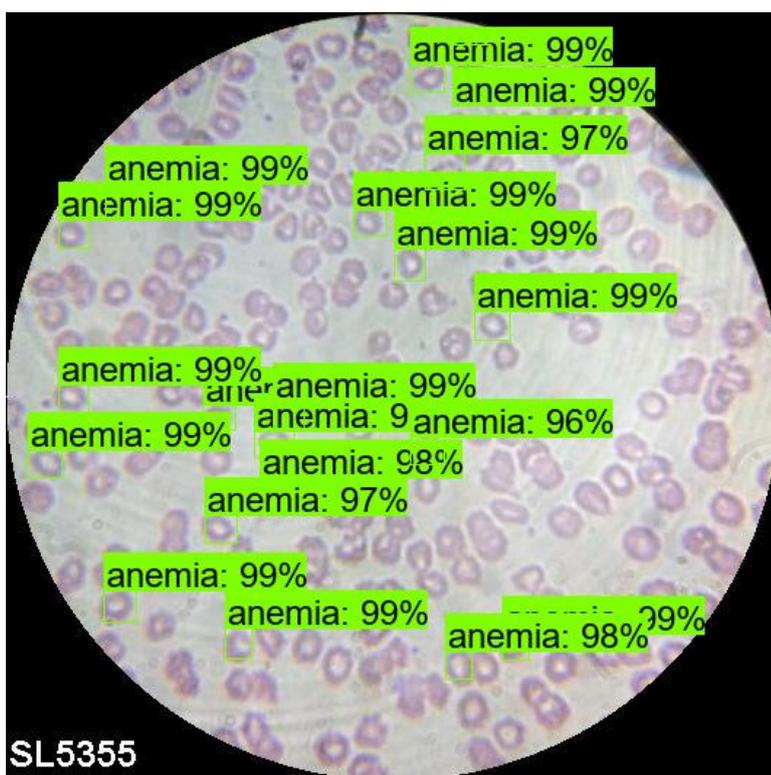


Image 2: Shows the marked area with % probability by the AI based software

#### IV. DISCUSSION

In the present pilot study, we have analyzed 150 peripheral blood smears by Leishman staining for presence of microcytic hypochromic blood picture and correlated with AI system. The sensitivity and specificity were found to be good. This shows that this particular AI system may be very useful for detection of presence of microcytic hypochromic red blood cells and can replace the requirement of expert microscopist in the coming future. Sensitivity and specificity of AI also depends on the threshold set for the AI system used. In our study this threshold was set at 70% and this was decided after training and internal lab testing of samples at different thresholds of 5% intervals (50%-80%). We found optimal sensitivity and specificity at 70% threshold only. It should be noted that this idea is called as self-adjusting neural networks that adjust themselves to a boundary to that the input data and their outcome must convert. To our understanding the meaning of a self-learning classification system adjusts the "rules" to a given final outcome. At higher threshold, there were too many false negatives. At lower threshold, there were too many false positives. It finds appropriate that the implementation of an automated diagnosis or pre-screening system consists of several modules that should work independently from each other. To start with, this concept a control and evaluation of the objective image quality is necessary so one can easily evaluate between the results of AI and microscopy. The system has used various enhancement techniques, and it has best quality to analyze the microscopic peripheral smear images, segmentation algorithm is developed to automate the process of detection of microcytic hypochromic RBC's using digital microscopic images of different subjects. Shape features extraction technique had been implemented to extract eleven shape features and finally for classification of the support vector machine was used to be a pattern recognition tool to classify the object in peripheral blood smear images to microcytic hypochromic RBC's or other types of RBC's.

As per our best knowledge such AI based pilot study has never been done before in India or elsewhere in the world. Few automated microscopy systems have been used in the past, but they were not based on artificial intelligence. MM Alam et al in their study used "you only look once" (YOLO) object detection and classification algorithm. YOLO framework has been trained with a modified configuration BCCD Dataset of blood smear images to automatically identify and count red blood cells, white blood cells, and platelets. Moreover, this study with other convolutional neural network architectures considering architecture complexity, reported accuracy, and running time with this framework and compare the accuracy of the models for blood cells detection. (19). Acharya V et al in their study proposed an image-processing technique for counting the number of red blood cells. It aimed to examine and process the blood smear image, in order to support the counting of red blood cells and identify the number of normal and abnormal cells in the image automatically. K-medoids algorithm which is robust to external noise was used to extract the WBCs from the image. Granulometric analysis was used to separate the red blood cells from the white blood cells. The red blood cells obtained were counted using the labeling algorithm and circular Hough transform. The radius range for the circle-drawing algorithm is estimated by computing the distance of the pixels from the boundary which automates the entire algorithm. A comparison is done between the counts obtained using the labeling algorithm and circular Hough transform. Results of the work showed that circular Hough transform was more accurate in counting the red blood cells than the labeling algorithm as it was successful in identifying even the overlapping cells. [20].

In case of histopathology examination AI have been successfully used to segment the colon gland, breast tissue, as well as the nuclei as reported by different authors in their study [26-33].

The limitation of our study is the small sample size. A larger sample size study is further required to validate our system.

#### V. CONCLUSION

In this pilot study automated AI based software for identification of microcytic hypochromic RBC's has been done. This AI based software method reduces fatigue and screening time by providing images on the screen and avoiding visual inspection of microscopic. The system has an acceptable degree of accuracy, specificity and sensitivity.

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# An Understanding of Concept of Corporate Social Responsibility

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**Abstract-** The present study was carried out to understand the concept of CSR. It is not simple to understand because, various concept and themes overlaps this term. The studying inferred that most of the author integrate social environment and interaction within there stakeholders.

**Index Terms-** Corporate social responsibility understanding, concept.

## I. INTRODUCTION

Corporate social responsibility (CSR) in India has traditionally been seen as a philanthropy activity but there is limited documentation on specific activities related to this concept. Although the roots of CSR lie in philanthropic activities of corporation, globally its concept has evolved and now encompass all the related concept such as triple bottom line, corporate citizenship, philanthropic strategic, shared value, corporate sustainability and business responsibility. There may be no single accepted universally accepted definition it is all theoretical statement. Actually business return will always win this is or me - first word "greedy corporate" etc. There are plenty of examples in this in actions to be able to say that it is a genuine factor, although also a reality that it doesn't currently get spread widely nor deeply enough. In fact due to its wide range of responsibility create confusions among the planners. To popularize CSR an effort to be made to develop a clear understanding to wind up gap between theoretical interpretation and actually practice. Keeping in view the study was undertaken an "An understanding concept of CSR".

### Objective

To develop an understanding of concept of Corporate Social Responsibility.

### Methodology

The research paper is an attempt of expiatory research, based on the secondary sources from journals,magazines,articles,news papers and media report.

### CSR defined

CSR has been defined by many authors and organizations as given below:-

1. European Commission (EC) stated "CSR as a concept whereby companies integrate social and environmental concern in

their business operation and their stakeholder on a voluntary basis".

2. Kotler and lee defined CSR as "corporate social responsibility is a commitment to improve community well-being through discretionary,business practice and contribution if corporate resources.corporate social initiatives are major activities undertaken by a corporation to support social causes and to fulfill commitments to corporate social responsibility".

3. Corporate Social initiatives are major activities undertaken by a corporation to support social cause and fulfill commitments to corporate social responsibility.

4. Lord Holame and Richard stated that "CSR is commitment by business to behave ethnically and contribute development by improving the quality of the workforce and their families as well as the local community and society at large".

5. WBCSD defines "CSR the continuing commitment by business to contribute to economic development while improving the quality of life of workforce and their families as of the community and society at large".

6. Maller barker stated that "CSR is how company manage there business progress to produce an overall positive impact on society".

7. According to UNIDO "CSR is a management concept whereby companies integrate social and environmental concerns in their business operation and interaction with their stakeholder".

8. Mc williams stated that "CSR as situation where the firms goes beyond compliance and engages in action that appears to further some social good, beyond the interest of the firm and that which is required by law".

9. Ruppelt squiring from many researches asserted that "CSR has been conceptualize as activity decision or policies that organize engage into effect positive social change and environmental sustainability".

10. Culderon, asserted that "CSR include a variety of activity to reach the broad area of competency from environmental issues era-diction of poverty, employment creation and labour practices, experimental protection, education and human development among other".

11. International finance corporation(IFC) , "CSR is often defined as corporate responsibility, corporate citizenship, social enterprise, sustainable development, triple bottom line, corporate ethics and in some cases corporate governance".

12. Carrol,A.B.,(1979) "Business comprises of economic, legal, ethical and discretionary expectations that society has of organizations at a given point".

### **Discussion**

Corporate social responsibility is an type of international private business self regulation that aims to contribute to social goals of philanthropic,activist,or charitable nature of by energy in support of volunteering or ethically oriented practices.

Corporate social responsibility is a self regulating business model that helps a company by socially accountable to itself,as stakeholders as public.

By prove fessing corporate social responsibility,also called corporate citizenship,companies can be conscious of the kind of impact they are having on all aspects of social environmental.for a company to be socially responsible,it first need to be accountable to itself and its shareholders.often companies that also programme having grown their business to the point where they can give back to society. Thus CSR is primarily a strategy of large corporation.also the more visible and successful a corporation is the more responsible it has set standards.

### **Conclusion**

1. CSR is a broad subject which leads to a variety of opinion and can be interpret in a number of different ways.
2. Companies that have adopt CSR programme have grown their business in such a way that they can give back to the society.
3. Companies contribute to economic development, improving the quality of life of the work force, legal community and environmental sustainability.

Thus, CSR is a management concept to bring about economic progress, social progress and environmental sustainability for the present and future generation through business operation.

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# Corona Virus Disease (Covid -19) - Pandemic; Prevention Is Better Than Curet

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**Abstract-** Corona virus disease is an infectious disease caused by a newly discovered corona virus .It is resembles to crown under electron microscope so the name corona came. Corona virus is large family of enveloped RNA viruses; it is mainly attacked on respiratory system, Seen mostly in age group of 30 to 79 years. This new virus and disease were unknown before the outbreak began in Wuhan, China, in December 2019.It is transmit through droplets to person and thete no vaccine till now so ,prevention is better way to fight against corona virus and disease.

**Index Terms-** corona virus, COVID- 19,symptoms,prevention ,treatments

Wenliang,was a Chinese ophthalmologist who worked as a physician at wuhan ,china, had received outbreak of unexplained pneumonia illness that is resembled with severe acute respiratory syndrome (SARS), Later acknowledged as covid -10 .He tried to given warning about the deadly virus but his warning were later shared publically and he has died due to Corona virus disease in 7 feb 2020 [1]. Corona virus and disease is an infectious disease caused by a newly discovered corona virus .It is resembles to crown under electron microscope so the name corona came. Corona virus is large family of enveloped RNA viruses; it is mainly attacked on respiratory system, Seen mostly in age group of 30 to 79 years. This new virus and disease were unknown before the outbreak began in Wuhan, China, in December 2019 [2].

## I. INTRODUCTION

The corona virus and desease basically origin from Wuhan city of China in last December . In late December 2019,Dr. Li

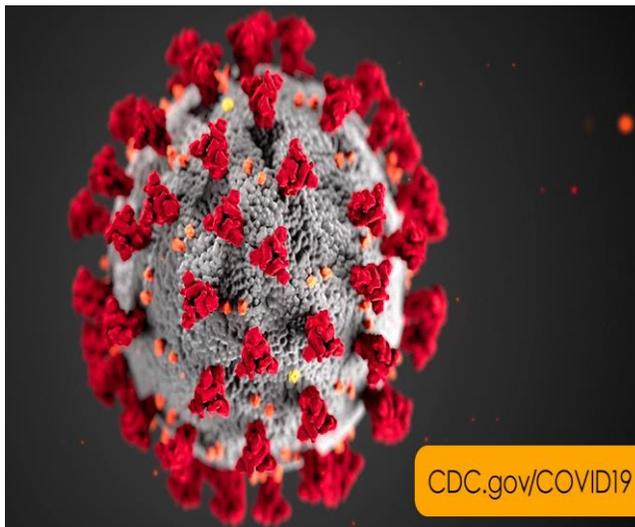


Figure 1: Structure of novel coronavirus

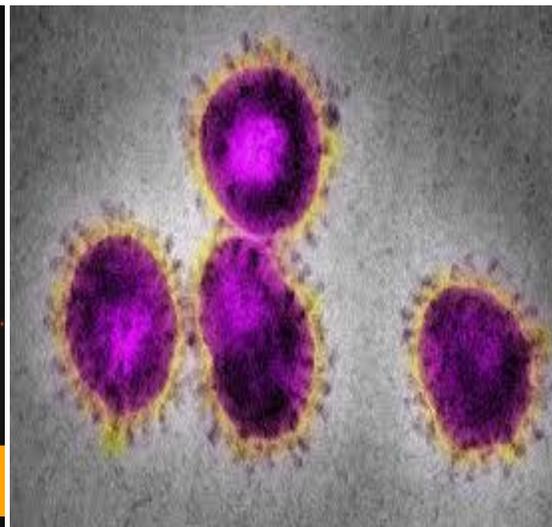


Figure 2: Internal structure of caronavirus

## Classification according to symptom-

## II. SYMPTOMS

The covid 19 virus affect different people in different way,the most common symptoms are [3]

- fever,
  - common cold,
  - dry cough,
  - fatigue,
- other symptoms include.
- Shortness of breath & difficulty in breathing

- Aches and pains
- Sore throat
- A very people will report nausea & diarrhea

**Warning Signs**-Bluish lips or face, difficult to arouse

**Incubation period**-2 to 14 days

**Mode of transmission**-person to person through respiratory droplet

### III. LABORATORY DIAGNOSIS

In case you feel your symptoms are specific to the coronavirus ,your health care provider can get in touch with CDC and local healthcare department for testing instructions. The

	Number of cases
Total (worldwide)	1,349,808
USA	367,650
Spain	136,675
Italy	132,547
Germany	103,375
France	98,010
China	81,740
Iran	60,500
UK	51,608
Turkey	30,217
Switzerland	21,712

government set up the specific lab for conducting coronavirus test

in each state. There are different types of test can be done for coronavirus [4] .

- Swab test – in this test they can take the sample from nose or throat.
- Nasal aspirate –In this case ,a saline solution will be injected into your nose and then a sample is taken with a light suction.
- Trachial aspirate - In this case a bronchoscope is introduce into the lung through mouth and collect the sample from it.
- Sputum test –sputum is thick mucus that is secreted by the lung wall and come out with the cough ,that sputum is collect by the swab for test.
- Blood test – In this case,a blood sample is taken from a vein in the arm.
- RT-PCR assay as per WHO guidelines

Decrease in lymphocyte count, hemoglobin, albumin , oxygen saturation increase in neutrophil count ESR,CRP

Resent data – Number of covid -19 cases in INDIA as 10 april 2020 [7].

India covid 19 till today	Conformed	Active	Recovered	Deceased
	4419	3968	329	122

Number of covid -19 cases worldwide as 10 april 2020 [7]-

## In India, confirmed coronavirus cases now double in a week. China, South Korea and Japan have already a flat curve. Italy, Spain, and Iran double every 2nd to 3rd day.

Cumulative numbers of confirmed cases in selected countries after the 100th case, last updated with the numbers from March 19 and 20 (as per time zone).

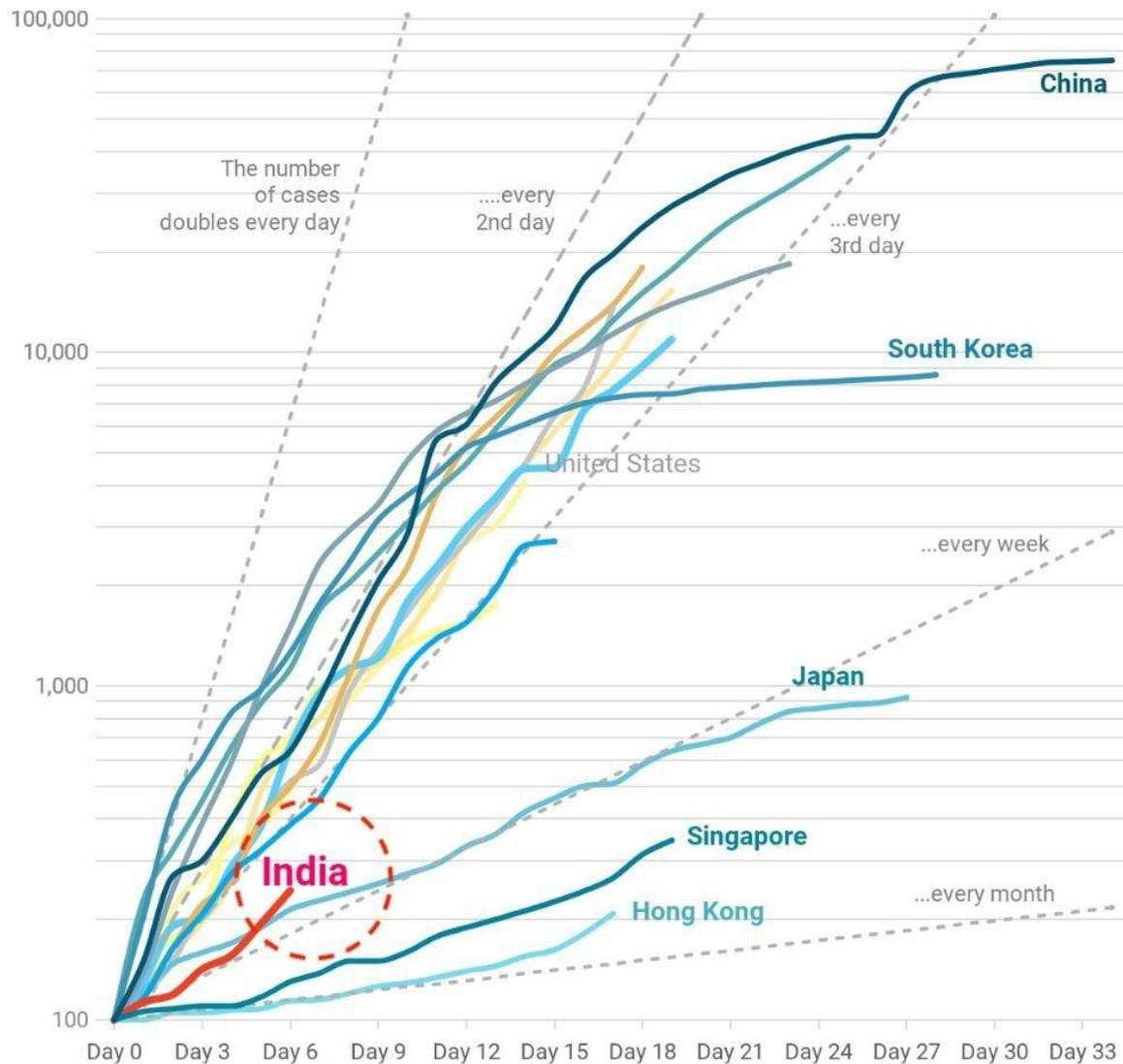


Chart: Dipu Rai with help of Lisa Charlotte Rost's Idea. • Source: Johns Hopkins CSSE



#### IV. PREVENTION

Social distancing of 1 meter, not to shake hand Quarantine [5],

- Wash your hands regularly with soap and water, or clean them with alcohol based hand wash.
- Avoid touching face
- Cover your mouth and nose with triple layer surgical mask, not to spit in public,

- Avoid consumption of raw or undercooked animal products.
- According to WHO smoker and alcoholics are more prone for covid so please avoid it.

**5. Treatment-**There currently is not a vaccine against developing Covid 19. Antibiotics are also because covid 19 is a viral infection [6].

If the symptoms are more severe, supportive treatments may be given by doctors in hospital. This type of treatment may be-

- Fluid to reduce the risk of dehydration.
- Medication to reduce a fever.
- Supplemental oxygen in more severe cases. in some very severe cases patient needs to ventilator also

Drugs used so far are-

1. Hydroxychloroquine 400mg orally for 7 to 10 days or Chloroquine phosphate 500mg BID for 10 days along with Azithromycin
2. Oseltamavir 150mg for 5 days
3. Lopinavir/Ritonavir
4. Intravenous Ascorbic Acid (IVAA)- : 100 mg / kg given over 24 hours in a continuous infusion
5. Ivermectin

**Chemoprophylaxis**-Hydroxychloroquine 200 mg BID for 7 days  
BCG Vaccination as it revokes immunity

memory

**Drugs to be avoided**-Ibuprofen, Aspirin

## V. DISCUSSION

On 11 march 2020,WHO declared “ Novel corona disease outbreak as pandemic and reiterated the call for countries to take immediate actions and scale up response to treat ,detect and reduce transmission to save people’s lives [8], Prevention is better than cure in case of corona disease .In India, honorable Shri Narendra modi ji ,Prime Minister of India has already lockdowned our country for 21 days to prevent the community spread of covid 19 and 50% successful but ,the main question is , this Would be a working on corona virus? Some researchers has given their opinion that “The number of corona virus patients would be increased after 21 day of lockdown so for complete prevention of corona disease ,the lockdown should be increased for 49 days in two way, either complete lockdown for 49 days or there will be 5 days gaps between lockdown eg 21 days – 18 days – 10 days .

## VI. CONCLUSION

“Prevention is better than cure”, because it was observed that within 5 month, the degrees of spreading and illness is very high of Corona virus disease 2019 (COVID-19) and presently there is no specific treatment or vaccine available for COVID-19 so self quarantine and social distancing is the best option to prevent from this disease. Use of soap for hand washing can

minimizes the chances of infection, containment and prevention is the best option to fight against COVID-19 [9].STAY IN HOME IS THE BEST MEDICINE.

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# Critical Success factors for the implementation of PPP model in the A.H. segment in India

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**Abstract:** This research work aims to find out the critical success factors (CSFs) with implementing PPP in affordable housing segment in India. Housing can be a way to define the living standard of a country. As India is a developing country and moving towards the urbanisation with a very faster pace, it results the increased cost of land, development of slums, shortage of affordable housing for low or medium income groups. It becomes difficult for the low or medium income people to purchase a house in the urban areas.

The government of India takes number of initiatives to tackle the problem of affordable housing. The involvement of private sector has playing a major role in the success of Affordable housing projects. The provision of housing for all cannot be the only responsibility of public sector. The burden on government can be reduced by investment from private sector. Affordable housing in Partnership, plays major role for promoting, the affordable housing. The community and private sector are the prominent resources, which have to be incentivized and channelized in the process. There are also various important factors which affect the success of Public private partnership in affordable housing.

The main objective of this research is to investigate these factors. To ascertain the importance of these factors, the study includes three bodies of knowledge. The first body is centered towards thorough literature study for finding important critical success factors for PPP success in affordable housing. The second body prepared the checklist for questionnaire further third body consists of survey on Likert scale and analyzing the result. The study includes a total of 92 Critical success factors (CSFs) categories under twelve critical success criteria. The highest Weightage CSFs (total of 41) critical success factors are shortlisted for questionnaire and are assessed by 19 respondents. The combination of these five bodies of knowledge into one literature developed the final conclusion.

**Keyword:** Affordable Housing, Public- Private Partnership, Critical Success Factors, Government Policies

## I. INTRODUCTION

Housing can define quality of life, economic growth and wellbeing of a country. The Cities across the world has becomes more economically powerful and essential than ever in terms of the education, employment or better living of standard. This escalated demand of urban land which increase the cost and shortage of A.H. for low and medium housing groups. This migration of people for the education, employment or better living of standard towards the developed cities has increased the burden on the urban areas. This growing concentration leads to congested transit, land shortages, slum development and also stressed out the primary needs of human being such as shortfall of houses, open spaces in towns & cities. The urban population of India increased from 27.81 % to 31.16 % during 2001-2011(census of India, 2011). Urban population is expected to reach about 600 million by 2031(taskforce report, MHUPA 2012). The housing shortage in the beginning of 12<sup>th</sup> five year plan (2012) is estimated 18.78 million, a number which was later revised to 100 million in 2017. The goals of A.H. are quite obvious ones but on close analysis, we find some less obvious reason which is equally important. The obvious reasons are providing shelter and the potential creation of wealth. The other reasons could be more participation of economically weaker sections in society, better living standards, facilities, educational and employment opportunities.

Due to this high pace of rapid urbanization, the demand for A.H. enhanced tremendously. This demand could be fulfilled if both the government and the private sector come together. India is finding the ways to implement public- private partnership (PPP) model in A.H., which helps to integrate the private sector funding in A.H. It would definitely shoulder the burden of land prices and the cost of construction, which represents there are vast opportunities in housing for the private sector, then just lucrative investment options. The

success of public- private partnership in A.H. is controlled by a number of factors which could be demonstrated as Critical Success Factors (CSFs). So, this study based on the CSFs for Implementation of PPP model in A.H. segment in India.

### ***Aim and Objective***

The aim is to find out Critical Success factors for the implementation of PPP model in the A.H. segment in India.

Objectives are as discussed below:-

- a) To determine the critical success factors for implementation of public private partnership in A.H.
- b) To do the ranking of critical success factors for implementation of public private partnership in A.H.

### ***Methodology***

The research concentrates on Critical Success factors for the implementation of PPP model in the A.H. segment in India. The research involves a combined questionnaire survey of professionals who have experience in handling PPP model in the A.H. The case studies are based on A.H. projects of Delhi and Gurgaon. The research starts with a comprehensive literature review of the identification of the success factors in PPP model in the A.H. Most of studied literature includes published literature, unpublished papers, books and internet resources relevant to area of investigation. Literature review provides a major support to make decisions on selecting success factors which affect the success of project. Brainstorming session provided a framework for making questionnaire for research work. This includes the case study of actual ongoing A.H. project on PPP mode. By literature review it is analysed that there are various factors which are responsible for the projects where construction of A.H. is going on with PPP mode.

### ***Significance of Project***

The A.H. is a project which will reduce the difference between various income groups in terms of their living standards. The need of A.H. arises with increment of the slum areas. When communities take a moment to consider their most important assets, the aspects that are often mentioned include high-quality schools, employment and living standard. Instead, they may travel long distances from more reasonably-priced suburbs. Due to limited income source the middle income group people are unable to afford a house in a high quality environment. The partnership with private sector would lead to faster completion and use of technology in the project.

## **II. LITERATURE REVIEW**

This chapter presents literature review on the subject of Critical success factors for the implementation of PPP model in A.H. The literature review is collated from various published and unpublished sources, which include international & national journals, conferences, books, reports, thesis and other reference. The next section deals with the integrative research papers. The third section presents methodological research papers and the fourth section narrates theoretical literature. The fifth section reviews the books on the subject. The chapter concludes with reviews of critical success factors and for the implementation of PPP model in A.H.

### ***List of Critical Success factors from Literature Review***

Based on literature review and by holding discussions with experts who are working actually in field, 92 CSFs were identified. After analyzing, these factors were grouped under 12 principal criteria. These numerous factors are Categorised under different Criteria such as political, social and financial, Legislation, Partnership, Land, Project Management, Feasibility study, Risk, Profit and Environmental affect the success of Public private partnership in A.H. Ashwin Mahalingam, M.ASCE1(2009) Concluded Political Willingness, Transparent political situation, Social support, Project economic viability, Access to finance and Favourable legal framework etc. as the Enablers in the PPP Experiences in Indian Cities. Similarly Yahaya Ahmed and Ibrahim Atan Bin Sipan (2019) concluded Project economic viability, efficient legal framework most critical for PPP model in A.H. segment in affordable housing in nigeria using critical success factors of public private partnership. Affordable housing development in india: current models and their replication by Ramakrishna Nallathiga\*\$, S P Lele\*\* and J V V Prasad(2018) states that Government guarantee, Political support, Effective land use planning, consistent monitoring are critical. An examination of the critical success factors for public private partnership in Housing projects in Nigeria written by Paschal Onyemaechi, Martin Samy and David Pollard(2015) states a number of factors for A.H.

<b>S.NO.</b>	<b>I. POLITICAL CRITERIA</b>
CF1	Political Willingness
CF2	Well-organized and committed public agency
CF3	Government guarantee
CF4	Efficient approval process
CF5	Public sector negotiating skills
CF6	Good and favourable governance
CF7	Political influence
CF8	Stable political situation
CF9	Transparent political situation
CF10	Political support
CF11	Statutory and political Environment
CF12	Public sector adequate negotiation staff
<b>S.NO.</b>	<b>II. SOCIAL CRITERIA</b>
CF13	Developer's social accountability
CF14	Slum Rehabilitisation
CF15	Stable and effective social support
CF16	Transparent social situation
CF17	Accessibility
CF18	Social support
<b>S.NO.</b>	<b>III. FINANCIAL CRITERIA</b>
CF19	Stable micro and macro-economic system
CF20	Expected debt paying ability of the project
CF21	Available strong and resilient financial market/ Favourable investment environment
CF22	Project economic viability
CF23	Sound financial package
CF24	Financial Framework/structure
CF25	Access to finance
CF26	Cross Subsidy
CF27	Adequate Funding and its provisions
CF28	Public guarantee's for loan
CF29	Available financial market or availability of suitable financial market
<b>S.NO.</b>	<b>IV. LEGISLATION CRITERIA</b>
CF30	Efficient legal framework
CF31	Favourable legal framework
CF32	Action against errant developers
<b>S.NO.</b>	<b>V. PARTNERSHIP CRITERIA</b>
CF33	Business diversification
CF34	Ample time to evaluate proposal
CF35	Robust and clear agreement
CF36	Competition
CF37	Shared authority, openness and communication between public and private sectors
CF38	Selecting the right partner
CF39	Removal of Wide gap between public and private sector expectations
CF40	Public guarantee's for loan
CF41	Management transfer from public to private sector
CF42	Independent authority for conflict resolution
CF43	Assistance in PPP
CF44	Strong and good private consortium/capable private partner
CF45	Experience in partnering
CF46	Indecisiveness, compatibility, and strong partners relationship
CF47	Consultation with end-user
<b>S.NO.</b>	<b>VI. LAND CRITERIA</b>
CF48	Availability of marketable land parcels
CF49	land acquisition
CF50	Availability of Land

CF51	Land Finance
CF52	Effective land use planning
<b>S.NO.</b>	<b>VII. PROJECT MANAGEMENT CRITERIA</b>
CF53	Project management success/Support
CF54	Client Involvement
CF55	Consistent monitoring
CF56	Realistic projection
CF57	Refutable developer
CF58	Quality Work
CF59	Rental cost in relation to income
CF60	Reduce life cycle cost of housing facility
CF61	Realistic Cost and Time Estimates
CF62	(Detailed) thorough and realistic assessment of the cost and benefits
CF63	Commuting cost from the location of housing to public facilities
CF64	Operational cost over-run
<b>S.NO.</b>	<b>VIII. FEASIBILITY STUDY CRITERIA</b>
CF65	Right project identification
CF66	Demand of project
CF67	Favourable locations/Connectivity
CF68	Appropriate project identification Design
CF69	project design and structuring
CF70	Planning and design with fast legal approvals
CF71	Duration
CF72	House buyers' demand
CF73	Pre-Analytical study of project
<b>S.NO.</b>	<b>IX. RISK CRITERIA</b>
CF74	Equitable risk allocation and sharing
CF75	Detailed risk analysis
CF76	Delaying Project approvals and permits
CF77	Appropriate risk allocation and risk sharing
<b>S.NO.</b>	<b>X. TECHNICAL CRITERIA</b>
CF78	Adequate Latest Technology and construction
CF79	Technical competence
CF80	Geotechnical Conditions
CF81	Workmanship
CF82	Availability of Resources
CF83	Transparent Procurement
CF84	Technical specification of housing
CF85	Project technical feasibility
<b>S.NO.</b>	<b>XI. PROFIT CRITERIA</b>
CF86	Multi benefit objectives
CF87	Developer's profit sharing accountability
CF88	Project profitability
CF89	Profit assurance for private sector
<b>S.NO.</b>	<b>XII. ENVIRONMENTAL CRITERIA</b>
CF90	Environmental protection
CF91	Environmental performance of housing facility (Eco-friendly)
CF92	Use of environmental friendly materials

ii. Conclusion

This research work is centred towards detailed study of Critical Success Factors with through literature study. After finding critical success factors for PPP success in affordable housing which includes a total of 92 Critical success factors (CSFs) identified. These are categorized by twelve critical success criteria. The highest Weightage CSFs (total of 42) critical success factors are shortlisted for questionnaire and are assessed by 20 respondents.

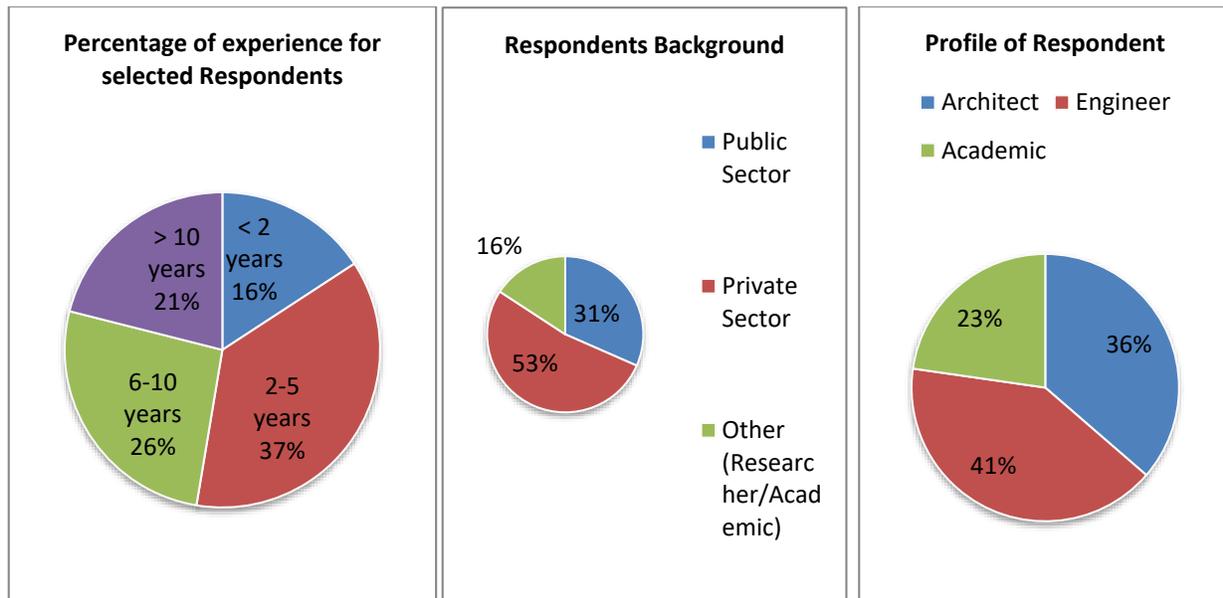
### III. QUESTIONNAIRE SURVEY

This section deals with the questionnaire survey related to study critical success factors for the implementation of PPP model in A.H. In this survey the respondents are client, contractor/professionals and researcher. The questionnaire consists of two parts, part A shows the respondent personal Info. Such that whether he is a contractor, engineer, architect or project manager etc., their work experience and designation in their company. Part B consists of success factors identified from literature review. The respondents were asked to rate the factors on an interval scale 1-5. Value of 1 is given to the factor having relatively least importance and value 5 given to factor which is extremely important for the Public private partnership implementation in affordable housing segment in India. A total of 92 factors were identified from literature study and sub grouped in 12 criteria. Depending upon highest Weightage, 41 factors were shortlisted for the questionnaire. Total 19 responses were obtained for the questionnaire survey. The demographic of respondents about their experience are given below. Experience of the respondents was asked during the questionnaire survey, 21 % of the respondents had an experience greater than 10 years and 26 % were in the range of 6-10 years experience in Construction.

#### i Demographics of Respondents

Category	Total Experience	No. of Respondents	%
1	< 2 years	3	16
2	2-5 years	7	37
3	6-10 years	5	26
4	> 10 years	4	21

S.No.	BACKGROUND	NO. OF RESPONDENTS	S.No.	PROFILE OF RESPONDENTS	NO. OF RESPONDENTS
1	PUBLIC SECTOR	6	1	ARCHITECT	8
2	PRIVATE SECTOR	10	2	ENGINEER	9
3	OTHER (RESEARCHER/ACADEMIC)	3	3	ACADEMIC	5



### IV DATA ANALYSIS AND RESULT

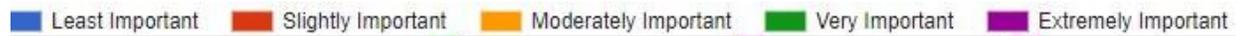
This section includes the analysis and results for the data collected in Phase I of the study. This chapter is divided into three main sections, section one deals with result analysis of Critical Success factors , section two comprises of descriptive analysis and in section three the view of respondents on the critical success factors for the affordable housing segment in India. Data Collection is done by using Likert scale method for the analysis importance of Critical Success factors for the implementation of PPP model in the A.H. segment in India.

Based on score, the importance gained by overall respondents the factors were ranked.

Sample size=13

Total respondents=19

In rating scale 1 indicates least important and 5 indicate extremely important.



The relative importance Index of all factors are then found by calculating RII based on which ranking is done. After that Ranking of Critical Factor for Success as per RII (Relative Importance Index) are sequenced; in ascending order.

The formula of RII as given below:

$$\text{Relative Importance Index (RII)} = \frac{\sum W}{A * N}$$

$$= \frac{(5n_5 + 4n_4 + 3n_3 + 2n_2 + 1n_1)}{5n}$$

Where w is the weighting given to each factor by the respondent, ranging from 1 to 5, (n1= number of respondent give least important 1, n2= number of respondent give slightly important, n3= number of respondent give moderately important, n4= number of respondent give very important. N5= number of respondent give extremely important. A is the highest weight (i.e. 5 in the study) and N is the total number of samples.

Factors	1	2	3	4	5	RII	Ranking
Effective land use planning	0	1	2	6	10	0.863158	1
Quality Work	0	1	3	7	8	0.831579	2
Availability of Land	1	1	2	7	8	0.810526	3
Planning and design with fast legal approvals	1	1	2	7	8	0.810526	3
Adequate Funding and its provisions	0	3	3	4	9	0.8	4
Favourable locations/Connectivity	0	2	3	7	7	0.8	4
Transparent Procurement	0	3	1	8	7	0.8	4
Access to finance	0	2	2	10	5	0.789474	5
Land Finance	1	2	1	8	7	0.789474	5
Government guarantee	1	2	2	7	7	0.778947	6
Consistent monitoring	1	3	1	6	8	0.778947	6
(Detailed) thorough and realistic assessment of the cost and benefits	1	1	4	6	7	0.778947	6
House buyers' demand	0	2	3	9	5	0.778947	6
Environmental performance of housing facility (Eco-friendly)	1	3	4	5	7	0.778947	6
Well-organized and committed public agency	1	2	2	8	6	0.768421	7
Project economic viability	0	3	2	9	5	0.768421	7
Adequate Latest Technology and construction	1	2	3	7	6	0.757895	8
Technical competence	1	1	4	8	5	0.757895	8
Project management success/Support	0	3	2	11	3	0.7474	9
Detailed risk analysis	1	2	5	5	6	0.736842	10
Use of environmental friendly materials	1	3	3	6	6	0.736842	10
Transparent political situation	2	1	6	3	7	0.726316	11
Available financial market or availability of suitable financial market	1	3	3	7	5	0.726316	11
Efficient legal framework	0	5	3	6	5	0.715789	12
Action against errant developers	0	3	4	5	6	0.715789	12
Strong and good private consortium	1	4	2	7	5	0.715789	12
Stable and effective social support	0	5	3	8	3	0.694737	13
Equitable risk allocation and sharing	0	4	5	7	3	0.694737	13

V.	Multi benefit objectives	1	3	5	6	4	0.694737	13
	Shared authority, openness and communication between public and private sectors	1	4	3	8	3	0.684211	14
	Project profitability	1	2	4	7	4	0.684211	14
	Appropriate risk allocation and risk sharing	2	1	5	10	1	0.673684	15
	Indecisiveness, compatibility, and strong partners relationship	1	3	7	4	4	0.673684	15
	Environmental protection	3	3	2	6	5	0.673684	15
	Profit assurance for private sector	2	3	3	9	2	0.663158	16
	Favourable legal framework	1	5	4	6	3	0.652632	17
	Delaying Project approvals and permits	2	1	7	8	1	0.652632	17
	Political Willingness	3	3	4	5	4	0.642105	18
	Transparent social situation	1	3	6	5	3	0.631579	19
	Political support	4	4	3	4	4	0.6	20
	Social support	2	6	5	4	2	0.578947	21

### CONCLUSION

Based on the overall respondent result the critical success factors are arranged in ascending order of their ranks; attribute with highest rank 1 indicates that it has max. Impact on the success of A.H. in partnership, attribute with lowest rank indicates that it has relatively less impact then other.

Ranking	Critical Success factors				
1	Effective land use planning				
2	Quality Work				
3	Availability of Land	Planning and design with fast legal approvals			
4	Adequate Funding and its provisions	Favourable locations/Connectivity		Planning and design with fast legal approvals	
5	Access to finance	Land Finance			
6	Government guarantee	Consistent monitoring	(Detailed) thorough and realistic assessment of the cost and benefits	House buyers' demand	Environmental performance of housing facility (Eco-friendly)
7	Well-organized and committed public agency	Project economic viability			
8	Adequate Latest Technology and construction	Technical competence			
9	Project management success/Support				
10	Detailed risk analysis	Use of environmental friendly materials			
11	Transparent political situation	Available financial market or availability of suitable financial market			
12	Efficient legal framework	Action against errant developers		Strong and good private consortium	
13	Stable and effective social support	Equitable risk allocation and sharing		Multi benefit objectives	
14	Project profitability	Shared authority, openness and communication between public and private sectors			
15	Appropriate risk allocation and risk sharing	Indecisiveness, compatibility, and strong partners relationship		Environmental protection	

16	Profit assurance for private sector	
17	Delaying Project approvals and permits	Favourable legal framework
18	Political Willingness	
19	Transparent social situation	
20	Political support	
21	Social support	

In future research, further work is needed to explore in more detail and to understand how the factors interact with each other in Affordable housing project. 42 critical success factors are selected on the basis of in depth literature review and case study. Ranking of Factors are calculated using the Relative Importance index. Ranking of CSFs are as follows;

- i. Effective Land use Planning
- ii. Quality Work
- iii. Planning and design with fast legal approvals
- iv. Favorable locations/Connectivity
- v. Access to finance
- vi. House buyers' demand

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# Appraising The Influence Of Socio-Economic Characteristic Of Members On Their Level Participation In Cooperative Society In Adamawa State, Nigeria

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**Abstract:** This study appraised the influence of socioeconomic characteristic of members on their participation in cooperative societies in Adamawa State. In order to achieve the objectives, this study was guided by three research questions. The structured questionnaire was used to collect data from randomly selected 397 members from four agricultural zones of the state. This study recorded 95% returning rate and data collected were analysed with simple percentage, frequency table and chi-square. The results of analysis established that majority of members of cooperative in Adamawa state were self-engaged, fairly educated, married and in their active ages. This study also found insignificant differences in the level of commitment of respondents irrespective of their level of education and job types. Also, there was insignificant difference in the proportionate of members benefiting from cooperative irrespective of their education and job type. However, this study shows slightly influence of education in participation and benefits. This study concluded that cooperatives are for all class of work, ages, gender, marital status as well as educational level. This study recommended for government policy and awareness for more participation among government workers. Also the study recommended for government should integrating cooperative education in our school curriculum to make people have more appreciation for the cooperative societies.

**Keywords;** Cooperative Societies, Socio-Economic Characteristics, Members, Participation

## INTRODUCTION

In an era when many people feel powerless to change their livelihoods, cooperatives may represent a strong, vibrant and viable economic alternative for poverty reduction (Dogarawa, 2009). It was reported by World Bank (2014) that over the years, many governments and people in different parts of the world have shown great interest in the activities of cooperative societies. This is as a result of the roles which the organizations play in all fields of human endeavors especially as they serve as vital alternatives to strengthening the weak economy and social status of the rural poor (Tanko, 2002). The Department for International Development, DFID (2011), stressed that cooperative is all about peoples' organizations, to capture wide range of opportunities in the economy, where they can address their socio-economic needs and aspirations. However, the technical and productive bases of the societies which form the prime movers of the real economy are weak, obsolete, disperse, and the sectorial linkages are poor.

Nigeria is richly endowed with both human and natural resources. Despite the vast resources, the country's economy has not experienced the required institutional and structural changes that guarantee rapid and sustainable growth relative to an acceptable standard of living (United Nation, 2014). Odebode (2009) mentioned that the development trend in Nigeria's economic sector did not reflect its great wealth in terms of human and natural resources. This assertion was supported by United Nation's Report of 2007: that despite the abundant agricultural resources and oil wealth, poverty is wide spread in the country and has increased since the late 1990. The report stated that over 62% of Nigerians are classified as poor with about 35% of them living in absolute poverty. International Fund for Agricultural Development, IFAD (2014) also reported that poverty is specifically severe in rural areas where up to 69.8% of the population live below the poverty line and social services/infrastructure are limited, leading to

decline in productivity of the majority agricultural oriented activities. The scenario necessitates for devising means towards changing the orientation of mobilizing, harnessing, harmonizing and transforming the resources in order to uplift the production level and the socio-economic life of the average Nigerian. As one of the measures towards the attainment of these goals, cooperative society's concepts stand as a panacea especially where 60–75% of the population is dependent on agriculture as profession, and most of whom live under poor conditions in the rural areas. Poverty has been a serious challenge to Nigerians. The effect of poverty includes inadequacy, hopelessness, powerlessness and deprivation in the basic necessities of life (Adegeye & Dittoh, 1995).

According to Sizya (2007), cooperative societies play a significant role in poverty reduction among smallholder farmers who comprised the majority of the rural poor by providing effective production support and marketing services. The Cooperatives Development Policy of Nigeria [CDPN] (2010), defined cooperatives as associations or organizations made up of group of persons who voluntarily agree to come together and utilize their major resources for the pursuit of their common goals and objectives. Cooperatives are private member oriented enterprises that operate on the principles of democracy and free market economy. They are often established as voluntary associations of like-minded people (Tanko, 2002).

The role of cooperative societies as one of these measures cannot therefore be over-emphasized, especially in Adamawa State, Nigeria, where large number of the populace are poor and live in rural areas. Generally, cooperatives focus on provision of credit facilities to its members, provision of employment opportunities, aids in building members saving capacities; partake in some business activities on behalf of members, provision of loanable productive assets, which strengthen the livelihood of members and their households. Cooperatives are supposed to be self-reliant, self-controlling, and self-sustaining peoples' oriented organizations. They are organizations where people voluntarily associate together mutually on the basis of equality to promote common economic interest for the upliftment of their standard of living (Tanko, 2002).

In a developing economy such as that of Nigeria, cooperative societies have been reckoned with as catalysts for development. Since the establishment of Nigeria's first cooperative society in 1934, there has been an upsurge in the formation of various types of cooperative societies (Olayide and Falusi, 1978). Despite its old age, cooperatives have not made significant strides in Nigeria, especially in the northern part of the country. Only recently, workers cooperative societies started gaining ground among working class citizens, most of who find it difficult to save part of their salaries. Cooperatives were thought to be associations meant for the poor, especially, farmers, small traders and low income earners (Dogarawa, 2009). The orientation of majority of educated and so-called elites in the society about cooperatives is that cooperative is not fit their status or having little to offer them economically. Recently in Adamawa State, the state Ministry of Commence and Industries, MCI (2015) reported that 87% of registered cooperative societies in Adamawa state, are agricultural cooperative, while 9% are cooperative societies for women wings of various religion organisations and the remaining 4% are general purposes cooperative societies. This report shows that working class citizens are not duly represent in cooperative membership. More also, the reviews by Adesina (1998), Bebeji (2001), Asaolu (2004), Akinwumi (2006), Armando (2008), Birchall and Ketison (2009), and Akiniyi (2013) indicated that majority of membership of cooperative societies comes from occupation such as agricultural production, tailoring, trading, carpentry, bricklaying, handcrafts, blacksmithing, while in some cases, few are found to be primary schools teachers.

The non-participation of majority of elites individual on the premises that cooperative societies has little role to play in their economic status or perceiving cooperative as societies that belittle their status contradicted the initial arguments by many pioneer of cooperative societies, such as Adesina (1998), Asaolu (2004), Akinwumi (2006), and Adurayemi (2014), that cooperative is meant for all ages, working classes, and people of different background. This study therefore, is an attempt to access whether the cooperatives are truly fitted particular socioeconomic status than others.

## Objectives

- i.) Determine the trends in the socio-economic characteristics of members of cooperative societies in the study area
- ii.) Determine the influence of socio-economic characteristics of members on their commitment to the cooperative activities
- iii.) Determine the influence of socio-economic characteristics of members on their level benefit derive from cooperative activities.

## Research Questions

1. What are the trends in the socio-economic characteristics of members of cooperative societies in the study area?
2. What are the influences of socio-economic characteristics of members on their commitment to the activities of cooperatives societies?
3. What are the influences of socio-economic characteristics of members on their benefit derived from cooperatives societies?

The findings of this study will be of immense benefit to the members of cooperatives in Adamwawa state to gear-up in their commitment to the activities of cooperatives, when realized that they were members of cooperative not because they were lowly rated members of society but to improve their economic and their general well-being. Also, the findings of this study will be an eye-openers for majority of civil servant workers that had been underrating the cooperatives, these set of people will realized the opportunities they had been denying thierselve as results of not participating in cooperative societies. Also the findings of this study will be highly useful to donor agencies, institutions of learning, scholars wishing to undertake further studies on the development of cooperatives, and most of all, serve a useful document for policy formulation on strategy development for poverty alleviation by the local, State and Federal Governments.

## Materials and Methods

Adamawa state is made-up of twenty-one Local Government Areas, which are zoned into four (4) Agricultural zones based on the climatic and types of crop grown (Kadams and Sajo, 1999). In all, there are 1140 cooperative societies with total of 54,280 members. Taro Yamane sample formula was used to randomly select total of 397 members of cooperatives societies from population, comprises total 126 members from Zone A, 87 from Zone B, 75 from Zone C and 109 from Zone D respectively. The structured questionnaire was used to collect data from sampled respondents and data were analyzed using simple percentage, frequency count and chi-square.

Commitment to cooperative activities was determine for each members in this study through their level of participation in the meeting, promptness of making dues payment and loan repayment as well as readiness to offer assistance to society. Also, the benefit derive from participating in cooperative societies were determined through dividend received by sampled members, their accessibility to loan facilities, the relevant of loan to the development of their business. All these were used determine in 4-point rating scale to arrive at three level of commitment and benefit derived for each respondent.

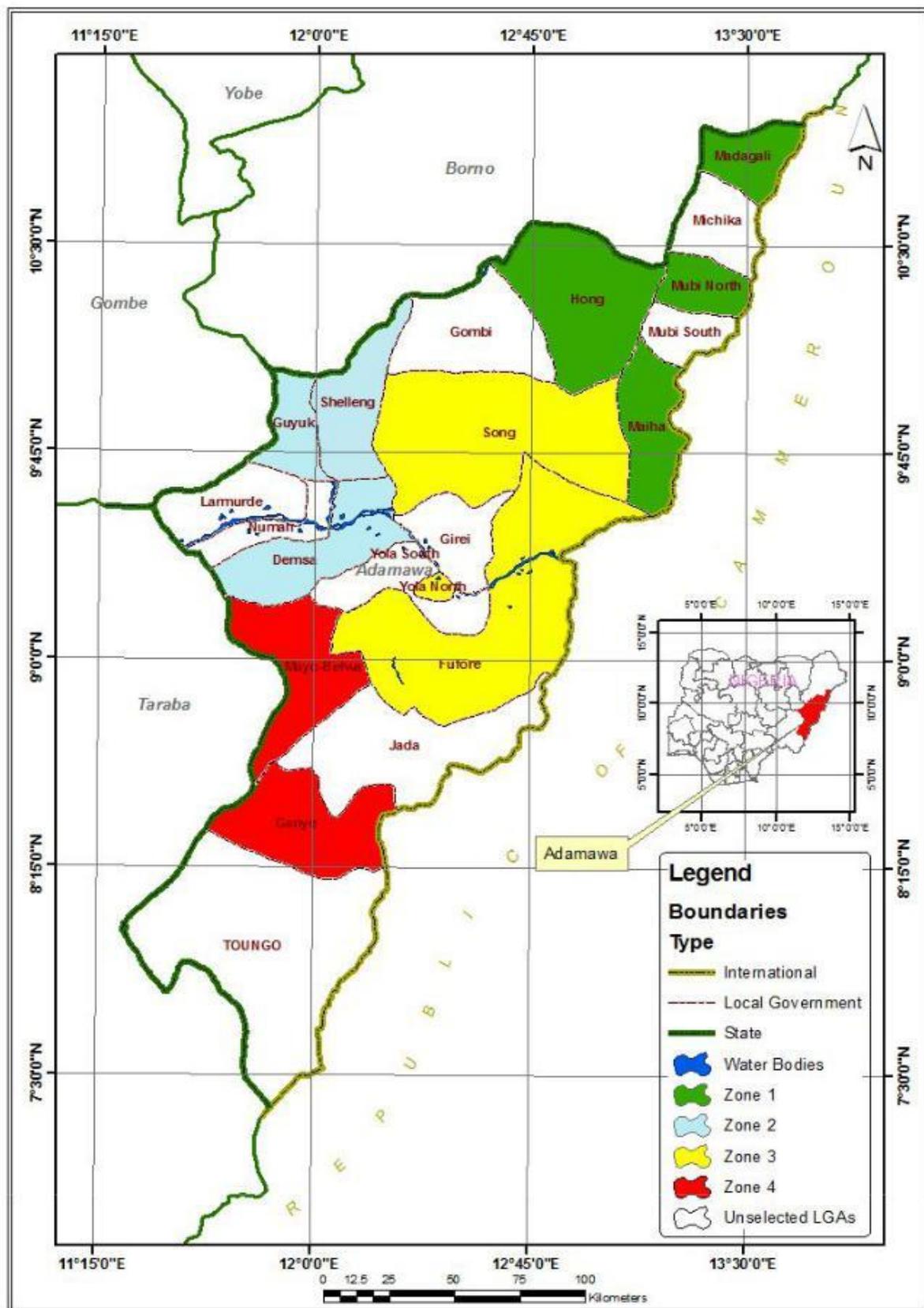


Figure 1: The Study Area

**RESULTS AND DISCUSSIONS**

**Research Question 1:** What are the trends in the socio-economic characteristics of members of cooperative societies in the study area?

**Table 1: Socioeconomic Characteristic of Sampled Members of Cooperative Societies**

Variables	Zone 1	Zone 2	Zone 3	Zone 4	Overall
	Fx(%)	Fx(%)	Fx(%)	Fx(%)	Fx(%)
<b>Age Group</b>					
18 – 29 years	36(30%)	23(29%)	14(20%)	24(22%)	97(26%)
30 – 49 years	58(49%)	41(51%)	53(77%)	56(52%)	208(55%)
50 years above	25(21%)	16(20%)	2(3%)	28(26%)	71(19%)
Total	119(100%)	80(100%)	69(100%)	108(100%)	376(100%)
<b>Gender</b>					
Male	76(64%)	48(60%)	38(55%)	69(64%)	231(61%)
Female	43(36%)	32(40%)	31(45%)	39(36%)	145(39%)
Total	119(100%)	80(100%)	69(100%)	108(100%)	376(100%)
<b>Marital Status</b>					
Married	42(35%)	38(48%)	28(41%)	45(42%)	153(41%)
Single	23(19%)	34(43%)	29(42%)	34(31%)	120(32%)
Divorcees/Widows	54(45%)	8(10%)	12(17%)	29(27%)	103(27%)
Total	119(100%)	80(100%)	69(100%)	108(100%)	376(100%)
<b>Educational Level</b>					
Primary	24(20%)	24(30%)	8(12%)	33(31%)	89(24%)
Secondary	34(29%)	32(40%)	21(30%)	30(28%)	117(31%)
Tertiary	24(20%)	8(10%)	20(29%)	15(14%)	67(18%)
Non formal	37(31%)	16(20%)	20(29%)	30(28%)	103(27%)
Total	119(100%)	80(100%)	69(100%)	108(100%)	376(100%)
<b>Occupation Type</b>					
Farming	35(29%)	42(53%)	22(32%)	56(52%)	155(41%)
Trade/Marketing	45(38%)	17(21%)	21(30%)	22(20%)	105(28%)
Public/Civil Service	21(18%)	13(16%)	24(35%)	20(19%)	78(21%)
Others	18(15%)	8(10%)	2(3%)	10(9%)	38(10%)
Total	119(100%)	80(100%)	69(100%)	108(100%)	376(100%)

Fx: frequency, (%): Percentages in Parenthesis

The results on Table 1 revealed the socioeconomic variable of the sampled members of cooperatives across the four zones, in Adamawa State. The results indicated that in overall, 26% of the respondents were within the age range of 18 – 29 years. Also, 55% of sampled member of cooperatives were within the age range of 31 – 49 years while the remaining 19% were those with age 50 years and above. This result shows that most respondents were within their active ages. However, the presence of other age groups indicated that the membership of cooperative societies fitted all ages of individual.

More also, the table indicated the gender distribution of respondents, that 61% were male while 39% were female. This reveals that men seem to dominate cooperative activities in the study area during the period of the study. This result may not be unconnected with the popular practice of the communities in the study area that men should shoulder most of the family responsibilities, while women are concerned more with the domestic responsibilities. Also, the results of distribution of sampled member of cooperative by their marital status indicated that in overall, 41% of the sampled member of cooperative are married, 32% are single, while the remaining 27% were either divorcees or widows. This result show that all category of marital status fitted being member of cooperative societies.

The results on the Table 1 also revealed the educational background of respondents. The results indicated that in overall, 24% of the members of cooperative hold primary schools certificates, 31% have secondary schools education while 18% of the sampled members of cooperative hold certificates from various Tertiary institutions and the remaining 27% were those without formal education. This result indicate that most sampled members of cooperative are having formal education and this factor is expected to be one of influential factors affecting their disposition towards cooperative activities as well as the benefit they might be deriving from cooperatives. More also, it is evident from this result that all category of people irrespective of their educational background can still participate as member of cooperative societies.

The type of occupation has depicted in the Table 1 revealed that most sampled member of cooperative societies were into farming, 28% were into trading or marketing activities, while 21% were those in public or civil service and the remaining 10% were those with other economic activities. This result shows that majority of members of cooperative are self-engaged such as such as agricultural production, tailoring, trading, carpentry, bricklaying, handcrafts, blacksmithing among other while those in civil and public organisation are sparsely represented.

**Research Question 2:** What are the influences of socio-economic characteristics of members on their commitment to the activities of cooperatives societies?

**Table 2.1a: Influences of Education on Members’ Level of Commitment to Cooperative Activities**

Commitment level		Educational Background				Total
		Primary	Secondary	Tertiary	Non-Formal	
NCM	Count	26	0	0	35	61
	%	29.2%	0.0%	0.0%	34.0%	16.2%
CM	Count	33	61	30	32	156
	%	37.1%	52.1%	44.8%	31.1%	41.5%
HCM	Count	30	56	37	36	159
	%	33.7%	47.9%	55.2%	35.0%	42.3%
Total	Count	89	117	67	103	376
	%	100.0%	100.0%	100.0%	100.0%	100.0%

NCM: not committed, CM: Committed, HCM: Highly committed

**Table 2.1b: Results of Chi-Square Analysis on Influence of Educational Qualification of Members of on their Level of Commitment to Cooperative Activities**

	Value	Df	Sig. (2-sided)
Pearson Chi-Square	9.984	6	.227
Table value	12.59		
N of Valid Cases	376		

**Table 2.2a: Influences of Job Types on Members’ Level of Commitment to Cooperative Activities**

		Job Type				Total
		Farming	Trading	Civil/Public Servant	Others	
NCM	Count	25	12	15	9	61

	%	16.1%	11.4%	19.2%	23.7%	16.2%
CM	Count	66	41	36	13	156
	%	42.6%	39.0%	46.2%	34.2%	41.5%
HCM	Count	64	52	27	16	159
	%	41.3%	49.5%	34.6%	42.1%	42.3%
Total	Count	155	105	78	38	376
	%	100.0%	100.0%	100.0%	100.0%	100.0%

NCM: not committed, CM: Committed, HCM: Highly committed

**Table 2.2b: Results of Chi-Square Analysis on Influence of Members’ Job Type on their Level of Commitment to Cooperative Activities**

	Value	df	Sig. (2-sided)
Pearson Chi-Square	6.740 <sup>a</sup>	6	.346
Linear-by-Linear Association	12.59	1	.367
N of Valid Cases	376		

The results on Table 2a revealed the influence of education on members’ commitment to cooperative activities. The results indicated that 47.9% and 55.5% categories of respondents with secondary and tertiary educational backgrounds indicated highly commitment respectively, while in the primary and non-formal educational categories 37.1% and 31.1% of the sampled members of cooperative indicated commitment to cooperative activities. More also, the result of chi-square analysis revealed 9.895 which is less than critical value 12.59 at degree of freedom of 6, p-value > 0.05. Therefore, this result indicates insignificant difference in the impact of education on level of commitment. This implies that those with higher level of education as well as those lower education commitment to the activities of the cooperatives almost in similar pattern. However, those with higher educational qualification show a bit more commitment to cooperative education than those with low level of education.

More so, the results on Table 3a revealed the influence of members’ job types on their commitment to cooperative activities. The results revealed the 41.3% of farmers, 49.5% of traders, and 34.6% of those in civil or public offices as well as 42.1% of those in others commercial activities highly committed to cooperative activities. Likewise, the result of chi-square analysis revealed chi-square value 6.740 which is less than 12.59, at degree of freedom of 6, p-value >0.05. Therefore, this result indicated that members’ job type does not significantly influence their commitment. This implies that all types of job of the members of cooperative do not influence participation better than the others.

These results showed that socioeconomic of members does not significant influence their commitment to cooperative activities. Rather, the results indicated that good education can makes members of cooperative societies to be more committed to various activities of cooperative.

**Research Question 3:** What are the influences of socio-economic characteristics of members on their benefit derived from cooperatives societies?

**Table 3.1a: Influences of Education on Members’ Level of Benefits Derived Through Cooperative Activities**

		Educational Background				Total
		Primary	Secondary	Tertiary	Non-formal	
Benefited	Count	48	61	36	52	197
	%	53.9%	52.1%	53.7%	50.5%	52.4%
Not Benefited	Count	41	56	31	51	179
	%	46.1%	47.9%	46.3%	49.5%	47.6%
Total	Count	89	117	67	103	376
	%	100.0%	100.0%	100.0%	100.0%	100.0%

**Table 3.1b: Results of Chi-Square Analysis on Influence of Educational Qualification of Members of on their Level of Benefits Derived from Cooperative Activities**

	Value	df	Sig. (2-sided)
Pearson Chi-Square	0.286	3	.963
Table value	7.815		
N of Valid Cases	376		

**Table 3.2a: Influences of Job Types on Members’ Level of Benefits Derived from Cooperative Activities**

		Job Type				Total
		Farming	Trading	Civil/Public Servant	Others	
Benefited	Count	82	59	43	13	197
	%	52.9%	56.2%	55.1%	34.2%	52.4%
Not Benefited	Count	73	46	35	25	179
	%	47.1%	43.8%	44.9%	65.8%	47.6%
Total	Count	155	105	78	38	376
	%	100.0%	100.0%	100.0%	100.0%	100.0%

**Table 3.1b: Results of Chi-Square Analysis on Influence of Members’ Job Type of on their Level of Benefits Derived from Cooperative Activities**

	Value	df	Sig. (2-sided)
Pearson Chi-Square	5.894 <sup>a</sup>	3	.117
Linear-by-Linear Association	7.815		
N of Valid Cases	376		

The results on table 3.1a revealed the influence of education on members' level of benefit derived from cooperative activities. The result indicated that 53.9% of those members holding primary school certificate benefited from cooperative societies. More so, 52.1% of those with secondary schools certificate, 53.7% of those with tertiary institutions certificates as well as 50.5% of those with non-formal education expressed benefited from their being members to cooperative societies. Furthermore, the results on Table 3.1b revealed chi-square value 0.286 which is less than table value 7.815 at degree of freedom of 3, p-value >0.05. This result implied insignificant differences in the benefits and possibilities opened to members of cooperative societies irrespective of their level of education.

The results on Table 3.2a revealed the influence of education on members' level of benefit derived from cooperative activities. The result indicated that 52.9% of those members into farming activities, and 56.2% of those in various trading activities, 55.1% of those workers of civil or public organisations as well as 34.2% of those into various other commercial activities expressed benefited from various activities of cooperative societies as results of being remembers. More also, the results on Table 3.2b revealed chi-square value 5.894 which is less than table value 7.815 at degree of freedom of 3, p-value >0.05. This result implied insignificant differences in the benefits and possibilities opened to members of cooperative societies irrespective of their job types. These results indicated that members of cooperative are opened to various benefits irrespective of their socioeconomic characteristic in the study area.

## **Discussion**

The results of socioeconomic characteristic from this study indicated that all ages are participating as members of cooperative societies, with majority being in active ages 30 – 49 years. Also, the findings of this study indicated that that all category of marital status fitted being member of cooperative societies. These findings agreed with the finding made by Tanko (2015) that all ages of able person irrespective of their gender opened to cooperative membership. Furthermore, the findings of this study indicated that most sampled members of cooperative are have formal education. Education is indicated by Oluwatayo (2009) as one of the factors expected to be influence disposition of members to cooperative activities as well as enhance their benefit deriving from cooperatives. However, the findings from this study indicated that majority of members of cooperative are self-engaged. This results agreed with the finding made by Adesina, (1998), Bebeji (2001), Asaolu (2004), Akinwumi (2006), Armando (2008) and Champo (2011) that majority of membership of cooperative societies comes from occupation such as agricultural production, tailoring, trading, carpentry, bricklaying, handcrafts, blacksmithing, while presence of those in public and private firms were low.

More also, the findings of this study indicated that socioeconomic characteristic of respondents does not significantly influenced their commitment to cooperative activities. This result implies the job and level of education by the members of cooperative those significantly hinder their commitment toward cooperative activities. In a nutshell, the results showed that being a membership should not be restricted to those with low education as well as those with particular job type. These findings agreed with the finding made by Tanko (2015) in his study that the nature of meeting, loan repayment and payment of dues are all make in such a way that every members irrespective of their job type and educational level can cope with. Likewise, the findings of the study conducted by Baarda (2006) revealed that cooperative societies are voluntary organizations that open to all persons able to use their services and willing to accept the responsibilities of membership, without gender, social, racial, political or religious discrimination. Likewise, Odebode (2009) found that the beauty of cooperative organisation is it is democratically controlled by their members, who actively participate in setting their policies and making decisions. In cooperative men and women serving as elected representatives are accountable to the membership.

The results of this study also indicated that members of cooperative irrespective of their level of education and job types significantly benefited from cooperative activities. This result implies that being members of cooperative irrespective of education and job type can still provide support to individual as member. This view was shared from the findings made by Oluwatayo (2009) in his study that every working class through dividend and loan facilities benefited significantly from cooperative societies. More also the finding made by Prashanth (2011) indicated that unless and otherwise specifically debarred, the membership of cooperative society is open to everybody and nobody should be obstructed to join on the basis of religion, caste, creed, sex, colour and socioeconomic status etc. Any person can become a member of a society at any time he likes and can leave the society when he does not like to continue as a member.

## Conclusion

The application of the basic principles of cooperative societies is simple and adaptable. People of different gender and occupations, farmers, crafts men, traders, public and private workers were able to organize themselves to pool their resources for the benefits of their livelihoods through the cooperatives. It is evident from the findings of this study that cooperative are not only meant for low income earners, members of cooperatives irrespective of their levels of incomes and profession benefited from cooperative activities. This study refuted the insinuation that members of cooperatives are usually people with low education status, the findings reaffirmed that majority of members of cooperatives are literate with fair education, despite majority been farmers.

## Recommendations

Based on the findings and the conclusions of this research, the following recommendations:

- i. In spite of peoples' awareness that cooperatives are not only meant for low income earners, majority of the members of the cooperatives were farmers and rural poor, there is need for the timely review of cooperative policy in Nigeria that will make the cooperatives societies appealing to people of all types of works.
- ii. More also, government should initiate cooperative activities in among civil and public servant to accommodate more members of various socio-economic statuses. This will open more opportunities for members in terms of building business associates, social-integration and sharing of ideas.
- iii. Integrating cooperative education in our school curriculum from early secondary schools level will make people have more appreciation for the cooperative societies. Teaching cooperative in the formal education setting will create the needed leadership and capacity for a virile cooperative development.

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# The Effect of IFRS on the Financial Reporting Quality of Multinational Companies in Nigeria- A Conceptual Review

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**Abstract:** *The objective of this study is to examine the effect of IFRS adoption on the financial reporting quality of multinational companies in Nigeria. The independent variable of this study is International Financial Reporting Standards (IFRS) while the dependent variable is financial reporting quality (FRQ) of multinational companies (MNCs). This study is conceptualized by researching into all relevant journals, articles and textbooks on the subject matter. Exploratory design was used to conceptually appraise the effect of independent variable on dependent variable. The research study showed that MNCs financial reports adhered significantly to the International Financial Reporting Standards (IFRS) in order to achieve the purpose of comparability, reliability, understandability and relevance purpose and thereby aiding Foreign Direct Investment (FDI).*

**Keywords:** *International Financial Reporting Standards (IFRS), Multinational Companies (MNCs), Financial Reporting Quality (FRQ).*

## 1.1. INTRODUCTION

The adoption of International Financial Reporting Standards (IFRS) has become a must for entities that are eager to spread the tentacles of their operations across border. The switch over from the Nigerian accounting standards to the international principles will come with its merits and demerits. In Nigeria, IFRS was first adopted by companies listed on the floor of Nigerian Stock Exchange in 2012 for the preparation of their financial reports.

The quest for growth in the international market investment, cross-border financial transaction, and international trade which compulsorily involves the preparation of financial statements that is useful worldwide has brought about the adoption of IFRS by both developed and developing countries (Armstrong, Barth, Jagolinzer & Riedl, 2010).

Iyoha and Faboyede (2011) confirmed that so many countries experienced various challenges in the switchover process in adopting IFRS, its prevalent acceptance has made its benefits to outweigh the cost implication. Doupnik and Perara (2012) made it clear that multinational companies will tremendously benefit from the adoption of IFRS in the preparation of their financial reports in so many ways. By making use of one set of accounting standards, it will lower the cost of the preparation of consolidated financial statements. It will also lessen the cost of subscribing for an increase in capital assets in global markets and it will aid the analytical review and

comparability of various financial statements among competing companies for anticipated business strategies (Doupnik & Perara, 2012).

Doupnik and Perara (2012) also highlighted the problems associated with IFRS that it involves high cost of training professionals and business owners, difficulties in comparability to prior years and phasing out any old information previously reported under the old system into a newly adopted set of standards.

Approximately 120 nations and reporting jurisdictions permit or require IFRS for domestic listed companies, although approximately 90 countries have fully conformed to IFRS as promulgated by the IASB and include a statement acknowledging such conformity in audit reports. Australia, Brazil, Argentina, European Union and among others fully permitted IFRS to be used in their countries, however, India, Indonesia and USA did not permit IFRS to be used for domestic listed companies (Atu, Rapheal & Atu, 2016).

Singh and Dyer (1998) defined multinational company as a business organization in more than one country. Many companies engage in transactions that cross national borders. The parties to these transactions must agree on the currency in which to settle the transaction. This will be the currency of either buyer/importer or the seller/exporter. Multinational companies have become veritable and most vital instruments and institutions for economic development, social change, technology, dynamism and in essence, new ideas (Singh & Dyer, 1998). MNCs operate within the contexts of environmental variables in locations other than their home-based countries.

Owojori and Asaolu (2010) explained multinational operations to consist strictly of trading activities with customers domiciled in other countries. Their international involvement takes the form of investment in foreign firms or establishment of foreign branches or subsidiaries either to engage in production or serves as sales outlet.

The fundamental review question is that do adoptions of IFRS by multinational companies on the financial reporting quality really bring about comparability among countries, comparability of accounting figure between the parent company and its subsidiaries based outside the home country? Do adoptions of IFRS by multinational companies on the financial reporting quality actually increase in growth of countries international businesses and assist internal investors to invest which lead to more capital inflow to the country? according to Alawiye-Adams and Ibukun-Falayi (2016).

This study sets out to examine the effects of International Financial Reporting Standards (IFRS) on the financial reporting quality of multinational companies in Nigeria.

The fact still remains that many researchers have worked on this subject matter and have studied many sectors of the economy but this conceptual review seeks to highlight and compare theories and concepts on the effect of IFRS on the financial reporting quality with a specific look into multinational companies in Nigeria.

This work will be useful for students who wish to know more about International Financial Reporting Standards adoption, financial reporting quality and Multinational companies.

This research work will also assist the multinational companies and all domestic companies to know the benefits embedded in the use of IFRS as standards for the preparation of their financial statements.

## **2.0. LITERATURE REVIEW**

### **2.1. Conceptual Framework**

#### **2.1.1. The Concept of International Financial Reporting Standards (IFRS).**

Aghator and Adeyemi (2009) explained International Financial Reporting Standards (IFRS) to be various sets of accounting rules published by the International Accounting Standards Board to aid preparers of financial statements worldwide, produce and present high quality, transparent and comparable financial information.

IASB (2009) clarifies International Financial Reporting Standards (IFRS) to be set of accounting rules or standards issued by the International Accounting Standard Board (IASB), an independent organization based in London, UK. IFRS finds ways to bring about convergence between national accounting standards and practices and high-quality global accounting standards (Yahaya, Fagbemi, & Oyeniyi, 2015).

Aghator and Adeyemi (2009) emphasized that with the reality of internationalization and increasing demand for transparent, uniformity and comparable financial information in the global markets, the International Accounting Standard Committee (IASC) was restructured in the year 2001 by creating the International Accounting Standards Board (IASB), among other changes. The IASB is responsible for developing, in the public interest, a single set of high quality, comprehensive and enforceable international accounting standards that require transparent and comparable information in general purpose financial statements and other financial reporting to help participants in the various capital markets of the world and other users of the information to make economic decisions (Obazee, 2011).

Atu, Rapheal and Atu, (2016) wrote that from the existence of IASB, it has been able to issue out numbers of IFRS and interpretations. In pursuance of its objectives, the IASB aligns with national accounting standards setters to attain convergence in accounting standards in the global world. IFRS are developed through an international due process that involves accountants, financial analysts and other users of financial statements, the business community, stock exchanges, regulatory and legal authorities, academia and other interested individuals and organizations from around the world (IASB, 2009).

Yahaya, Fagbemi, and Oyeniyi, (2015) stated that the Nigeria's Federal Executive Council (FEC) gave approval for the adoption of IFRS from January 1, 2012. The adoption was arranged in such a way that all stakeholders use IFRS by January 2014. According to the IFRS adoption Roadmap Committee (2010), Public Listed Entities and Significant Public Interest Entities are expected to adopt the IFRS by January 2012. All Other Public Interest Entities are expected to mandatorily adopt the IFRS for statutory purposes by January 2013, and Small and Medium-sized Entities (SMEs) shall mandatorily adopt IFRS by January 2014. Nigerian listed entities were required to prepare their closing balances as at December 31, 2010 according to IFRS (Abdulkadir, 2013).

##### **2.1.1.1. Reasons for the adoption of IFRS in Nigeria**

Obazee (2011) and Atu (2013) in their works, enumerated reasons for the adoption of IFRS in Nigeria as follow:

1. To encourage comparability, reliability, transparency and efficiency of financial reporting in Nigeria.
2. To assure investors abroad of a meaningful decision on portfolio investment.
3. To reduce the cost of doing business abroad by eliminating the need for supplementary information from Nigerian companies.

4. Facilitation or easy consolidation of financial information of the same company with offices in different countries. Multinationals companies avoid the hassle of restating their accounts in local GAAPs to meet the requirements of national stock exchange and regulators, making the consolidation of accounts of foreign subsidiaries easier and lowering overall cost of financial reporting.
5. Easier regulation of financial information of entities in Nigeria.
6. Enhanced knowledge of global financial reporting standards by tertiary institutions in Nigeria.
7. Additional and better-quality financial information for shareholders and supervisory authorities.
8. Government to be able to better access the tax liabilities of multinational companies.

#### **2.1.1.2. Challenges of IFRS adoption in Nigeria**

The practical challenges that have been faced in Nigeria as a result of implementing the IFRS need to be identified and addressed in order to benefit fully from the introduction of IFRS. The challenges according to Obazee (2011), Abdulkadir (2013), and Fowokan (2011) are discussed as follow:

**1. Accounting Education and Training:** Practical implementation of IFRS necessitates adequate technical capacity among preparers and users of financial statements, auditors and regulatory authorities (Fowokan, 2011). Nigeria faced a variety of capacity-related problems, which was dependent on the approach they took. Obazee (2011) revealed one of the main challenges Nigeria encountered in the practical implementation process, was the chronic shortage of accountants and auditors who are technically competent in implementing IFRS. Usually, the time lag between decision date and the actual implementation date is not sufficiently long to train a good number of professionals who could competently apply international standards.

**2. Tax Reporting:** The tax considerations associated with the conversion to IFRS, like other aspects of conversion, are complex. IFRS conversion calls for a detailed review of tax laws and tax administration. IFRS convergence will create problem. How do taxation laws address the treatment of tax liabilities arising from on convergence from Nigeria GAAP to IFRS? Where this is not taken care of, it would duplicate administrative work for the organization. Specific taxation rules would have to be redefined to accommodate these adjustments. For instance, tax laws which limit relief of tax losses to four years should be reviewed. This is because transition adjustments may result in huge losses that may not be recoverable in four years. Accounting issues that may present significant tax burden on adoption of IFRS, include determination of impairment, loan loss provisioning and investment in securities/financial instruments (Fowokan, 2011).

**3. Amendment to Existing Laws:** In Nigeria, accounting practices are governed by the Companies and Allied Matters Act (CAMA) 1990, and the Statement of Accounting Standards (SAS) issued by the Nigerian Accounting Standards Board (NASB) and other existing laws such as Nigerian Stock Exchange Act 1961, Nigerian Deposit Insurance Act 2006, Banks and Other Financial Institution Act 1991, Investment and Securities Act 2007, Companies Income Tax Act 2004, Federal Inland Revenue Services Act 2007. IFRS provisions do not recognize these local laws and if IFRS should be applied fully in Nigeria, the above laws will be modified (Abdulkadir, 2013).

**4. Fair Value:** In IFRS format, Fair value is used in measurement of most items of financial statements and this led to volatility and subjectivity in financial statements in arriving at the fair value. Where this adjustment is reflected in income statements as gain or losses, it remains a contentious issue if it should be applied in computing distributable profit (IFRS, 2011).

**5. Management Compensation Plan:** Because of the new financial statements reporting format envisaged under IFRS which is quite different from Nigeria GAAP, the terms and conditions relating to management compensation plans would have to be changed. Therefore, contracts terms and conditions of management staff will be renegotiated (Abdulkadir, 2013).

**6. Reporting Systems:** Companies will need to ensure that existing business reporting model is amended to suit the disclosure and reporting requirements of IFRS which is distinct from Nigeria reporting requirements. To correct this anomaly, information systems should be put in place to capture new requirements relating to fixed assets, segment disclosures, related party transaction, etc. Good internal control would help minimize the risk of business disruptions (Obazee, 2011).

### **2.1.2. The Concept of Multi-National Company (MNC)**

Loku and Loku (2016) considers multinational company as a business entity whose operations activities are situated in more than one country and is the institutional form that defines foreign direct investment. This form consists of a country location where the firm is incorporated and of the establishment of branches or subsidiaries in foreign countries. Multinational companies can vary in the area of their multinational operations in terms of the number of countries in which they operate (Mayrhofer, 2012).

There is a frequent confusion that equates the ability to control with the flow of capital across national borders. It is recognized widely that capital flow is not the distinguishing characteristic of a multinational company. Capital flow from one country to another in expectation of higher rates of return. However, this flow may be invested in the form of bonds, or in shares too insignificant to grant control to foreign owners. In this case, this type of investment is treated as a 'portfolio' investment. The central aspect of 'direct investment' is the ownership claim by a party located in one country on the operations of a foreign firm or subsidiary in another. The multinational company is, thus, the product of foreign direct investment that is defined as the effective control of operations in a country by foreign owners (Loku & Loku, 2016).

The economic definition, however, does not capture the importance of the multinational company as the organizational mechanism by which different social and economic systems confront each other. The multinational company, because usually it develops in the cultural and social context of one nation, exports its organizational capacity from one institutional setting to another. In this regard, it plays a powerful role as a task by which to exchange institutional knowledge across borders. Osuagwu and Ezie (2013) see multinational company as an agent of imperialism that is a policy of extending the rule or authority of an empire or institution across border. They further explained that more multinational companies expand the wider they boost immunity around them to prevent non-performances. As they expand, they obtain huge political influence. They go into mergers and acquisition and some of those business strategies are unfriendly (Osuagwu & Ezie, 2013).

Hill (2005) highlighted the main objective of multinational companies is to secure the least costly production of goods for global markets. It means maximization of profitability with the possible minimum cost of production in the world market.

The global negotiator gave a definition of multinational company as a large commercial organisation with affiliates operating companies in a number of different countries. They further proposed three models that express multinational companies which are: centralization model, regionalization model and multinational model. In the economist definition, the multinational companies are those large firm which are incorporated in one country but which own, control or manage production and distribution facilities in several countries. In the sociological definition, the multinational companies maintain global dominance of the industrialisation nations simply by doing business perpetuating international stratification.

Mayrhofer and Prange (2015) highlighted some main features of multinational company:

- i. Huge Assets and Turnover;
- ii. International operation through network of branches;
- iii. Unit of control;
- iv. Mighty economic power;
- v. Advanced and sophisticated technology;
- vi. Professional management;
- vii. Better quality of product;
- viii. Aggressive advertising and marketing;
- ix. There is a parent company in the home country where the Headquarter is;
- x. There are branches or subsidiaries in different countries (host countries);
- xi. The branches or subsidiaries operate not only to achieve special objectives for themselves, but also for general objectives of the MNC as a whole, according to a certain international strategy;
- xii. The parent company works under the laws of the home country, while the foreign branches or subsidiaries work under the applied laws in the host countries;
- xiii. The company must be controlling foreign offices, production, policies, quality, deadline and procedures;
- xiv. The product being produced must sooth the region where the company/branch is located.

#### **2.1.2.1. Characteristics of Multinational Companies**

**1. Geographical Spread:** Nobes and Parker (2004) stated that geographical spread of multinational companies places them in a considerable flexible position, because of the wide range of the multi-options in some decision areas, such as sourcing, pricing, financing, cash flow etc. The reality of networks of foreign affiliates within multinational company gives the possibility of integrated production and marketing on a global basis.

**2. The Efficiency:** The magnitude of the available resources of multinational companies enables it to distribute these resources wherever they want in different countries in the world. Multinational companies can transport investments, money, people, machines, materials, goods, special technical knowledge and cleverness, and other services (Nobes & Parker, 2004).

**3. The Power:** The power attribute of the multinational companies is a result of its size, geographical spread, scope of operations, and efficiency. Multinational company surpasses the national boundaries and controls to have the potential to influence the world affairs and course of events in the host countries in very significant ways (Nobes & Parker, 2004).

#### **2.1.2.2. Advantages of Multinational Companies (MNCs)**

- i. Employment Generation;
- ii. Automatic flow of foreign capital;
- iii. Proper use of idle resources;
- iv. Improvement in Balance of Payment position;
- v. Technical development;

vi. Managerial development;

vii. Promotion of international brotherhood and culture;

viii. Improvement in standard of living.

### **2.1.2.3. Limitations of Multinational Companies**

i. Careless exploit of national resources;

ii. Danger of unhealthy rivalry with domestic industries;

iii. Repatriation of profits;

iv. Danger to independence;

v. Disregard of the national interest of the host country;

vi. Misuse of mighty status;

vii. Exploitation of people in a systematic manner;

viii. Selfish promotion of alien culture;

ix. No benefit to poor people as multinational company's products are for the rich.

### **2.1.3. The Concept of Financial Reporting Quality**

Iyoha and Faboyede (2011) explained that financial reporting quality is an essential need to the users who need them for financial, economic and investment decision-making purposes. Lee, Rose-Green and Huang (2012) stated that financial reporting quality as the degree to which accounting information is free from errors, material misstatements and other unethical accounting and managerial practices. They further explained that a financial report can be termed as a quality one if it shows the economic substance of an entity in relation to uniformity, reliability, relevance and comparability.

The value of financial reporting is generally determined by its quality (Pounder, 2013). The concept of financial reporting quality is that some accounting information is better and more reliable than other accounting information in relation to communicating what it purports to communicate. Accounting quality is of great benefit to various types of users of financial reports (Pounder, 2013).

Financial reporting quality has no particular generally accepted definition in this study though some definitions will be looked into. Financial reporting quality can be seen as the precision with which the financial reports convey information to equity investors about the firms expected cash flows (Biddle, Gilles & Verdi, 2009). On the other hand, reporting quality refers to the extent to which financial report of a company communicates its underlying economic state and its performance during the period of measurement

(Elbannan, 2010). Tang, Chen, and Zhijun (2012) define financial reporting quality as the degree to which the financial statements provide true and fair information about the fundamental performance and financial position.

Jonas and Blanchet (2000) emphasized that the quality of financial reporting is full and transparent financial information that is not designed to mislead users. The role of financial reporting is complex and according to Financial Accounting Standard Board (FASB), it aims to provide even-handed financial and other information that together with information of other sources facilitate the efficient functioning of capital and other markets and assists the efficient allocation of the scarce resources in the economy.

Therefore, the concept of financial reporting quality is broad and includes financial information, disclosures and non-financial information useful for decision making (Tasios & Bekiaris, 2012). Some researchers show that the key determinant of financial reporting quality includes legal system, source of financing, characteristics of the tax system, involvement of the accounting professionals, economic development and accounting literacy. The quality of financial reporting is a broad concept which has series of diverse measurable attributes. One property of accounting which is frequently mentioned in support of harmonization is comparability.

It cannot be clearly concluded if harmonization results in significantly greater comparability across countries. That is why this aspect is intensively studied and the results are still very different, causing diverse point of view upon this subject (Achim & Chis, 2014). In order to have a certain degree of quality, financial statements should meet certain qualitative criteria. These criteria are stated by International Accounting Standards Board (IASB) and Financial Accounting Standards Board (FASB) in their conceptual frameworks, where they concluded that high quality is achieved by adherence to the objective and the qualitative characteristics of financial reporting information (IASB, 2018). Financial reporting quality is a key requirement for the effective functioning of the accounting system and its usefulness.

In order to achieve the primary objective of this study, which is to examine the effect of IFRS adoption on the financial reporting quality of multinational companies in Nigeria, financial report should display certain qualitative characteristics.

### **2.1.3.1. Qualitative Characteristics of Financial Reporting**

#### **1. Relevance**

Cheung, Evans and Wright (2010) explained that when accounting information in financial reports controls beneficiaries in their economic decisions, then the information in the financial report has the quality of relevance.

#### **2. Comparability**

Comparability enables interested and potential users to compare financial statements to ascertain the financial position, cash flow, liquidity, profitability and performance of an entity. This consideration allows users to compare and contrast accounting information in the financial report of an entity with other companies in the same period (Herath & Albarqi, 2017).

#### **3. Reliability**

Downen (2014) considers reliability to be one of the primary factors in assessing the quality of accounting information. Reliability is analyzed in such a way that the accounting information which the user depend upon is free from bias, errors and material misstatement (Cheung, Evans & Wright, 2010).

#### **4. Understandability**

Understandability is one of the germane and enhancing qualitative attributes of accounting information in the financial reports. The features of understandability is attained via effective communication which reveal understanding of the information presented and classified clearly and sufficiently from the users (Beest, Braam & Boelens, 2009).

### 2.1.3.2. Differences between IFRS (International Financial Reporting Standards) and GAAP (Generally Accepted Accounting Principles)

The differences observed between IFRS and GAAP are stated below but not limited to the following:

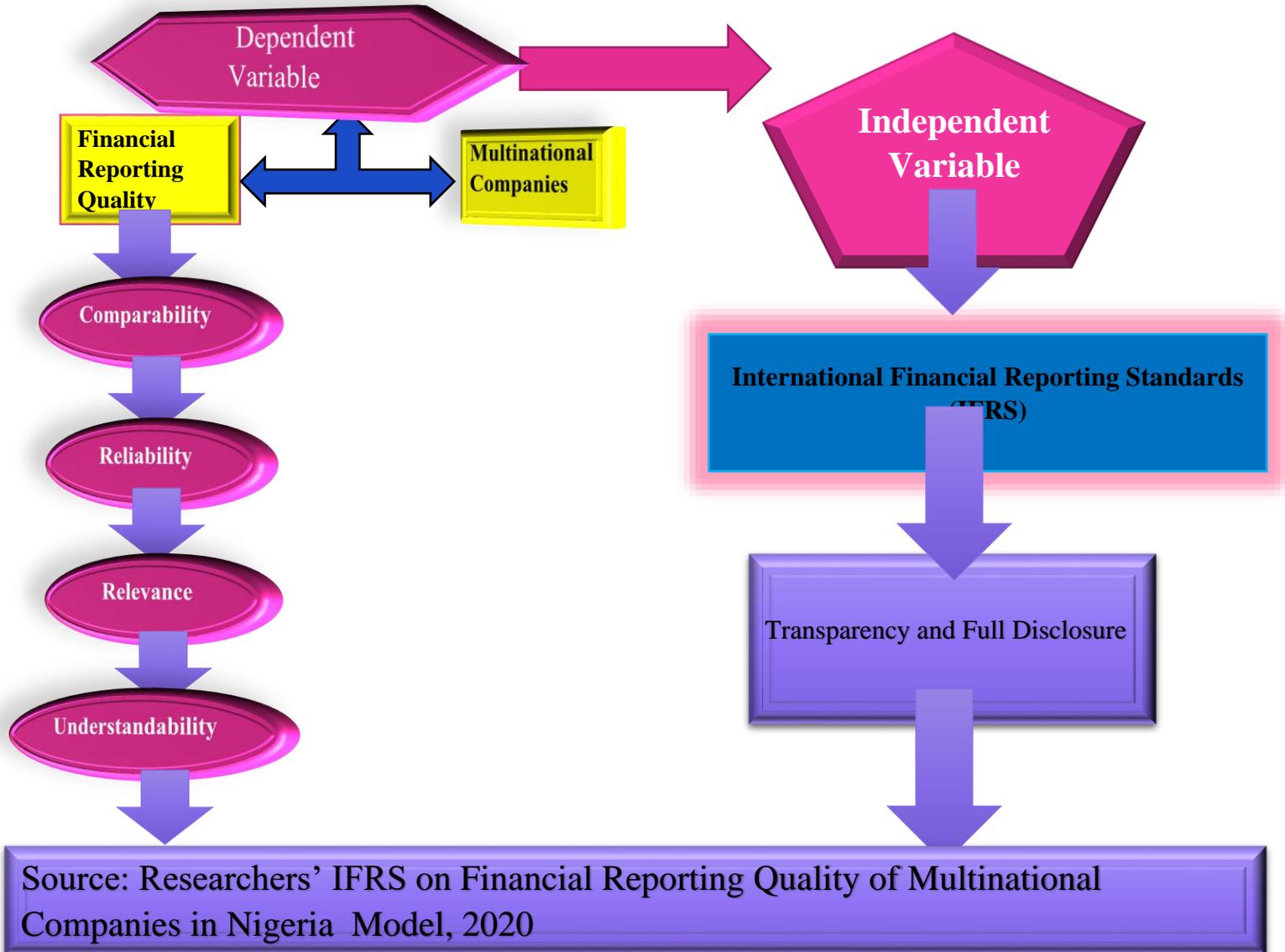
S/N	ISSUES	IFRS	GAAP
1.	LIFO (Last In First Out)	IFRS prohibits the use of LIFO as method of inventory valuation.	GAAP allows companies to value inventories using LIFO method.
2	Cost of Development e.g. Preliminary Expenses	Costs of development are to be capitalized and amortized over multiple period of time.	Cost of development are to be charged to expense as they are incurred.
3.	Write-Down	Write-down value of inventory and non-current asset can be reversed if the market value of the asset increases.	It cannot be reversed if the market value increases.
4.	Acceptability	It is globally accepted standard for accounting and more than 110 countries use it.	It is exclusively used within the United States of America.
5.	Rules & Principle	IFRS is Principle Based.	GAAP is Rule- Based.
6.	Fixed Asset Valuation	It values Tangible Fixed Asset by using Revaluation Model i.e. Fair Value – Accumulated Depreciation and impairment loss.	It values Tangible Fixed Asset by using cost model i.e. Historical Value – Accumulated Depreciation.
7.	Classification of Liabilities	There are no differences made between the classification of liabilities as all debts are classified as non-current in the Statement of financial position.	Debts are classified as current liabilities (within 12 months) and non-current liabilities (more than one year).

### 2.1.3.3. The effects of IFRS on the financial reporting quality of multinational companies

From the perspective of many researchers, the positive influences of IFRS on the financial reporting quality outweigh the negative effect it got. Considering the increasing qualitative characteristics associated with IFRS on the financial reporting in term of value relevance, comparability, understandability, reliability, timeliness and faithful representation ((Perafan-Pena & Franco, 2017); (Zhang & Wu, 2014); (Bassemir & Novotny-Farkas, 2018); (Yurisandi & Evita, 2015); (Bodle, Cybinski & Monem, 2016)).

However, Pelucio- Grecco, Geron and Lima (2014) shows that the implementation of IFRS is negatively associated with Earnings Management which is negatively associated with the quality of financial reporting.

### 2.1.3.4. Conceptual Framework of the effect of IFRS on Financial Reporting Quality of Multinational Companies in Nigeria



## 2.2. Theoretical Framework

### 2.2.1. Theory of Institutionalization

Kostova, Roth and Dacin (2008) indispensably hold that organizational survival is determined by the extent of alignment with the institutional environment. While allowing for a nominal amount of agency, institutionalists largely suggest that incorporation of institutionally mandated elements allows organizational actors to portray the organization as legitimate, thereby enhancing its likelihood of survival.

Philip and Tracey (2009) supported the assertion of Kostova et al. (2008) by accepting the concept of organizational field under institutional theory because international businesses like multinational companies need to take the concept more seriously as it is difficult to see how they can avoid joining the fields in the countries or regions that they enter, they increase their interactions with suppliers, customers, and competitors; they participate in common activities such as industry associations and they come to be mutually aware of other participants in their field. The concept of organizational field provides a useful framework for understanding the institutional environment faced by multinational companies in each of the institutional contexts in which they operate (Philip and Tracey, 2009).

### **2.2.2. Legitimacy Theory**

Suchman (1995) states that “Legitimacy is a generalized perception or assumption that the actions of an entity or a company are proper or appropriate within some social constructed system of norms, value, beliefs and definition”. This theory explains social and environmental disclosure, useful in corporate reporting, it helps to communicate with the shareholders and clarify importance of this relationship (Damaso & Lourenco, 2011).

Damaso and Lourenco (2011) further explained that legitimacy theory is mainly considered by the external perception by the society which is measured by IFRS disclosure.

This theory supports this research work in that IFRS adoption by multinational companies will increase the quality of their financial reporting if the required disclosures mandated by IASB are complied. These disclosures will aid the external users of the financial report to make their decision. The fundamental requirement of IFRS is transparency and disclosure.

### **2.2.3. Stakeholder Theory**

Freeman (1984)’s Stakeholder theory addresses morals and values in managing an organization. The theory emphasizes on interrelated connection between customers, suppliers, investors, communities and those who have stake in the entity. The theory resolves that an entity should create a value for all stakeholder either the existing or the potential one.

This theory is in support of this study based on the fact that if multinational companies adopt the use of IFRS as their accounting standard of reporting, it will create value to their stakeholders and also attracts Foreign Direct Investment (FDI).

## **2.3. Conceptual Review**

In the course of this research work, some related journals were consulted and reviewed.

Herarth and Albarqi (2017) examined Financial Reporting Quality: A literature Review. The researchers reviewed current articles and research papers with regard to influences on and measures of the quality of financial reporting and also found out some gaps in the existing literature. This research recognized some instances of insufficient information and some gaps in the existing literature.

Uwuigbe, Erin, Uwuigbe, Peter, and Jinadu (2017) in their work: IFRS and Stock market behaviour: An emerging market experience. They examined the impact of IFRS on stock market behaviour in the financial and consumer goods sector of the Nigerian economy. They found out that IFRS adoption has improved the trading volume activities of listed firms in Nigeria. It equally observed that there is no significant relationship between IFRS adoption and stock price informativeness. They further suggested that regulatory bodies in the country should ensure that the companies listed on the Stock Exchange comply strictly with the IFRS implementation because this will help the investors of those companies have relevant information regarding stock market indices.

Sanyaolu, Iyoha and Ojeka (2017) examined the International Financial Reporting Standards Adoption and Earnings of Quoted Banks in Nigeria. The study examined the effect of adoption of IFRS on the earning yield (EY) and earnings per share (EPS) of quoted banks in Nigeria. Findings showed a positive relationship between EPS and IFRS adoption and concluded that IFRS adoption has improved the decision-making capability of various stakeholders, thus increasing investors’ confidence and inflow of capital in the

country through foreign direct investment (FDI). The study further suggested that in order to safeguard the suitable adoption of IFRS in Nigeria, competent accountants of Nigeria must intensify its efforts in organizing IFRS based training programs for its member and other parties connected with corporate reporting.

Alawiye-Adams and Ibukun-Falayi (2016) looked into the impact of International Financial Reporting Standards (IFRS) adoption on the quality of financial statements of Banks in Nigeria and tried to justify the comparability, relevance and clarity qualitative objective of financial reports of Nigerian banks. It was revealed from their findings that there is significant relationship between IFRS adoption and the comparability quality of financial report of Nigeria banks; and adoption of IFRS has substantial influence on the relevance principle of making decision by users of financial report of Nigerian banks.

Jinadu, Ojeka and Ogundana (2016) in their study examined whether the adoption of IFRS has improved the quality of accounting information in the area of value relevance as it affects Nigerian quoted firms. The study applied the use of regression techniques to analyse the data collected and the findings revealed that the adoption of IFRS has a positive and significant effect on the value relevance of accounting information. Their study recommended that government should empower the relevant bodies to incorporate more measures to improve the quality of the financial reporting in order to increase the value relevance of financial statements.

Yahaya, Fagbemi and Oyeniyi (2015) in their work: Effects of International Financial Reporting Standards on the Financial Statement of Nigerian Banks, looked into the significant roles played by IFRS in ensuring quality accounting information. Their findings revealed that the adoption of IFRS in Nigeria brings good news in term of comparability of Nigerian Financial Statements internationally and it was recommended that the comparison of financial ratios under both Nigerian Generally Accepted Accounting Principle (NGAAP) and IFRS for the comparative year prior to IFRS adoption may be seen as a prudent step prior to undertaking a trend analysis of a particular company.

Kenneth (2012) in his work: adoption of IFRS and financial statement effects: the perceived implications Non-Foreign Direct Investment and Nigeria Economy. His findings revealed that the adoption of IFRS will increase the level of confidence of global investors and investment analyst in the financial statement of companies in Nigeria. And there is a significant relationship between IFRS adoption by companies and Foreign Direct Investment in Nigeria.

Owojori and Asaolu (2010) on the critical evaluation of accounting systems in multinational organizations in Nigeria, looked into the challenges faced with multinational organizations due to its peculiar nature and found out that the international accounting standards have impact on the preparation of the financial statement of multinational organizations.

#### **4.0. Conclusion and Recommendation**

It can be concluded that IFRS adoption has significant effects on the financial reporting quality of multinational companies in Nigeria. The quality of financial report of a multinational company is determined by its relevance, timeliness, faithful representation, understandability, reliability and comparability. Adoption of IFRS by multinational companies will encourage foreign direct investment and thereby increasing the profitability of the companies. Transparency and full disclosure of both financial and non-

financial activities being the fundamental requirement of IFRS adoption will attract foreign investors to invest in multinational companies.

This paper recommends that regulatory bodies in the country must ensure that multinational companies listed on the Stock Exchange comply strictly with the IFRS implementation so as to ensure that investors have relevant information for financial and investment decision making process. The Financial Reporting Council of Nigeria which is Federal government agency (FRC) established by the Financial Reporting Council of Nigeria Act, No. 6, 2011 should be strengthened and restructured to further its supervisory on ensuring quality financial reporting in line with International Financial Reporting Standards. Moreover, FRC should develop, publish and update statement of accounting standards to be followed by multinational companies when they prepared their financial statement and promote and enforce compliance with IFRS.

This study is limited by the fact that it only examined conceptual review of the effects of IFRS on the financial reporting quality of multinational companies only, we hereby recommend that future empirical research could evaluate other sectors of the Nigerian economy like Insurance sectors, shipping and airline sectors etc. for more practical evidence on the research study.

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# Legal and Safe Abortion is Women's Human Rights

*“Forcing a woman, by threat of criminal sanction, to carry a foetus to term unless she meets certain criteria unrelated to her own priorities and aspirations, is a profound interference with a woman's body and thus a violation of security of the person.”-- Justice Dickson*

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## Introduction

Is Abortion women's human rights? Is it a matter of choice? Or is it a matter of family planning policy? Is the current law sufficient to grant the Right of Women to their Sexual and Reproductive rights? If yes, then how? What are the effects of such deprivation on the unmarried females of any age? What type of alternative method can be adopted to reform the present condition? Does the society allow a woman to opt abortion if she became pregnant by unexpected situation? Is the medical system accommodating such woman for abortion? For every query the answer is 'no' women are restricted to abort, they are legally questioned and never allowed, they are blackmailed with family sentiments and hospitalization limited and costly.

Historically, restrictions on abortion were introduced for three main reasons: 1. Abortion was dangerous, and abortionists were killing a lot of women. Hence, the laws had a public health intention to protect women—who nevertheless sought abortions and risked their lives in doing so, as they still do today if they have no other choice. Abortion was considered a sin or a form of transgression of morality, and the laws were intended to punish and act as a deterrent. 3. Abortion was restricted to protect fetal life in some or all circumstances.

There is no doubt that law on abortion undermines women's rights under international law to life, to health, and to be free from cruel, inhumane, or degrading treatment. Yet some contend that moderating the full legalizing abortion would be inconsistent with the country's constitutional recognition of the right to life from conception. The World Health Organization estimates that the average rate of unsafe abortion is “four times higher in countries with more restrictive abortion laws than in countries with less restrictive laws.” Restrictive abortion laws are also associated with higher levels of maternal mortality. Further, criminalizing abortion in extreme circumstances—such as when pregnancy is the result of rape—is an inhumane response that places women's and girls' lives and dignity at risk. For example, a 10-year-old girl became pregnant after she was raped by her known relatives, but authorities denied her request for an abortion. At age 11, the girl gave birth. No one should be forced to continue their pregnancy in such circumstances, even if lawmakers believe that it can help protect life.

The Global status of Abortion is 25 per 1000 for unmarried women establishing it for a fact that unmarried women do incur pregnancies and therefore, need abortions. It is indeed problematic to think that unmarried women cannot be pregnant while it is well known that many girls get pregnant outside or without marriage. There are occasions instead of various contraceptives women became pregnant. This clearly points toward the fact that apart from the usual shame and stigma, the laws and policies are also a reason for the occurrence of 'unsafe abortions' in our society. It is pertinent to note that the 'Right to Terminate' forms a part of the Reproductive Rights of a female. In India, Medical Termination of Pregnancy Act, 1971 governs abortion and policies related to it. The Act was enacted to allow certain pregnancies to be terminated by registered medical practitioners. Abortions under this Act can be performed under limited circumstances & up to 20 weeks only. The list of 'circumstances and special situations' given in the Act is restrictive in nature and excludes the unmarried women from the list thereby, keeping the right of unmarried women to undergo an abortion, in a suspense and confusion. The Act was enacted keeping in mind the problems caused by the increasing population to a newly independent country (India) with limited resources. It is well known that population control has always remained an issue under the laws in India, concerning reproduction and fertility.

Explanation to Section-3 of the Medical Termination of Pregnancy Act, 1971 provides that if a pregnancy occurs due to the failure of any device or method used by any married woman or her husband for the purpose of limiting the number of children, the anguish caused by such unwanted pregnancy may be presumed to constitute a grave injury to the mental health of the pregnant woman. The Act fails to consider or recognise the 'anguish' caused by an unwanted pregnancy to an unmarried woman. It screams of silence when it comes to pregnancies incurred by unmarried women or the termination thereof. The Act also requires the written consent of guardian in case a pregnant woman is below eighteen (18) years of age.

This creates problems for the young girls who are in dire need of an abortion to resort to illegal means and seek different solutions to their problems, the issues of honour, shame and guilt make the situation even more vulnerable for them. It is important to note that illegal abortions are generally unsafe. These 'unsafe abortions' are one of the reasons for maternal deaths in India and worldwide. Majority of these are the abortions that are carried illegally and in hiding despite of having a valid law for over past 40-45 years. According to the World Health Organization (WHO), one woman in the developing nations die in every eight minutes due to complications arising out of unsafe abortions, irony being, that abortion isn't a very difficult procedure in medical terms if done at the right time by a trained person. The history states many incidents of abortions in our society long before the existence of Laws and policies on the topic.

The MTP Act not only limits the Reproductive Rights of females but it also mirrors a patriarchal presumption whereby unmarried women aren't entitled to have consensual sexual relationships. Therefore, these laws also deny women's autonomy in sexuality and their sexual and reproductive rights. Such laws imply that unmarried women are not allowed to enjoy consensual sexual relationships even when they are adults. Moreover, it is implied that the women having sex without marriage must use contraceptives and if they do use contraceptives and still get pregnant, then they have no right to seek a safe solution. The Act very cleverly, just like a typical Indian parent avoids the topic of the pregnancy of the unmarried women and termination of it. It seems to the researcher that any connection between 'unmarried women and abortion' was perceived as immoral by the standards of our society to be put together in the Act. The feminists have been asserting for safe abortion rights for all women regardless of the different situations in which a woman undergo an abortion, it is human rights, moral policing towards such women is violation human rights. They state that a woman must be free from the pressure coming from various quarters such as State, religion, family or societal preferences etc., in order to make a free decision without coercion and control her agency and mind.

Many researches contributed to address the struggle of women in society and gave a multi-disciplinary approach to the policies governing abortions. This chapter tries to address the various issues related to abortions and (unmarried) women and by dealing with the practical and functional aspect of Law and the impact thereof in the context of human rights. It will contribute to the literature presented on the topic and further provide insights to the possibility arguing this as human rights. This tries to find an answer to a legal problem through different dimensions and hopes that this piece of work declares that abortion as human rights.

India legalized abortion in 1971. Despite legalizing abortions, women could not achieve the expected outcomes and majority women still resort to unsafe abortion, contributing largely to maternal morbidity and mortality. Liberal abortion policies and legislations aren't the answer in themselves and aren't adequate. The Abortion Policy in India is consistent with India's Family Planning Policy. For unmarried women law do not allows them. India's abortion policy encourages the promotion of family planning services but at the very same time it recognizes the importance of providing a safe, affordable, accessible and acceptable abortion services to women who need to terminate the unwanted pregnancy.

An estimated number of about 4-6 million abortions take place in India every year (some reports project this number as high as 10 million). India still lack the data on abortions outside the legal framework that is, the illegal abortions which happen to be a reality. There are few studies undertaken in India on why women do who seek abortions being unmarried, tops the charts. The lack of safe and legal abortion facility give rise to 'informal providers', who are untrained, home based providers. They are non-physicians and charge very less as compared to the legal health clinics. They also assert that these informal providers are used because the legal abortion options are very costly and aren't easily accessible especially in cases of unmarried women. The legal abortion service providers do not treat client with dignity as well and this speaks volumes about the failure of public health services in terms of those who need them the most. The numbers of adolescent girls and young women getting pregnant, experiencing birth and abortions is very high and young people are more interested in sex due to several biological reasons- hormones. They experiment and experience and this is an open secret. Reproductive health, especially reproductive health of adolescents is poorly understood in India. Even fewer studies discuss female sexual health than males. This makes the young couples, especially females very vulnerable and prone to situations of pregnancies and abortions. Unmarried Adolescents constitutes a large number of abortion seekers. These factors give rise to several problems to the young girls, especially those who are unmarried. The lack of abortion facilities, the fear of losing their dignity in society, the humiliation they suffer at the health centres and the expensive costs of safe and legal abortion force them to go for cheap and illegal means. Thereby, endangering their health. This could all be done away if we accept the problem and bring a change in our current laws.

## **Reproductive Rights- Universal Human Rights**

Reproduction or procreation is a fundamental concept. In simple words, it is an act through which one gives birth to one's offspring. Reproductive Rights could be understood as the rights of people related to the process of sexual reproduction. They are quoted with the Sexual Rights of human beings and together, these Sexual and Reproductive Rights (SR-HR) form a part of Human Rights. It was the year 1994 when a breakthrough was achieved in the field of reproductive health at the International Conference on Population and Development (ICPD) held at Cairo. It was for the first time when a connection was established and acknowledged between the human rights and health, which was later, associated with the concept of women empowerment. It was at the ICPD 1994 that a woman's right to 'reproductive and sexual health' was considered as one of the most significant rights under the broad causes of woman's health. The reproductive rights are basic and fundamental to all human beings.

These reproductive rights with respect to women's health include-Right to control one's reproductive functions - It means that a woman will have full control on the reproductive functions of her body including the right to have consensual sexual intercourse free from coercion and violence or not to have one at all. Right to make autonomous reproductive decisions - It includes the choices of a woman to reproduce or not to reproduce and attain highest level of reproductive health and is inclusive of access to safe abortion services. Right to have an informed opinion regarding reproductive choices - It includes the right to have information and access to sexual and reproductive education that can help her make informed choices. Right to protection from gender discriminatory practices like FGM. It is protection against gender discriminatory practices and gender-based violence.

World Health Organization (WHO) states that the reproductive rights are based on the basic right that all couples and individuals have to freely and responsibly decide the number, spacing and timing of their kids and the right to attain highest level of sexual and reproductive health; these are also inclusive of the right to make decisions regarding reproduction free from all sorts of force, coercion and discrimination. Abortion is one of the safest medical procedures if done following the World Health Organization's (WHO) guidance. But it is also the cause of at least one in six maternal deaths from complications when it is unsafe. WHO estimates available data from all countries showed that the broader the legal grounds for abortion, the fewer deaths there are from unsafe abortions? In fact, the research found that there are only six main grounds for allowing abortion apply in most countries: ground 1 – risk to life. Ground 2 – rape or sexual abuse. Ground 3 –serious fetal anomaly. Ground 4–risk to physical and sometimes mental health. Ground 5– social and economic reasons. Ground 6– on request

The issue of SR-HR is closely related with gender and social justice. In 1979, the United Nations adopted Convention on Elimination of All Forms of Discrimination Against Women (CEDAW); it marked the treaty of the 'bill of rights' for women. CEDAW has clearly stated that a woman's right to health is inclusive of her sexual and reproductive rights. A woman must have full autonomy in her sexual and reproductive decisions and activities. These reproductive rights are a subset of human rights, which are already recognised as being of universal significance. The Committee on Economic, Social and Cultural Rights have also recognised these rights and the Nation States have obligations to respect, protect and fulfil these rights and are supposed to make legislations doing the same. Under these rights all people have a right to healthy and safe consensual sexual activity and control over their bodies.

The Tehran Proclamation is considered to be the first international document that raised and acknowledged one of the reproductive rights. It stated that, the parents have a basic human right to freely and responsibly determine the number and limit of their children. CEDAW addresses all the sphere of a woman's rights including her civil, political, economic, cultural and social rights. It directs the Nation States who are parties to it to take appropriate measures to eliminate discrimination against women in the field of health care and ensure access to health services on the basis of equality including those of family planning.

CEDAW dealt with multiple aspects of discrimination faced by a woman. Then came the year 1994 when the women groups and activists at the International Conference on Population and Development (ICDP) were able to produce substantial Program of Action thereby recognising women's issues and giving aspirations for a better world for women. ICPD marks an important event in the history of women's rights as it gave affirmation and assertion to the reproductive rights of women. It connected the policy of family planning with reproductive health and defined it (reproductive health) as a state of complete social, physical and mental well-being and stated that people must have liberty to decide if they want kids or not, or their numbers or gap between to them. It asserted the fact that men and women must have an easy access to safe and effective methods of family planning and talked about women's right to safe abortion. Cairo Conference gave a strong message on women's right over their fertility. It brought the concepts of 'autonomy', 'consent' and 'equality' in the ambit of reproductive rights.

In 1995, Fourth World Conference on Women (FWCW) was held in Beijing, China, where a step ahead was taken. This conference invited Governments to consider reviewing their Abortion Laws so that abortions could be decriminalized, and the illegal abortions could be prevented. It recognized a woman's right over her own fertility to control and direct it as key to women empowerment. This treaty is often referred to as International Bill of Women's Right; it significantly addresses the discrimination against women. FWCW broadened the ambit of the definition of reproductive rights and talked about the concept of 'equality' and 'responsibility' in sexual relationships. There are variations in the adoptions of these Conventions by the Nation States, despite the preference to ICPD and CEDAW get, yet there is no common policy that is being universally followed by the countries. Each follows its own policy regardless of these conventions. Abortion forms an integral part of reproductive rights; it is a subset of maternal health as well as a woman's right to form her own choices. It is an important area of birth control and was talked along with the family planning methods for controlling the increasing population. In 1920, it was Soviet Union that became the first Nation to legalize abortions in order to provide access to safe abortion services conducted by trained medical staff instead of traditional and dangerous means.

Later on, United Kingdom followed the example and enacted one of the most liberal laws on Abortion in Europe in the form of Abortion Act of 1967, which legalized abortions for women under various circumstances, and its example was closely followed by Canada, which legalised abortions in 1969. The Abortions in Canada were permitted only when there was a danger to the life of a pregnant woman, which was restrictive in nature and was struck down by the Supreme Court of Canada in R v. Morgentaler (28th January 1988) as it infringed Canadian Charter for Rights and Freedom by infringing the life, liberty and security of the women. Abortion was decriminalized in Canada and was liberalized. United States legalized abortion with Roe V. Wade and a Federal Law was passed to protect the right to abort; the court held that the foetus is not a person protected by the Constitution of US and women could have an abortion until the foetus became viable.

The FWCW in 1995 talked openly about women's equality and her right to have control over her fertility. The women rights groups and activists considered it a huge recognition to their efforts that the issues of 'Inequality' between the genders was discussed and the governments were urged under the Action Plan to form policies addressing the same issues. It recognised inequalities in every field; inequalities of health, decision-making, power sharing, economic, social etc. all were brought at the surface. In September 2016, the UN declared that repealing the 'anti-abortion laws would save the lives of at least, 50,000 women a year. Today, despite the fact that abortion rights are considered to be one of the most important parts of reproductive rights of women, abortion is still illegal and criminalised in many countries of the world, as a result of which women are dying every day, all around the world. The fact is that no international law or treaty can ensure a woman of a safe abortion; it is only the access to these health services that matters and that can bring a change.

### **Limitation in Indian Reproductive Rights**

India is a complex society with vast cultural as well as social differences that impact the phenomenon of reproduction and abortion. The history of reproduction in India lies in its traditions and its history of gender and sexuality as well as that of its colonial past.

Sarah Hodges, in her writing listed the following three phases of history of reproduction in India: the first one is Medicalization of Childbirth- It discusses how the biological issues of maternity and childbirth became expertise of medical field and also discusses the relationship between the reproductive practices and hospitals. Second one is 'Social History of Reproduction in different groups'- It is about the fact that different groups had different practices when it came to reproduction and how these practices contradicted with one another. It also talks about the political and hygienic changes brought in. And the third is 'National Efficiency'- It talks about the phase of national planning policies and how it constituted of maternal and child welfare along with population control and national strength and women's health was solely connected with childbirth.

The reproductive practices in India has seen a great change due to the efforts and impact of the British, from change in the values of hygiene and sanitation to the replacement of dai(s)/midwife with professionals. This somehow also made the dais or midwives more vulnerable and in 19th century began the phase of medicalization or hospitalization of childbirths in India. With 1860 came the Indian Penal Code that penalised causing miscarriages or injuries to the unborn children. Section-312 & 313 form a part of early law on causing termination of a pregnancy. Section-312 punishes 'any' person who 'causes a miscarriage' of a pregnant woman (not done in good faith to save her life) with 3 years of imprisonment and up to 7 years if the woman was quick with child. The Explanation to this section also states that a woman doing this to her shall also be punished under this section. The law clearly bans abortions in all cases except if there is a danger to the life of the mother. Section-313 of IPC punishes anyone who commits a miscarriage on woman without her consent with imprisonment up to 10 years.

These were the only Laws governing the termination (miscarriage/abortion) of pregnancy in India. The British left India in 1947 and as a newly independent country dealing with the remnants and pain of partition & rape of hundreds and thousands of women struggling with unaccounted children, they realised that they needed causes to terminate unwanted pregnancies. Later, the agenda of

population control came up with poverty and scarce resources and widespread illiteracy. As a result of which, they focused on family planning and population control.

In 1971 'Medical Termination of Pregnancy Bill' was passed by Parliament and Medical Termination of Pregnancy Act, 1971 was passed, it was modelled after the UK Abortion Act of 1967 and allowed abortion by a registered medical practitioner up to 20 weeks if the pregnancy was risky to the life of mother or is grave injury to her physical or mental health; or there is a risk of child being born with serious abnormalities. In case of that a pregnancy is a result of rape or failure of a contraceptive device used by married woman/husband; it would be considered that it is an injury to the mental health of the woman. Later on, India saw a rampant increase in sex selective abortions due to the desire to have a son and ultimately in 1994 Pre-Conception and Pre Natal Diagnostic Techniques Act was enacted banning sex selective abortions and making it punitive.

### **Termination of Pregnancy**

The Medical Termination of Pregnancy Act or the MTP Act governs termination of pregnancy in India. The Act was an attempt to legalize certain types of abortions in India and the objective to the Act states that it is to provide for termination of certain pregnancies by registered medical practitioners for matters connected with it. This law directly affects women and their rights and came into being about 24 years after India gained independence. After the propaganda of hygiene and health that took place during the medicalization of childbirth, the concept of birth control and abortion had to be imbibed at policy level, which happened in the form of Medical Termination of Pregnancy Act, 1971.

The issue of population growth and control was talked about in India ever since its first five-year plan. The Central Family Planning Board of Government of India, in the year 1964 recommended a formation of a committee to discuss about all the aspects of abortion and to suggest alteration in laws existing then. The committee so formed submitted its report in the year 1966 in which it had studied abortion scenario in India keeping in mind the International background and later specific questions were developed to seek the opinion of various experts. This committee was of the view that the laws governing termination of pregnancy in India (S.-312 & 313 of IPC) were of restrictive nature and that the termination of pregnancy should be allowed by a registered practitioner in cases of life threat to the woman, risk to her physical and mental health, in case the child suffer serious abnormalities and in cases of rape or mentally ill girl; it recommended a qualified medical practitioner doing it at an approved place with prior written consent of the pregnant woman and parent/guardian in case under.

The committee recommended emphasising on the issue of family planning, health & welfare and on promotion of responsible attitude towards sex, marriage & parenthood. The recommendations were accepted with a few changes by then Minister of Health & Family Planning and a bill was drafted by consulting the Ministry of Law in 1969. The bill was sent to the States for comments or recommendations, as health is a subject under the State List of the Indian Constitution. Many States accepted the recommendations on the said bill and many suggested reforms like considering termination in all cases regardless of rape or marital status of a woman. Afterwards a Joint Committee decided on the said recommendations and the bill was passed in the Parliament as The Medical Termination of Pregnancy Act, 1971.

### **The Features of MTP Act, 1971**

The Act liberalized pre-existing restrictive laws on abortion that criminalised the doctor as well as the women seeking abortions and made India first developing country to legalize abortion. It was a step ahead for India in its aim of a being a Welfare State. The MTP Act, 1971 was in consonance with the Indian Constitution and fitted in our action plan for population control. It came as a pleasant surprise for the women activists.

While it wasn't exactly how they wanted it to be, but it certainly expanded the rights of women and empowered them. It was supposed to make them in charge of their bodies and decisions with respect to that. The Act was propagated as a tool to women's freedom as it ensured freedom from unwanted and undesirable pregnancy. The salient features of the Act are as follows: It decriminalised abortions done in good faith- The Act legalised and liberalised its abortion laws, which were restricted and punitive in nature by allowing the termination of pregnancy of women by medical practitioners in selected circumstances. Shifted Responsibility on Registered Medical Practitioners- the MTP Act allowed termination of pregnancy, to those medical practitioners who are registered and possess necessary qualifications under Sec.-2 of Indian Medical Council Act, 1956 with names entered into State Medical Register and have training/experience of gynaecology & obstetrics as per MTP Act.

The Act also creates a safeguard for such registered medical practitioners from punishment under Indian Penal Code if the pregnancy is terminated under the provisions of this Act. Decided the upper limit of termination - The Act set an upper limit of termination of pregnancy in India at 20 weeks after which the termination is not allowed under any circumstance except by the order of the courts. Consent - The Act deems it mandatory to seek consent of the woman undergoing termination and creates an obligation on

parent/guardian to consent in case the girl is lunatic or under 18 years of age. Decided the place of conducting such termination- The Act states that such termination shall be carried only at the hospitals managed or approved by the government or at any other place approved by the Government.

Power to make rules and regulations- The Act give power to the Central Government to make rules regarding the training of the medical practitioners under this Act or any other matter required under this Act. The State Government can regulate the information given by and required by the medical practitioners before termination of pregnancy. It also regulates the disclosure of such information under the Act with notified reasons. Act done in good faith- The MTP Act, 1971 protects the medical practitioner from any suit or legal proceeding for any damage caused or likely to be caused by an act so done under this Act in good faith.

The liberalization of Abortion Laws came both as a blessing and a curse to Indian soil. This Act was envisioned to achieve effective and planned population growth by granting the right to terminate pregnancies and to improve the health of India’s women and children Little did they imagine that it will be used as tool by the society that favours male child so much that it won’t think twice before eliminating its female children. This liberalizing law on Abortion paved a way towards unregulated and unchecked elimination of the female foetus in its mother’s womb. The Act instead of a tool for a planned pregnancy became a pawn in the hands of the dark side of the society and was more often started being used as a solution of not having a female child. For them, this Act was even better as it allowed them to kill their daughters even before their birth; they did not have to wait for another daughter to be born and then kill her. The discriminatory practices that India as a society (still) practices created a huge imbalance in the sex ratio of our country.

Snap shots depicts the situations and their status of termination under the MTP Act.

Situations for Termination	If Termination of Pregnancy is allowed
The pregnancy is life threatening to a woman and she’ll die unless aborted	Yes, Allows
If continuation of pregnancy is dangerous to her physical or mental health	
In case Pregnancy is a result of Rape/Incest	
Severe physical or mental defects are detected in foetus	
Pregnancy is caused due to failure of a birth control method used by a ‘married woman or her husband’	
Pregnancy of a girl who is under 18 years of age (Married/unmarried)	NO* (unless parent/guardian permits and consents)
Pregnancy of a girl above 18 years of age but lunatic	
Pregnancy of an Unmarried Girl above 18 years of age	
Demanded or requested by ANY pregnant woman without these circumstances	
With any of these cases, if pregnancy exceeds beyond 20 weeks	

There was an increase in the number of females per 1000 males from the year 1971 to 1981, while there were 930 females in 1971, the figure increased up to 934 in the year 1981. It was concluded that perhaps it was due to maternal and child healthcare programme that were giving results and it was believed that the discrimination between male and female children would now decrease but later on, the year 1991 gave a shock. It became very clear that the increasing sex ratio was real and that the girls were going ‘missing’. There were only 927 girls on 1000 boys. Some demographers argued that it was because of the sex selective abortions while others rejected this idea and blamed it on poor management. To curb and eradicate the issue, later in 1994 Pre-Conception and Pre Natal Diagnostic Technique Act was enacted which made it illegal to perform sex selective abortions and banned pre natal sex selection.

Currently, the abortions in India are governed by MTP Act, 1971 and can be conducted in the circumstances listed in it only. Any other abortion including the sex selective abortion is illegal. The social situations in our society have made the rules regarding MTP Act strict in order to ensure that no sex selective abortion takes place on the name of a termination of pregnancy.

**Denial of Termination of a Pregnancy A gross violation of human rights**

The MTP Act was introduced as a mechanism to control the population. The language used in the Act as well the restrictions make it very clear that the Act was not very motivated by the rights of women to a dignified life or their rights to their bodies and sexuality. The fact that the final decision regarding the termination of the pregnancy doesn’t remain with the woman, rather it is in the hands of

the medical practitioner who has the final say. Thus, it is very clear that the MTP Act does not encompass a fundamental right to abortion and this restrictive liberalisation of Laws creates a lot of problems for the stakeholders as well as the beneficiaries of that law, which happened in the case of MTP Act, 1971.

The Act does not recognise the right to have an abortion on demand regardless of the conditions; in case a woman fails to prove any of the conditions falling into the Act, she will be denied a Legal Abortion; The Act also fails to 'acknowledge' the pregnancies incurred by unmarried women and the termination thereof (barring rape cases). The fact that the cases of unmarried women are not mentioned or discussed indicates towards the 'denial mode' of the Government towards these pregnancies. It is only in the cases of Rape that if an unmarried girl gets pregnant, she can have a legal abortion under this Act. If leave the rape victims then unmarried women seeking an abortion might fall into one of these two categories: Unmarried girls who are 18 years and below, and unmarried women from 18 years and above. The Act incorporates old notions of chastity in its concepts for termination of pregnancy in doing so.

The unmarried girls who are 18 years of age *cannot* have an abortion under this Act without the Permission/Consent of her Guardians/Parent. Now, the stigma attached with the issues of unmarried sexual relations or pregnancy is too much to bear and a girl in such situation might not want to tell or approach her parents or anyone. In an Indian society, a girl would hide the fact of her pregnancy and would want to 'get rid of it' at the very first instance.

Fear is what such girl feels; fear of someone finding it out; fear for her life, fear of shattered dreams etc. Rathika who is a respondent did undergo abortion when she was 18 years old, she could recall every detail of the fear and agony she felt when the secret of her pregnancy was known. "I wasn't as lucky as my classmate. My parents did come to know about my pregnancy. I was so afraid; my life was over. I wanted to die. My parents had a fight and they hit me. My father hit me, I couldn't believe it. They were asking for the boy's name, they wanted to know if I was raped. My brother called me as 'Dhaasi' and my mother suspected me as 'Prostitute'. I thought my life was over" The presumption that 'all' girls in such situations would approach their parents or guardians is unrealistic. This is an issue, which is also related to the 'Age of Consent'. The fact that under the Indian Penal Code, age of consent remains to be 18 and an underage person cannot consent to sexual activities; such a sexual relation will attract the penalty for Rape under IPC. This fact has been well debated in the Indian Parliament, but the age of consent remains 18 for sexual activities.

The issue of pregnancy of an unmarried minor girl further 'attracts' the provisions of Protection of Children from Sexual Offences Act, 2012 (POCSO Act) and binds the Doctor or anyone whom the girl approaches for termination of such pregnancy to mandatorily report this incident (girl's pregnancy) to the police failure to do so would attract penalty and the doctor or person might end in Jail.

POCSO states that whoever commits penetrative sexual assault on a child, which in the case of female child, makes the child pregnant because of sexual assault shall be punishable with imprisonment of not less than 10 years. This puts the person seeking abortion under MTP Act and the person who is providing abortion under a dilemma and conflict of Laws. The Doctors are afraid of these provisions and often hesitate to provide abortion services to underage girls. The respondent say that the doctors rarely terminate pregnancy of underage girls.

Doctors don't take cases of girls under 18 years. They have turned many girls down, on phone and in person. These cases are 'risky' to them, they might get in trouble... This is illegal. There are medicines, sometimes they tell them. That doctors tell them the names of medicines that's it. No written prescription. No ultrasound and no abortion at all in my clinic.

The unmarried women above 18 years of age and in need of termination of pregnancy are not discussed or talked about or acknowledged in the MTP Act, 1971 at all. The 'Legal Status' of abortion of unmarried women above 18 years of age is unclear and ambiguous in India. They are neither allowed nor denied abortions under the MTP Act, 1971. The issue of consensual Pre-Marital Sex becomes too big a taboo to digest and the sexuality of women has been controlled and oppressed by patriarchal society of India and denying her the recognition of her rights is one such tool of oppression and subjugation. Unlike the girls under 18 years of age, the women of this category have right to consent to a sexual relationship and also have a right to undergo a safe and legal abortion. The 'non-cooperative' Law and policies, the pressure to hide, the stigma attached and the moral policing by some doctors (& lack of finances in some cases) forces these women to resort to 'unsafe', 'hidden' and 'dangerous' means which are often illegal.

A recent study from Guttmacher Institute (USA) has revealed that seven out of every 1,000 women aged 15–44 in developing regions were treated for complications resulting from unsafe abortion procedures. The study said that because many women who experience complications do not receive medical care for them, the actual number of women who suffer some complications due to unsafe abortions is high.

The 'social stigma' on unmarried woman's sexual and reproductive rights result in the need to hide the pregnancy and not asking directly for a safe abortion. This need for hidden abortions takes women to 'Quacks' or 'Dr. Google' or make them desperate enough

to buy unregulated and illegal drugs and swallow them without doctor's prescription. It can dangerously lead to consequences like suicide by the young women as a last recourse.

Recently, the High Court of Bombay stated that the women have the right to terminate their pregnancies regardless of any reasons. The court held that, "the right to control their own body and fertility and motherhood choices should be left to the women alone and that the right to autonomy and to decide what to do with their own bodies, including whether or not to get pregnant and stay pregnant is the basic right of women."

In *Ms X v. Union of India*, honourable Supreme Court of India permitted a 23-week pregnant woman of termination her pregnancy; the court went beyond the time period declared by the MTP Act, 1971 (20 weeks). However, the Apex court did not clear the ambiguity regarding the autonomy of a woman on her own body, which the researcher believes to be an issue of great significance and hence, require immediate attention. The honourable Supreme Court (though) has tried to remove the stigma related to unmarried women's pregnancy by recognising their infants as 'legal' and by giving rights of a lawfully wedded wife in cases of 'long cohabitation' with a partner but it is believed that it is the duty of the apex court to expressly grant the basic right of the autonomy of her body to women.

In the case of Bombay High Court, "High Court in its own motion *V. The State of Maharashtra*", the court has provided no justification on the terms "marriage" and "husband and wife" that are used in MTP Act, 1971, however it has clearly declared the fact a man and a woman who are in live-in-relationship, cannot be covered under of MTP Act, 1971 whereas it should be read to mean any couple living together like a married couple. This judgment has also not clearly justified the status of pregnancies incurred by unmarried women who are not per se living with her partner or the cases of unmarried women's pregnancies that are a result of a sexual encounter only.

Apart from these issues, the MTP Act read along with the PcPNDT Act, makes it mandatory for the medical practitioner to obtain necessary information that contains, the name, age, address of the victim and the reason for the termination for pregnancy. The PcPNDT Act mandates the clinic/hospital/registered practitioner to maintain a record for the very same purpose and that record need to be preserved for 2 years. Often the unmarried girls seeking abortions do not reveal their true identities; they fake their names and addresses etc. out of fear and anticipation of complexities in future. This fear, shame and stigmatisation of Abortion make all these women do such activities. The cost of getting a hygienic, legal and confidential abortion done at a private clinic starts from Rupees 10,000, to 50000 the fact that young adults who do not earn are hampered due to financial issues.

Abortions taking place during surrogacy have been reported to be sex-selective in nature and there are factual reports to prove the huge imbalance between the sex ratio of children born through surrogate mothers. This further remained an issue in providing safe abortion services to surrogate mothers and was one of the major factors that India is banning commercial surrogacy

### **Case laws on MTP Act**

The MTP Act, plays an important role in issues of women's reproductive health in India; in an age where a preventable mortality death is considered as a violation of human rights, it becomes all the way more important to focus on the right to health under Article 21 of the Indian Constitution. Recently, In the case of *Laxmi Mandal vs Deen Dayal Hari Nager Hospital & Ors* the court awarded a compensation of Rs 2.4 lakhs to the family of Shanti Devi (passed away during child-birth). The Court found the hospital in violation of the woman's right to life and health as her death was preventable.

In the case of *Parmanand Katra v. Union of India* the court held that every medical practitioner is professionally obligated to treat emergency cases with expertise and cannot refuse to offer treatment to such cases. Hence, the cases where the hospitals reject a young woman for abortion due to any ethical or moral reasons must be criminalised. In *Paschim Banga Khet Mazdoor Samity and Ors., vs. State of West Bengal* the court held that it is the primary duty of a welfare state to ensure that medical facilities are adequate and available to provide treatment.

The right to health of women ensures her a dignified life, hence, the medical, legal and social implications of MTP Act, should be taken in such a view as to maximize women's right of life. The proposed MTP (Amendment) Bill, 2014 is pending in the parliament, and increases the upper limit to get an abortion from 20 to 24 weeks but even then it does not talk about the ambiguity regarding the status of unmarried women. At present, the MTP Act, does not guarantee a woman the right of choice and control over her body and deprives her of right to life under Article-21 of the Constitution.

### **Abortion- A Human Rights is Pro-Choice, Pro-Life**

The debates have been long going on the relationship between abortion and feminism. It brings the whole debate of 'Pro-Choice versus Pro-life' into consideration. Pro- Life and Pro- Choice are two main perspectives and stands taken by people on the issue of

abortion. These debates do not have much relevance in Indian context and are confined primarily to academic context only because abortions are already legally allowed under MTP Act of 1971.

The people believing in Pro-life theory believe that it is wrong to 'terminate pregnancy' and consider it morally, ethically or religiously wrong to conduct or undergo abortions. They believe that the unborn foetus, from the moment of its conception, becomes a full-fledged member of the human community and that it is a person since its conception. For them abortion is inherently a wrong thing just like stealing or killing, regardless of any cultural value. Their arguments revolve around the questions like if foetus have a moral or human right or if abortion is ethically valid and how should a society limit or ban abortions. They argue that, the supporters of abortion should understand that morally the right to choose pertains to oneself and does not extend to another person, in this case, the foetus. This perspective is often connected with religion especially religions like Christianity (Catholic) and Islam consider it wrong and immoral to terminate the pregnancy. The religions like Hinduism, Buddhism, Sikhism etc. have a philosophy of Karma and believe that it is the mother who commits the Karma and the foetus is unable to perform any Karma before its birth and hence, can be terminated; their views are also impacted by their theories of rebirth.

The believers of Pro Choice have a different stance than the former group. Their perspective raises various questions regarding the practices, social status of a woman and termination of her pregnancy. Pro-Choice in simple words, indicates the choice of a woman; the fact that a woman has the right to decide for herself and regarding her body. It is about personal autonomy of a woman, which the 'Pro-choice' believers think will be achieved through maximizing her options and choices. Giving her the option of termination of the pregnancy by the State and the Laws, where by it is the woman who decides whether she wants to choose this option, does this or not, is 'Pro-Choice'.

Pro-Choice does not mean that a woman should terminate her pregnancy or should get an abortion done. It simply means, that if she wants to give birth, she should and in case she wants not to give birth, then she MUST have the option of a safe and legal termination. It is very common for the people to think that 'Pro-Choice' means ANTI-LIFE. Pro-choice believers are entitled to the moral or ethical view of abortion being a wrong practice, some of them hold this view as well; it simply means that even if they think abortion isn't morally or ethically right, they still want to let the woman choose. In other words, they want her to have an option to it and not inherently ban it. Against the popular confusions, 'Pro-Life' is not about 'Saying YES to Abortions' but providing more options and choices to the women. Pro-choice writings also support the conclusion that there needs to be greater discussion about the abortion decision. A debate that should have been seen in the light of 'Free Choice' or the 'Autonomy of a woman' on her bodily decisions, due to lack of information and awareness, is largely seen just as a matter of 'Pro-Abortion and Anti-Abortion', which defeats the whole purpose of the concept of 'Free Choice'.

### **Feminists Perspective**

The general analysis of the human condition has tended to overlook women's conditions and hence, Feminism argues that a critique must begin from the perspective of women. Female sexuality has always been a taboo in the society and so has been the issues related to it like pregnancy and abortion. The feminist and the women rights' movements from time to time have fought for the share of females and for their 'equal' place in society. Abortion or the termination of pregnancy being a controversial topic, has divided the views of 'feminists. The early leaders of the feminist movement viewed abortion as 'child murder' and as a means of exploiting both women and children. As much as they believed in 'equality' of sexes and genders, abortion was still considered a non-feminist and presumed to be 'anti-choice' notion. Abortion along with the statues of marriage and divorce, rape, bigamy etc. was said to be made by men and was considered as "the ultimate exploitation of women.

The popular belief behind their voices and opinion was that women do not want to abort or terminate the pregnancy; it is under the pressure of several circumstances that causes her to opt for such practices. They focussed more on finding solutions to such problems that drove women to abort; they also consider it (abortion) against the core feminist principles of justice, non-violence and non-discrimination.

Contemporary Feminists take into consideration the abortion law and the new reproductive technologies that grant new powers to the medical profession. Their writings question the long-held beliefs and values about birth, life, death, culture, morality and motherhood. The issue of Abortion being represented as 'EQUAL' and 'Non-Discriminated' by a certain group of feminists is considered problematic, since men cannot biologically get pregnant.

Susan Sherwin argues that, a woman knows what's best for her and therefore, it must be her 'choice' while deciding how to deal with the situation she is in. If a woman wants to be free from male dominance then she must take control of her reproductive choices which starts from whether to abort or not; she argues that it is a woman's responsibility and privilege to determine the social status of the foetus since it is the body of a woman where its development and growth takes place and that women aren't pro abortions but they support sexual and reproductive freedom of females.

The different opinions of Feminist give rise to the question that why should we then, include 'feminist perspective' while discussing the issue of abortions? It is because its inclusion will help in fighting against gender discrimination in a much more logical way. The feminist views are necessary to be read and included, as they will bring the desired social transformation.

It is also important to note that, the issue of pregnancy and abortion starts with 'sexual relations' and in traditional patriarchal societies the sexuality of women is not liberated or free; they are responsible for 'not keeping their legs closed' or of not using a proper birth control method. This view is highly responsible for 'Shaming' of women and creating a mental pressure on them to hide and 'get rid of' the problem as soon as possible.

### **Optional Rights**

While the whole 'Pro Choice' argument is based on increasing the availability of options so that a woman can exercise her right to choose in real sense. But the concept of choice here means a choice that is 'informed' and 'freely made' by the woman. The concept of informed choice means that a woman must be educated and informed about the choices available to her. The data collected by the researcher indicates that more than half of the people in New Delhi did not know about the choices or options available to them. The women must be informed by different ways like educating them or by organising awareness drives, so that they know before they can choose. An uninformed choice is dangerous and makes the women vulnerable.

The concept of free choice is that the choice of woman must be free from any coercion or pressure, be it physical or mental. The concept of free choice sounds a myth seeing the Indian society. The researcher found a desire to give the child for adoption after the birth was brought up on more than one occasion by the respondents. "I felt guilty afterwards (abortion). I have a cousin who cannot have kids; I have seen how much she wants them. I felt bad. I wish I could have helped her, giving birth to it secretly somewhere and giving it to my cousin... I think about imaginary situations where I could have pulled it off! I wanted to get rid of it then because I did not have a choice, I was single, unmarried, living in Delhi. I had my career to look forward to. I wish I had a choice. I am okay now, I guess but sometimes... it just happens."- Vandana (27, works in a MNC, 25 when aborted)

### **Western Case Study**

Recently, Canada has pledged up to \$20 million for contraceptives, family planning and comprehensive sexuality education, and access to post-abortion care, making up loss of U.S. international development funding tied to abortion-related projects. Canada has one of the most liberal abortion laws that believes that it is a woman's right to choose and decide. It does not criminalise abortion and provides access to safe abortions.

It was in 1869 that Canada criminalised abortions; later on, contraception and birth control methods were also banned. It was revealed that approximately 4,000 to 6,000 Canadian women died as a result of unsafe abortion or complexities arising out of it, till the year 1947; many people were arrested for giving birth controls or information about them or doing illegal abortions. The estimation of 'abortions' during that time goes up to almost 10,000-12,000 abortions a year. In the year 1969, the Canadian government permitted abortion under limited circumstances and they were to be provided only at a hospital if a group of doctors affirmed that the continued pregnancy would endanger the mother's life; but abortion was not decriminalised by the government.

Women's Movements: This 'limited' Law on abortion did not help the women, especially those who were poor and had no access to hospitals; this was a Law for rich women who had access to the hospitals. Moreover, at times women couldn't find a group of doctors to certify for their needs of abortion the different doctors interpreted the situation differently. Dr. Henry Morgentaler argued that women have basic right to choose and to abort if they want and hence, they must be given the choice. He started providing women with safe abortion services against the Law. Having done 5,000 abortions illegally, he was arrested multiple times and was let off.

In 1970's a movement to raise awareness regarding the right of a woman to choose for her began with 'Abortion Caravan' where thousands of women marched on the streets and protested in front of the people and the Parliament against the restrictive laws on abortion. It helped in politicizing and activating the women throughout Canada and the protesters were successful in creating a public opinion on the women's rights to choose.

Later on, in 1974 the Canadian Alliance to Repeal the Abortion Law, (CARAL) was formed later became the Canadian Abortion Rights Action League worked in favour of women's right to have safe abortion. The organization along with Dr. Morgentaler and other women's groups spent the next 15 years opening and running abortion clinics across Canada, violating the law; the doctors working there were arrested on the charge of 'conspiracy to procure a miscarriage' and a jury trial began in 1984 which was later quashed and restarted. Dr. Morgentaler appealed to the Canadian Supreme Court in 1988 and the court repealing the abortion law in practice, entirely, pronounced the historical judgment for R v. Morgentaler.

It was held that the abortion law in practice was unconstitutional and violated a woman's right to 'life, liberty and security of person' under Section-7 of Charter of Rights and Freedom, 1982. It was declared by the court that it is a profound interference with a woman's body and a violation of her 'security of the person' to force her by threat of a criminal sanction and deny her a right to control her own body, unless she meets a 'criteria' so decided by others which is not related to her priorities and aspirations.

This was a historic decision for women in Canada, they were now free to choose for themselves and abortion became just like any other medical service where they could just ask for it. It was governed by provincial medical regulations. Canada brought 'abortion care' in line with its Canada Health Act and has approved the use of Mifepristone as an abortion method in 2015, though 'accessibility' to the health centers remains a concern in Canada but due to its liberal laws, it is committed to provide women with their right to safe choice.

Unlike rest of the United Kingdom, abortions are largely banned in the Ireland (in north as well as in south). The Abortion Act, 1967 that governs abortion in UK does not apply to the (North) Ireland. It is the "Offences against the Person Act 1861", as well as the Criminal Justice Act (Northern Ireland), 1945" that applies to the Ireland (North). Ireland has a restrictive policy on abortion and allows it only if the life of pregnant woman is threatened due to her pregnancy; there also exist a lot of confusion among the society in Ireland regarding its policy on abortion.

Under the Protection of Life during Pregnancy Act, 2013, the department of Health in Ireland has issued guidelines and allows for abortions only if a woman's life is immediately threatened. The age of consent in Ireland is 17 years as per its law; this does not sync with the restrictive laws on abortion. The laws are proving to be harmful for young women who have the freedom and right to have consensual sex from the age of seventeen but in case they get pregnant, as a result of a sexual activity then they have no legal right to terminate the pregnancy unless the pregnancy causes an immediate threat to their life. The Irish laws currently penalise buying or selling of abortion medicines or pills as well, as a result of which it becomes almost impossible for young pregnant women to have a safe abortion.

According to Amnesty International, women in Ireland can undergo as long as a 14 years long imprisonment in case of illegal abortions; it reports Ireland to have one of the strictest laws on abortion in the whole Europe.

But this does not stop women in Ireland to have an abortion. They travel to other parts of UK, preferably to England and Wales to avail a safe abortion service. Almost 15,500 women travelled to England or Wales for the procedure. In the cases, these women cannot afford to travel to have an abortion they use the services of online non-profit organisations to get the abortion pills delivered to them. Almost around 5,600 women in Ireland tried to buy abortion pills online over period of five years but this does not guarantee them their right to have access to safe abortion service, as there is always a possibility of being penalised for the same and prosecuted.

Section-22 of Protection of Life during Pregnancy Act, 2013 (Ireland) states that it is an offence to intentionally destroy unborn human life and that any person who is guilty of this shall be liable to a fine or imprisonment for a term not exceeding 14 years, or both. Hence, the women obtaining abortion pills or engaging in any method of induced abortion are always under the scrutiny of the law enforcement department of Ireland.

It was the death of Dr. Savita Halappanavar (an Indian living in Republic of Ireland) due to refusal of abortion service by the hospital at Galway University that made the whole world question Ireland's abortion policy. Dr. Halappanavar was 17 weeks pregnant and did miscarry but she was denied an abortion, this happened not only because of the failure of medical staff to recognise the danger but also because of the fact that the doctors did not want any criminal liability for an induced abortion on themselves.

The midwife manager of the hospital gave the statement that Ireland being a catholic country does not permit abortion and on October 22, 2012, Sarita died after a week's struggle. This case has brought the state of confusion, which exists in the Irish society, on the surface, where not even the doctors are clear about the status of abortion in the country and remain in a moral as well legal dilemma regarding providing an abortion service to the women. Since then, there have been demands from the world community (including India) to Irish government, to liberalise the abortion laws; but the same old provisions govern abortions in Ireland today. India should learn from both the countries and liberalise its laws on abortion in order to give its women a right to dignified life.

### **Human Rights Instruments on safe and legal abortion to Woman**

Women's Right to Life Multiple human rights instruments protect the right to life. In 21<sup>st</sup> Century, in elaborating States' obligations in reporting on their compliance with the right to life enshrined in the International Covenant on Civil and Political Rights (ICCPR), the Human Rights Committee called upon States to inform it of "any measures taken by the State to help women prevent unwanted pregnancies, and to ensure that they do not have to undergo life-threatening clandestine abortions." Forcing a woman to undergo a life-threatening unsafe abortion threatens her right to life. It is widely acknowledged that in countries in which abortion is restricted by law, women seek abortions clandestinely, often under conditions that are medically unsafe and therefore life-threatening.

According to the World Health Organization (WHO), about 21.6 million women had unsafe abortions in 2008, in 2018 it is 23.7 million women. These unsafe abortions were responsible for the deaths of nearly 47,000 women in a year. In India it is around 10000 women die out of unsafe abortion. The incidence of unsafe abortion is closely associated with high maternal mortality rates. Therefore, laws that force women to resort to unsafe procedures infringe upon women’s right to life.

**Protective provision in Human rights Instruments**

Human Rights Protected	International Legal Instruments						Regional Legal Instruments				Conference resolution		
	Universal Declaration of Human Rights	Civil and Political Rights Covenant	Economic, Social and Cultural Rights Covenant	Women’s Convention	Children’s Convention	Disability Convention	American Convention on Human Rights	Banjul Charter	Maputo Protocol	European Convention on Human Rights	Vienna	Caro	Beijing
The right to life, liberty & security	Art. 3	Art. 6.1 Art. 9.1			Art. 6 Art. 37(b) Art. 37(c) Art. 37(d)	Art. 10 Art. 14	Art. 4.1 Art. 7.1	Art. 4 Art. 6	Art. 4	Art. 2.1 Art. 5.1		Prin. 1 Para. 8.3 4	Para. 106 Para. 216
The right to be free from cruel, inhuman or degrading treatment	Art. 5	Art. 7			Art. 37(a)	Art. 15	Art. 5.2	Art. 5	Art. 4	Art. 3	Para. 56	Para. 4.1 0	
The right to equality & to be free from gender discrimination	Art. 2	Art. 2.1 Art. 3	Art. 2.2 Art. 3	Art. 1 Art. 2 Art. 3	Art. 2	Art. 3(b) Art. 3(g) Art. 5 Art. 6	Art. 1	Art. 2 Art. 3 Art. 18.3	Art. 2	Art. 14	Para. 18	Prin. 1 Prin. 4	Para. 214 Para. 216 Para. 232
The right to modify customs that discriminate				Art. 2 Art. 3 Art. 5	Art. 24.3				Art. 2(2)		Para. 18 Para. 38 Para.	Para. 4.4 Para. 5.5 Para.	Para. 107 Para. 224 Para.

against women											49	9.2	230
The right to health, reproductive health, & family planning	Art. 25		Art. 12	Art 11.1(f) Art. 11.3 Art. 12 Art. 14.2(b)	Art. 24	Art. 25		Art. 16	Art. 14		Par a. 18 Par a. 24 Par a. 31 Par a. 41	Pri n. 8 Pa ra. 7.2 Pa ra. 7.3 Pa ra. 7.5	Par a. 89 Par a. 92 Par a. 106 Par a. 223
The right to privacy	Art. 12	Art. 17			Art. 16	Art. 3(a) Art. 22	Art. 11			Art. 8		Pa ra. 7.2	Par a. 106 Par a. 107
The right to determine number & spacing of one's children				Art. 16.1(e)		Art. 23(b)			Art. 14(1) (b)			Pri n. 8 Pa ra. 7.3	Par a. 223
The right to the enjoyment of the benefits of scientific progress	Art. 27	Art. 15(b)										Pa ra. 7.3	

Several United Nations (UN) human rights bodies have framed maternal deaths due to unsafe abortion as a violation of women’s right to life.<sup>6</sup> As a result, they have called on States to review restrictive laws that criminalize abortion<sup>7</sup> and increase access to family planning and sexual and reproductive health information, in order to reduce the number of unsafe abortions.

While the phrase “right to life” has been associated with the campaigns of those who oppose abortion, it has not been interpreted in any international setting to require restrictions on abortion. Most recently, the European Court of Human Rights, in the case *Vo v. France*, ruled that “it is neither desirable, nor even possible as matters stand, to answer in the abstract the question whether the unborn child is a person for the purpose of Article 2 of the Convention ...” (providing that [e]veryone’s right to life shall be protected by law) The court therefore refused to adopt a ruling that would have called into question the validity of laws permitting abortion in 39 member states of the Council of Europe.

**Estimated number of unsafe abortions per 1000 women aged 15–44 years,**

S.no	1990	2008	2016
Latin America and Caribbean	45	31	30/1000

Africa	28	28	26/1000
Asia	14	12	35/1000
Europe	12	2	NA

### **Women's Right to Health**

International law guarantees women the right to the highest attainable standard of physical and mental health. The right to health requires governments to provide health care and to work toward creating conditions conducive to the enjoyment of good health. In 2000, the Committee on Economic, Social and Cultural Rights recognized that the right to health includes the right to control one's health and body, including sexual and reproductive freedom, and the right to be free from interference. Furthermore, the right to health requires the removal of all barriers interfering with access to health services, education and information, including in the area of sexual and reproductive health.

The Protocol to the African Charter on Human and Peoples' Rights on the Rights of Women in Africa (Maputo Protocol) explicitly recognizes that the right to health includes access to safe and legal abortion, at a minimum, in certain circumstances. It requires States Parties to "ensure that the right to health of women, including sexual and reproductive health is respected and promoted by taking appropriate measures to authorize abortion in cases of sexual assault, rape, incest, and where the continued pregnancy endangers the mental and physical health of the mother or the life of the mother or the foetus.

#### **Safe abortion services protect women's right to health.**

The right to health can be interpreted to require governments to take appropriate measures to ensure that women have the necessary information and the ability to make crucial decisions about their reproductive lives, such as determining whether or not to continue a pregnancy, and to guarantee that women are not exposed to the risks of unsafe abortion, which can have devastating effects on their health, leading to long-term disabilities, such as uterine perforation, chronic pelvic pain or pelvic inflammatory disease. Such measures include removing barriers that interfere with women's access to health services, such as legal restrictions on abortion, and ensuring access to high-quality abortion information and services.

Several UN human rights bodies have recognized the deleterious impact of restrictive abortion laws on women's health<sup>16</sup> and have consistently raised general concerns about the inaccessibility of safe abortion services. The Programme of Action adopted at the International Conference on Population and Development (ICPD) in 1994 called upon governments to consider the consequences of unsafe abortion on women's health. It states that governments should "deal with the health impact of unsafe abortion as a major public health concern.

At the 1995 Fourth World Conference on Women, the international community reiterated this language and urged governments to "consider reviewing laws containing punitive measures against women who have undergone illegal abortions. In addition, in a paragraph addressing research on women's health, the Platform for Action adopted at this conference urges governments "to understand and better address the determinants and consequences of unsafe abortion. In 1999, at the five-year review of the ICPD, governments recognized the need for greater safety and availability of abortion services. They affirmed that in circumstances where abortion is not against the law, health systems should train and equip health-service providers and should take other measures to ensure that such abortion is safe and accessible. Additional measures should be taken to safeguard women's health.

### **Women's Right to Equality and Non-Discrimination**

The right to gender equality is a fundamental principle of human rights law. All major human rights instruments require freedom from discrimination in the enjoyment of protected human rights. According to the Convention on the Elimination of All Forms of Discrimination against Women, "discrimination against women" includes laws that have either the "effect" or the "purpose" of preventing a woman from exercising any of her human rights or fundamental freedoms on a basis of equality with men.

In 1999, the Committee on the Elimination of Discrimination against Women (CEDAW Committee) recognized "laws that criminalize medical procedures only needed by women and that punish women who undergo those procedures" as a barrier to women's access to appropriate health care.

#### **Denying women access to abortion is a form of gender discrimination.**

Laws that restrict abortion have the effect and purpose of preventing a woman from exercising any of her human rights or fundamental freedoms on a basis of equality with men. Restricting abortion has the effect of denying women access to a procedure

that may be necessary for their equal enjoyment of the right to health. Only women must live with the physical consequences of unwanted pregnancy. Some women suffer maternity-related injuries, such as hemorrhage or obstructed labor. Women are consequently exposed to health risks not experienced by men.

Laws that deny access to abortion, whatever their stated objectives, have the discriminatory purpose of both denigrating and undermining women's capacity to make responsible decisions about their bodies and their lives. Indeed, it is not surprising that unwillingness to allow women to make decisions about their own bodies often coincides with the tendency to deny women decision-making roles in the areas of political, economic, social, and cultural affairs.

The CEDAW Committee has consistently expressed concern about restrictive laws that criminalize abortion. Furthermore, the Human Rights Committee has recognized that criminalizing abortion, even in cases of rape, is incompatible with the States' obligation to ensure the equal right of men and women to the civil and political rights set forth in the ICCPR. Additionally, it has indicated that the problem of maternal mortality due to unsafe abortion is evidence of discrimination against women.

### **Women's Right to Reproductive Self-Determination**

Human rights instruments provide the basis for the right of women to make decisions regarding their own bodies. They require the right to freedom in decision-making about private matters. Such provisions include protections of the right to physical integrity, the right to decide freely and responsibly the number and spacing of one's children and the right to privacy. Women have the right to decide whether to bring a pregnancy to term.

When a pregnancy is unwanted, its continuation can take a heavy toll on a woman's physical and emotional well-being. Decisions one makes about one's body, particularly one's reproductive capacity, lie squarely in the domain of private decision-making. A pregnant woman may seek advice from others, but only she knows whether she is ready to have a child, and governments should play no role in making that decision for her. The Human Rights Committee has recognized that denying women access to legal abortion services is an arbitrary interference in their private lives.

The European Court of Human Rights has underscored the connection between pregnancy and a woman's private life, which includes her physical and psychological integrity. It has recognized that States have a positive obligation to effectively secure the physical integrity of pregnant women. This obligation requires them to establish procedural safeguards to ensure that women can make an informed decision about whether to terminate a pregnancy<sup>30</sup> and access safe and legal abortion services in a timely manner.

### **Woman's Right to be Free from Cruel, Inhuman, or Degrading Treatment**

International law recognizes that women have a right to be free from cruel, inhuman, or degrading treatment. The Human Rights Committee has stated that cruel, inhuman, or degrading treatment is not restricted to acts that cause physical pain, but also applies to mental suffering, which often accompanies denials of access to abortion services. Forcing women to carry pregnancies to term causes physical and mental suffering. As a result of restrictive abortion laws and policies, many women experiencing complications of pregnancy and needing therapeutic abortion are forced to suffer from painful, frightening and life-threatening conditions. Human rights bodies have recognized that restrictive abortion laws can lead to violations of the right to be free from cruel, inhuman and degrading treatment. The Committee against Torture has recognized the impact of restrictive laws, which force women to carry unwanted pregnancies to term or to undergo illegal abortions that often place their health and lives in danger, and noted that the failure of States to take steps to prevent these acts constitutes cruel and inhuman treatment.<sup>33</sup> Specifically, it has indicated that a total prohibition on abortion, which forces a woman to carry a pregnancy resulting from a crime of gender based violence, such as rape, "entails constant exposure to the violation committed against her and causes serious traumatic stress and a risk of long-lasting psychological problems such as anxiety and depression. The Human Rights Committee has stated that criminalizing abortion is incompatible with the right to be free from cruel, inhuman or degrading treatment.

Women may also undergo severe suffering and anguish when legal abortion services are inaccessible. In many countries, healthcare personnel refuse to provide legal abortion services because of their own objection or discriminatory attitudes towards abortions. In the case of *L.M.R. v. Argentina*, the Human Rights Committee found that the State's failure to ensure a woman's access to abortion services to which she was legally entitled, caused her physical and mental suffering, which constituted cruel, inhuman or degrading treatment.

Additionally, in the case of *R.R. v. Poland*, the European Court of Human Rights established a violation of the right to be free from inhumane and degrading treatment because of the suffering experienced by R.R., due to the knowledge that she could not terminate her pregnancy even though the fetus had an incurable deformity and she was entitled to have an abortion under the Polish law. The Court stated that "[s]he suffered acute anguish through having to think about how she and her family would be able to ensure the

child's welfare, happiness and appropriate long-term medical care.”<sup>38</sup> Furthermore, the denial of access to abortion services in certain circumstances, regardless of the legality of the procedure, constitutes cruel, inhuman or degrading treatment.

In the landmark decision of *K.L. v. Peru*, the Human Rights Committee found that the depression and emotional distress experienced by a 17-year old girl were foreseeable consequences of the State's failure to enable her to benefit from a therapeutic abortion, and constituted a violation of her fundamental right to be free from cruel, inhuman, or degrading treatment.<sup>39</sup> Notably, this ruling did not depend on the legality of abortion.

**Women's Right to the Enjoyment of the Benefits of Scientific Progress-** The Universal Declaration of Human Rights and the International Covenant on Economic, Social and Cultural Rights enshrine the right to enjoy the benefits of scientific progress. Women have the right to access the full range of abortion technologies. As the medical and scientific communities make advances in abortion technologies, this right entitles women to access the full range of technologies for the safest abortion care.

The right to the benefits of scientific progress is particularly salient in the context of abortion because numerous safe, effective and low-cost health interventions, such as medical abortions, can substantially improve women's access to safe abortion services, thereby reducing the incidence of unsafe abortion, and decreasing the attendant maternal morbidity and mortality rates. Medical abortion is an alternative to surgical abortion that generally uses two medicines to end a pregnancy. The most common regimen calls for an oral dose of Mifepristone, followed by a dose of Misoprostol up to 48 hours later. This regimen, which can be initiated as soon as pregnancy is confirmed, is approximately 95% effective. In 2005, the WHO added Mifepristone and Misoprostol to its Model List of Essential Medicines, a list intended to guide governments in their prioritization of necessary drugs for budgetary allocations and procurement in their national health systems.

Permitting medical abortion can significantly improve women's overall access to safe abortion because it can be provided in a broad range of settings, such as in practitioner's offices, and can be offered by non-physicians, which helps to expand the pool of providers available to perform safe abortions. Additionally, reducing reliance on physicians can reduce costs and help make abortion more available and accessible to women. By approving medical abortion protocols, training providers and removing barriers to the regimen, governments can ensure that women have access to medical abortion in a safe setting, which allows them to enjoy their right to the benefits of scientific progress.

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# Simulation Of The Influence Of Top Management Team On Performance Of Companies Listed At The Nairobi Securities Exchange

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**Abstract:** The top management team (TMT) influences a crucial decision carried meant for the whole company. The TMT are made up of high-level executives, generally with designations such as president, General Managers, Managers and associated titles. They are accountable to the entire organization. Organizational strategies are influenced by the personal attributes of TMT are such as experience, expertise, values and dispositions. Leaders make decisions that conform to the basic characteristics of management and consist of elements of psychological characteristics and observable experiences. This study operationalizes the characteristics of the management team to include functional background, tenure, age, gender and education. This research seeks to understand how the qualities managers play on achievement of company goals, since the question of whether diversity in the configuration of the management context is valuable and crucial for companies remains unanswered and open to the discussion. The survey was grounded on the theory of the upper echelon. This research embraced a cross-sectional descriptive survey plan. Questionnaires containing closed and open questions were applied to obtain primary information from 66 companies listed on the Nairobi Security Exchange (NSE), 50 of the 66 responses were returned, indicating a response rate of 75.76. The study revealed a moderate relationship among the attributes of TMT and the performance of the company. The management team (education, seniority, age, gender, functional history) accounted for 51.4% of the change in company accomplishment. The inferences show that the managing team has a substantial influence on the performance of firms listed at NSE. The outcome adds to the boosting of literature by validating the postulation of the theory of the higher level.

**Key words:** Top Management Team, Firm Performance, Nairobi Securities Exchange.

## INTRODUCTION

Organizations top management teams is made up of executives holding designations such as president, chairman, CEO, directors/vice president. According to Wasike, Machuki, Aosa and Ganesh, (2015), top management positions hold responsibility for running organization. Top management team (TMT) characteristics denote exceptional personal qualities attributed to colleagues of TMT which are innate or studied, evident or intellectual. Kinuu (2014) posited that these characteristics exhibit the value top management members brings to the management of the firm. TMT interpret plans devised by board of the company into objectives, objectives, tactics meant to guide the organization to win in their field operation. TMT establish choices that involve everybody in the company and hence add to the achievement or collapse of the companies (Pearce & Robinson, 2011). According to Thompson (1967), top management processes information of the firm depending on how the dynamism in the operating environment. TMT influences the strategy and actions taken chosen the to realize the objectives of firm (Ondari, 2015).

According to Kasomi (2015), researchers group TMT traits into three main groups, such as, cognitive, demographic, and psychological characteristics. Demographic attributes including gender, education, age, functional history, work experience, seniority in organization and the size of the TMT. Cognitive traits in TMT facilitate goal-oriented behavior. Mental qualities are linked to flexibility or ability to change to the suitable emotional state. It entail proposition of thinking or understanding of individuals' thoughts and expectations or predictions. They manifest themselves for form identification, crisis definition and problem solving, which are the

result of possible solutions and the crisis handling. The implication affecting self-control or the aptitude to recognize and achieve your own emotions (Narayana, Zane & Kemmerer, 2011).

The study adopted the implementation of Nielson and Nielson (2013) of TMT, i.e. duration of occupation, functional context, age, sex and education. TMT composed of members with varied occupancy gains from different skills and points of view distributed by each member with a positive influence on organizational achievement. A company's performance must be reflected in the establishment's aptitude to achieve its objectives and aims, using its resources effectively and efficiently (Daft, 2000). Njoroge (2015), contended that no sole measure of company performance, as different measures are adopted by businesses depending on their orientation. According to Awino et al., (2011), the combination of different measures of a company's performance is an effective way to measure overall achievement. Kaplan and Norton (1992) concluded that four perspectives are used to measure performance: these perspectives are customer satisfaction, learning and growth, financial and internal processes. The study was based on the upper echelon theory (Hambrick & Mason, 1984). It postulates that the result of an organization depends on the attributes of TMT (Hambrick and Mason, 1984).

The main deliberation and orientation of any serious organization is to try to outdo industry competitors by providing shareholders with sustainable and superior returns and to satisfy all other stakeholders (Child, 1972). According to Machuki and Aosa (2011), organizations should assess fundamental success and failure as a discourse in the business of organizational management. Actual results against planned objectives, goals and outputs constitute the actual accomplishment of the corporation.

The conduct of corporations listed at the NSE is of major strategic importance in driving the socio-economic agenda of Kenya, as envisaged in Vision 2030 of the country which anchors on the three key pillars, which are; economic, social and policy to transform Kenya into an industrialized economy by 2030. Businesses need effective management teams to overcome the competitive challenges they face in an operating environment in order to achieve superior performance (Cannella, Park & Lee, 2008).

Surveys that have looked at TMT and business performance have produced varied findings, with some reporting a positive impact, others showing a negative impact and still others having no influence. Irungu (2007) focused on the association among TMT demography and organizational performance and established that various demographic factors have different magnitudes and directions of influence on performance. Praptiningsih (2009) in his study linked company governance devices and corporate performance in Asian banks using cross-sectional surveys and panel data and concluded that duality of CEOs positively affected performance of enterprises. Guo and Kumara (2012) in their research on the impact of company sovereignty devices using a random effects model on non-financial businesses in Sri Lanka, established that there is a substantial negative association among the size of the non-executive board of directors in a firm.

Irungu (2007) studied effect of TMT on listed companies at NSE applying relevant data collected from 29 banks and established existence of positive relationship among the characteristics of TMT and various business performing indicators. Lishenga (2012) assessed the consequence of board meetings using a cross-sectional survey and panel data and established positive relationship. Mkalama (2014) researched on the link among the characteristics of TMTs and the performance of state-owned companies using cross-sectional descriptive survey method and observed that the traits of TMT impact on the accomplishment of corporations. The above studies present contextual, conceptual, and procedural gaps to be covered by this survey.

## MATERIALS

Hambrick and Mason (1984), contends that TMT attributes act as a reflection of the corporation by playing a significant and influential role towards the overall performance of the company. The attributes of managers have an effect on the choices they make, and consequently on strategies and measures to be implemented by the companies they are responsible for propelling towards the achievement of their mandate and their key objectives (Hambrick et al., 2015). Cannella, Park & Lee, (2008), believes that TMT attributes are correlated together with cognitive and psychological elements of settings; thus, organizations have the upper hand in developing, adapting and executing strategies that maximize their advantage over other competing companies. The value of upper echelon theory acknowledges that the various qualities of TMT impact on their decisions on strategy and structure, thus clearly affecting both strategic choice and business performance (Nielsen 2010). Hambrick and Mason (1984) propose an connection among the extent of the experience of the TMT members and the emphasis placed on exits in the company's strategy. Proposals of upper echelon theory have broadened the field of knowledge in research on the role of TMT and business performance (Kinuu, Murgor, Ongeti, Letting & Aosa, 2012). UET theory makes it easier to underestimate the characteristics of TMTs and how their potential improves business performance.

In a study by Jaw and Lin (2009) on the characteristics of the company elite and the internationalization of firms, a sample of 165 Taiwanese companies in a technically intensive firms, and discovered that there is a curvilinear association among the length of the CEO Post, the Size of TMT and the heterogeneity of TMT tenures and the internalization business. The connection among the tenure of the CEO position and the TMT contract was in the form of an inverting U.

Carpenter and Frederickson (2010), studied effect of operating environment on the association amongst TMT with global strategic posture, discovered that environmental factors were created without uncertainty the lack of information required for the price of decision thus moderates the relationship by affecting the probabilities to the results of the organization. Akpan and Amran (2014) found that the size and education level of boards were positively linked to the performance of companies among 90 companies sampled from Nigerian Stock Market as at 2010-2012. It suggested that the independence, equity and age of the board were linked to the performance of the business. The report observed a negative association among women's board membership and turnover.

Herrmann and Datta (2005), posted that organizations with a high level of global expansion attract TMT members of advanced education, more international experience, a younger workforce and long-lasting performance. The literature review revealed conceptual, contextual and methodological gaps. Other contradictory results from various studies validate the need for this current study.

## METHODS

The study was based on a positivist philosophy approach. The positivism approach was adopted because the study aimed to empirically and objectively analyze the association among TMT and business performance and to test the hypothesis drawn from the theory. The survey espoused a descriptive cross-sectional survey. Nachmias and Nachmias (2004) postulate that cross-sectional studies allow the academic to cause if there is substantial relations among the variables and the strength of these associations.

. This design has been used successfully by, Machuki (2011), Irungu (2007) and Mutuku (2012) to test hypothesis and draw conclusions. The study used census approach where all 66 listed companies at Nairobi Securities Exchange were surveyed. Out of 66

companies, 50 companies responded therefore their responses were analyzed. Diagnostic test, that is linearity, normality, multicollinearity and homoscedasticity were conducted.

## RESEARCH FINDINGS

Outcomes of the survey are presented in Table 1 below.

Table 1: Influence of Top Management Team on and Overall Firm Performance

Model Summary									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Change Statistics			Sig. F Change
						F Change	df1	df2	
1	.717 <sup>a</sup>	.514	.446	.91411	.514	7.409	5	44	.004
ANOVA <sup>a</sup>									
Model		Sum of Squares	df	Mean Square	F	Sig.			
1	Regression	14.113	5	2.823	7.409	.004 <sup>b</sup>			
	Residual	16.767	44	.381					
	Total	30.880	49						
Coefficients <sup>a</sup>									
Model		Unstandardized Coefficients		Standardized Coefficients		Collinearity Statistics			
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF	
1	(Constant)	0.074	0.034		2.143	.000			
	Functional Background	.217	.069	.220	3.144	.002	.743	1.346	
	Tenure	.212	.082	.206	2.561	.006	.781	1.280	
	Age	.020	.007	.020	2.754	.004	.840	1.191	
	Gender	.025	.007	.020	3.218	.000	.853	1.173	
	Education	.124	.037	.112	3.314	.003	.918	1.090	

a. Dependent Variable: Firm Performance

b. Predictors: (Constant), Education, Tenure, Age, Gender, Functional Background

The study found a moderate association among TMT and performance ( $R = .717$ ). Coefficient of determination ( $R^2 = .514$ ) indicates that top management team (Education, Tenure, Age, Gender, Functional context) represented 51.4% of the variation in business performance. The other variables not included in the study represent 48.6%. ( $F = 7.409$ ,  $p$  value =  $0.004 < 0.05$ ) indicated that the model established was too significant. The non-standardized beta coefficient indicated that education ( $\beta = .124$ , the value  $p = .003 < .05$ ), the length of the mandate ( $\beta = .212$ , the value  $p = .006 < .05$ ), age ( $\beta = .020$ ,  $p$ -value =  $.004 < .05$ ), sex ( $\beta = .025$ , the value  $p = .000 < .05$ ) and the functional context ( $\beta = .217$ , the value  $p = .002 < .05$ ) are individually significantly statistically significant contribution to business. It also indicates that the functional context has the highest positive impact on company performance, followed by education, tenure, gender and age, respectively. The assumption that the management team does not have a significant effect on the performance of companies listed on the NSE has been rejected, and the management team significantly influences the performance of companies listed on the Nairobi Securities Exchange.

The results support the theory of the upper echelon. Therefore, when recruiting senior managers, the panel should be guided to match the characteristic profiles of candidates with members of the existing management team. The results are consistent with those of Mutuku, K'Obonyo and Awino (2013) who postulated that the characteristics of the management team can translate into effective strategic decision-making, greater creativity, more innovation and the ability to reach more and different types of stakeholders, which indeed have a positive impact on business performance. The results further indicate that senior management leads the organizations as agents of the shareholders (principals). As the business grows, the company's shareholders hire professional executives to help manage the business by creating a principal / agent relationship. Education as well as levels of specialization were associated with receptiveness to innovation and reflected personal elegance and mentality, thus resulting in tangible performance. Functional skills are taken into account when recruiting senior managers. These results support the research work of Dezso and Ross (2012) according to which the characteristics of the management team (education, functional training and work experience) contribute to organizational performance. The results are consistent with studies by Yang and Wang (2014) who have argued that the age and work experience of senior managers lead to better identification of corporate governance practices resulting in superior performance.

## CONCLUSION AND RECOMMENDATION

It has been found that the TMT dimensions collectively and individually positively significantly influence the performance of the business. The functional context has the highest clear effect on the accomplishment of the business, followed respectively by education, tenure, gender and age. The study also found that the characteristics of the team's senior management are highly valued and that the leaders appointed must have the values and qualifications set to drive businesses to success. The characteristics of senior team management reflect their mental alignment, their morals and their information base and therefore impact the planned choices they make in their functions to ensure the success of the organization, because TMT's professional experience and expertise offer superior advice and improved corporate governance resulting in competitive advantage. The results of the hypothesis test established that TMT significantly affects the performance of companies listed on the NSE, so companies should put more emphasis on the selection and composition of TMT. The study added to the theory of the upper echelon and justifies the hypothesis. The empirical support from this survey adds to the overall literature review for future researchers and academics.

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# Assessment of the Stakeholders' Compliance with Public Procurement Act of 2011 and It's Regulations. A Case of Longido District Council

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## Definition of Key Terms

### Procurement

Procurement includes all activities required in order to obtain the product from the supplier and get it to the place where it is actually needed. It encompasses the purchasing function, stores, traffic and transportation, incoming inspection and quality control and assurance (Farmer and Weele, 2000). Procurement, according to Wind and Thomas (2001), is as old as organizations but it has evolved over time. It developed from the need of organizations to acquire those goods and services that they could not produce but needed in their operations. Initially, the focus of contracting was typically on minimizing costs to the procurement entity rather than on delivering specific service quality outcomes. With time procurement has evolved to include new aspects like strategic sourcing, e-procurement and performance based service contracting. In seeking to outsource for goods and services, good practice and business efficacy demand that the purchaser wants to find a supplier who will be both reliable and will provide products or services that are good value for money (Griffith and Griffith, 2002).

### Public Procurement

Kipchilat (2006) notes that public procurement is different from private procurement because in public procurement the economic results must be measured against more complex and long-term criteria. Furthermore, public procurement must be transacted with other considerations in mind, besides the economy. These considerations include accountability, non-discrimination among potential suppliers and respect for international obligations. For these reasons, public procurement is now subjected in all countries to enacted regulations, in order to protect public interests, especially public finance. Baily et al (2010) note that public purchases are accountable to the public whose money is spent, including disappointed tenderness and potential suppliers. As such they must produce procedures and practices which will stand up to scrutiny during either government audits or challenge through the courts of any purchasing decision that has been made un-procedurally. The primary purpose of public accountability is to prevent abuses of taxpayer's money.

### Compliance

As cited by Gelderman et al (2006) in general, compliance refers to target "acting in accordance with an influence attempt from the source" (Payan and McFarland, 2005). From the perspective of a formal concept of compliance, the conduct of the regulated actor is compared to a formal definition of the corresponding

(legal) obligation (Lange, 1999). Compliance has a negative connotation, because it is usually associated with enforced behavior. In the marketing-channel literature compliance is considered as giving in to "the wishes of a more powerful channel member" (Hunt et al., 1987). Kelman (1958) too points at the negative sides of compliance: an individual accepts influence not because he believes in its content but because he expects to gain specific rewards or approval and avoid specific punishments or disapproval by conforming." Compliance occurs when the target performs a requested action, but is apathetic about it, rather than enthusiastic, and puts in only a minimal or average effort (Yukl, 1989).

**Abstract-** The aim of the study was to assess Factors Influencing Public Procurement Compliance with Public Procurement Act of 2011 and It's Regulations in Longido District Council. The study also identified the major challenges facing stakeholders' in complying with PPA of 2011 and its regulations. Moreover, the study determined possible measures for effective stakeholders' compliance with Public Procurement Act of 2011 and its regulations. Descriptive design was useful for collecting data and techniques used in analysis. Data was collected using administered questionnaires. All completed questionnaires proceeded to data analysis. A total of 50 questionnaires were returned. Data was analyzed using IBM SPSS Version 25 for descriptive and inferential statistics.

The results from the analysis revealed flow of funds, competence and commitment, staff training, and ICT, top management support and internal processes are the key factor affecting stakeholders' compliance. Also, Lack of incentives, Illiteracy and inadequate contract management skills among some service providers and Accusation of conflict of interest, bribery and corruption in procurement processes were major challenges facing stakeholders' in complying with PPA and its regulations. Moreover, study findings revealed that addressing stakeholders' problems, stakeholders training and development and enhancing transparency to curb corruption are possible measures for effective stakeholders' compliance with PPA of 2011 and its regulations. The study recommends that there is need to do a further research on the private sector in Tanzania. A broad based study on the effect of compliance with Public Procurement Act of 2011 and its regulations in performance of organizations should also be carried out.

## I. BACKGROUND TO THE STUDY

In Tanzania, the Public Procurement Act was enacted to harmonize public procurement processes in the public service, secure judicious, economic and efficient use of public resources, and furthermore, ensure that public procurement is fair, transparent and non-discriminatory. Public Procurement has a long history. According to Telgen, (2006) Public Procurement is a comprehensive process stretching from procurement planning, budget allocation, bids invitation, bids evaluation, contract award, contract management, performance evaluation, auditing and reporting. It is an activity that must support the delivery of a public body's strategic objectives at the same time live up to the expectations of the targeted public and taxpayers at large. Arrowsmith (2010), stated that public procurement is one of the Government activities which have significant impact economically, socially and political in the country. In provision of services, governments spent huge sum of money in acquisition of materials and services. It is estimated that 7-13% of world Gross Domestic Product (GDP) and 30% of world merchandise trade could be available in the public procurement. Most industrialized countries spend at least 10% of their GDP on public procurement Trionfetti, (2013).

Developing countries, in one way or another, have reformed their public procurement regulations. The reforms have not been limited to regulations only, included public procurement processes, methods, procurement organizational structures and appropriate job specification and description for the workforce. The reforms have been a result of joint effort with various development partners like the World Bank, International Trade Centre, WTO, and UNCTAD varying from country to country. The PPRA as an oversight body has the mandate to ensure that public entities are adhering to Public Procurement Act, 2011. The PPA 2011 is giving equal opportunity to all prospective suppliers, contractors, consultants and service providers. It ensures fairness of treatment to all parties in order to obtain the value for money in the procurement process. The Act applies to all Government institutions which use public funds. The Defence and National Security Organs are obliged to comply with the Act in managing their procurement and disposal of public assets. They are required to prepare dual list that is items for open tendering and list for restricted items. They are required to agree annually with the PPRA on the restricted list and the methods of procurement for the restricted items. The PPA 2011 is being implemented with Public Procurement Regulations 2013 Government Notice No. 446 published on 15th December, 2013. However, apart from their contribution and Government efforts Public Procurement in LGAs encounter many barriers and problems in their operations, limiting their performance. The Public Procurement Act identified the compliance weakness in the public institutions that need urgent attention. These are: Lack of qualified procurement personnel, incorrect interpretation and application of some provisions of the procurement Act, slow pace in regularizing the Draft Regulations, lack of clear procedures for Emergency Procurement, lack of Training Avenues or Institutions, poor Record Management (scattered files), poor handling of Suppliers' Complaints, poor Procurement Planning, Mobilization & Implementation, poor Contract Management and high cost of Advertisement (PPA, 2007).

It is from this background that this study assessed the stakeholders' compliance with Public Procurement Act of 2011 and its regulations on Local Government Authorities (LGAs) in Tanzania.

### Statement of the problem

It has been observed that in Tanzania LGAs the Public Procurement Act and its regulations were initiated in order to govern the Public Procurement (CPAR, 2013). This Act requires value for money to be realized even though it has been revised in a several times as Act No. 21 of 2004, No. 7 of 2013 and amendment of 2016 with their regulations, however; the experience shows that the law is not properly enforced. Abukari, (2014) found that the implementation of the Act was hindered by poor information dissemination, in adequate capacity and trainings, delay in payment of works executed by service providers and challenges with the law itself. Malima, (2016) found that factors that limited application of PPA procedures were: lack of procurement knowledge, lack of inadequacy fund due to highly dependency from donors and improper positioning of Procurement Management Units (PMUs). Fikya, (2017) found that generalization of the PPA 2011 in all Institutions was the major challenge. In Tanzania a number of studies relating to the above topic has been conducted but has not covered the problem. This was evidenced by Fikya, (2017) done a research on the Challenges on Complying with PPA of 2004 in the procurement of Goods in the specialized Institution at Medical Store Department (MSD). Suka, (2015) conducted a study on the effectiveness of PPA No. 21 of 2004 in procurement of Goods in the Central Government in Tanzania. Least but not last, Nyendage, (2015) conducted a study on the effectiveness of PPA No.21 of 2004 in achieving economy and efficient, in the use of Public funds in LGAs which was done at Ilala Municipal Council but in a most cases not covered all challenges of complying with PPA and its regulations. Therefore, from such views no research has been done specifically on assessing the compliance to PPA 2011 and its regulations in LGAs, Hence; this study sought to do an assessment of the stakeholders' compliance with Public Procurement Act of 2011 and its Regulations in Tanzania Local Government Authorities for the case of Longido District Council.

### Specific objectives

The specific objectives of this study were to examine factors affecting stakeholders' compliance with PPA of 2011 and its regulations, to identify the major challenges facing stakeholders' in complying with PPA of 2011 and its regulations and to determine possible measures for effective stakeholders' compliance with Public Procurement Act of 2011 and its regulations

### Significance of the Study

This study bears the following importance;

### Government of Tanzania

The research findings would give guidelines to the Tanzania Government in the formulation of appropriate laws and rules that will be used in the planning, designing and implementation of a

sound public procurement system that will align itself to the overall economic strategy

### **Policy Makers**

The study will enable policy makers to plan, organize and formulate good policies and laws that will help the society to grow. It will assist the policy makers to do the rational and right decision making when they are planning things that have direct impact to the society.

### **Researchers and Academicians**

Another relevance of this study is the provision of empirical literature to the future researchers who are also interested in conducting researches in the area of compliance on Public Procurement Act of 2011 and its regulations. It would also serve as stock of knowledge for practitioners and students to gather experience in the area of compliance on Public Procurement Act of 2011 and its regulations. This study is therefore meant to provide empirical bases for such researchers.

## **II. LITERATURE REVIEW**

### **FACTORS INFLUENCING PUBLIC PROCUREMENT COMPLIANCE**

Factors influencing compliance with the public procurement range from staff training, use of ICT, top management support, awareness in provisions of public procurement laws, procurement ethic, technical audit factors and effectiveness of public procurement audit among others.

#### **Staff Training**

According to Raymond (2008), professionalism in public procurement relates not only to the levels of education and qualifications of the workforce but also to the professional approach in the conduct of business activities. If the workforce is not adequately educated in procurement matters, serious consequences; including, breaches of codes of conduct occur. According to Atkinson (2003) cited in Raymond(2008), there are approximately 500,000 professional purchasing people in the United States and only 10 per cent of these have been members of a professional body and the rest are not even aware that there are ethical and legal standards involved in procurement. He also linked lack of a high degree of professionalism in public procurement to corruption, which ultimately impedes compliance. The procurement officers must be trained and aware about all regulations in relation to procurement and related procedures (Hui et al 2011). Rossi, (2010) asserts that ethical code is not only a deterrent of incorrect behavior but also an enabler for all members of the organization to safeguard the ethical legacy of the firm. In Uganda, the PPDA Audit Report (2008) revealed that lack of professionalism was high amongst public procurement officers. This position is further confirmed by Basheka and Mugabira (2008) who state that the level of professionalism in public procurement in Uganda is low or non-existent. De-Boer and Telgen, (2010) also attributed non-compliance in public procurement to lack of purchasing professionalism in the public sector.

#### **Information, Communication and Technology (ICT)**

The role of ICT and Management Information Systems in enhancing efficiency and transparency in public procurement cannot be underestimated (De-Boer and Telgen, 2010). ICT in public procurement is intended to serve a number of objectives which include: Broadening participation in public tendering, To speed up the procurement process and make it more efficient by expanding supply and demand; and to provide transparency in public procurement by reviewing established procedures and public information, and by developing an easy auditing system. Installation of ICT in public entities procurement aims at benefiting three main stakeholders: First, there is the public at large, which demands easy access to reliable information on public procurement. Secondly, the government purchasers that need a more efficient, faster and less bureaucratic procurement process. Besides that, public entities are keen on the use of systems to restore public trust on the part of public sector spending going to the acquisition of goods and services. According to (Oliver, 2005), Business solutions like SAPERP help in streamlining procurement controls all across the functional lines. Public sector procurement functions should also be cross-linked with such solutions. SAP also enables all units track procurement performances across different departments in the public sector. It enhances visibility and increases inventory transactions efficiently.

#### **Top Management Support**

Hui et al (2011) stipulates that efficient management is one of the most effective preventive mechanisms for it promotes transparency and accountability, facilitates oversight and provides a good basis to prevent corruption. Rossi, (2010) opines that formal controls must first be defined, agreed, and applied top-down internally within an organization if they are to be effective. An organization with a genuine commitment to legal compliance is evidenced by top management's dedication to ethical corporate behavior (Krawiec, 2003). In a related argument, Obanda, (2010) stipulated that strong institutional support at top levels of government is needed by procurement personnel in order to promote integrity, monitor the public procurement process and apply procurement law appropriately.

#### **Awareness in Provisions of Public Procurement Laws**

According to Rossi (2010), compliance with the formal elements gives an indication of knowledge of the rules. Gelderman et al; (2013) maintained that public purchasers will comply with the rules if they perceive them as clear. It is further argued that Lack of clarity is believed to increase the possibilities for deliberate non-compliance. Educating and training public purchasers will be an effective tool for increasing the compliance with the directives.

#### **Ethics in Procurement Regulations**

Dobler and Burt (2013) define a profession as: "a calling requiring specialized knowledge and often long and intense preparation including instruction in skills and methods, maintaining by force of organization or concerted opinion high standards of achievement and conduct, and committing its members to continued study and to a kind of work to which has for its prime purpose the rendering of a public service" This definition is echoed by Millerson (2014) who lists the following

essential features of a profession. A profession according to Millerson has the following essential features; A skill based on theoretical knowledge; A skill requiring training and education; the demonstration of competence by professional by passing a test; maintenance of integrity by adherence to a code of conduct; service provided for the public good and that the profession is organized.

### **Institutional Factors**

According to Luy (2014), there are six dimensions through which we can judge the level of institutionalization of any structure and its ability to adapt to change, including: autonomy, complexity, coherence, congruence and exclusivity. Implementation of organizational activities depends on the relationships between and within organizations. One way to explain this relationships and its effect on implementation of organizational activities is the principal-agency theory holds that shirking is likely to occur when there is some disagreement between policy makers and the bureaucracy. Civilian political leaders (principals) delegate authority to the bureaucracy (agent) with the expectation that the agent does not move quickly enough to reflect the policy preferences of principal, the committee members could show their displeasure by cutting the funding of the organization. Leaders (the principals), through powers of appointment and the purse are in position to influence bureaucratic outputs. Luy, (2014) quoting Calvert et.al. (2010), found that politicians wield considerable power in affecting bureaucratic outputs via the power of appointment. Calvert et al posits that the chief executives power of appointment and the threat of legislative sanctions influence bureaucratic output.

### **Accountability**

Accountability is government's obligation to demonstrate effectiveness in carrying out goals and producing the types of services that the public wants and needs (Segal and Summers, 2012). Lack of accountability creates opportunities for corruption. Brinkerhoff (2014) identifies three key components of accountability, including the measurement of goals and results, the justification or explanation of those results to internal or external monitors, and punishment or sanctions for non-performance or corrupt behavior. Strategies to help increase accountability include information systems which measure how inputs are used to produce outputs; watchdog organizations, health boards or other civic organizations to demand explanation of results; performance incentives to reward good performance; and sanctions for poor performance (Vian and Collins,2014).

### **Internal Processes**

Public procurement has, for long, been overshadowed with inefficiency, corruption and disregard of fundamental "value for money" considerations. This has adversely impacted the rate and quality of progress in realizing the objectives of national development, especially in developing and transition countries (Tan et al., 2009). Employees may neither engage in, nor give the appearance of engaging in, dishonest or unethical actions. Both are injurious to the public's perception of honest government. As a government employee, you might have access to procurement and other nonpublic information that could affect a contract bid or the award process (Wymer and Regan, 2010). Improper

disclosure of such protected information could violate numerous laws, as well as ethics rules. It also could subject you to administrative actions, as well as civil or criminal penalties. Management in contracting authorities should ensure that there is an appropriate focus on good practice in purchasing and, where there is a significant procurement function that procedures are in place to ensure compliance with all relevant guidelines.

### **Theories guiding the Study**

#### **Stakeholders Theory**

Stakeholder theory originated by Freeman (1984) is defined as "any group or individual who can affect or is affected by the achievement of the organization's objectives". Unlike agency theory in which the managers are working and serving for the stakeholders, stakeholder theorists suggest that managers in organizations have a network of relationships to serve that include the suppliers, employees and business partners. According to Freeman (2002), each stakeholder is given an important say in making important decisions. Business and executives who manage them, should create value for customers, suppliers, employees, communities and financiers (Stieb, 2008) The stakeholder theory argues about the importance of a firm paying special attention to the various stakeholder groups that are deemed to have a stake in the operations of a firm. The representation of all stakeholder groups on boards is therefore necessary for effective corporate governance (Gibson, 2010). The model depicts the stakeholders in a typical large corporation. The stakes of each are reciprocal, since each can affect the other in terms of harms and benefits as well as rights and duties (Freeman, 2002). Owners have financial stake in the corporation and expect returns. Employees have their jobs and usually their livelihood at stake. They have socialized skills and in return for their labor, expect security, wages and benefits and meaningful work (Frey & Nickerman, 2009). They are in return expected to follow the instructions of management, and be responsible citizens in the local community in which the corporation operates. The stakeholders theory will be used to establish how different stakeholders such as the general public, the government, civil society, suppliers and various procurement professional organizations influence effective implementation of the public procurement rules and regulations and how this affects organizational performance.

#### **Principal Agent Theory**

Agency theory was expounded by Alchian and Demsetz (1972) and further developed by Jensen and Meckling (1976). The theory defines the relationship between the principals, such as shareholders and agents or company executives and managers. In this theory, shareholders who are the owners of the company, hire the agents to perform work. Principals delegate the running of business to the managers, who are the shareholders' agents (Clarke, 2014). According to Rungtusanatham et al., (2013), two parties have an agency relationship when they cooperate and engage in an association wherein one party delegates decisions or work to another to act on its behalf. The important assumptions underlying agency theory are that: potential goal conflicts exist between principals and agents; each party acts in its own self-interest; information asymmetry frequently exists between principals and agents; agents are more risk averse than the

principals; and efficiency is the effectiveness criterion (Xingxing&Kaynak, 2012). The theory deals with situations in which the principal is in a position to induce the agent, to perform some task in the principal's interest, but not necessarily the agent's (Health & Norman, 2013). Accounting officers and procurement managers in state corporations play the agent role for the government and the organization stakeholders. Compliance with procurement rules and regulations may be as result of principal-agent problem (Langevoort, 2012). The PPDA, (2005) bestows the responsibility of compliance with PP legal framework on the Accounting Officers of the PEs. Theory will be useful in explaining the relationship between the government and the state corporations in compliance to the legal framework. Theory will explain how the actions of the agent affect the principal and other stakeholders for example making non optimal decisions as far as the utilization of financial resources and non-financial resources are concerned (Muranda, 2016).

### **Institutional Theory**

Institutional theory adopts a sociological perspective to explain organizational structures and behavior (Dunn, 2010). It draws attention to the social and cultural factors that influence organizational decision-making and in particular how rationalized activities are adopted by organizations (Scott, 2011). The institutional theory is the traditional approach that is used to examine elements of public procurement (Obanda, 2010). Scott, (2014) identifies three pillars of institutions as regulatory, normative and cultural cognitive. The regulatory pillar emphasizes the use of rules, laws and sanctions as enforcement mechanism, with expedience as basis for compliance. The normative pillar refers to norms and values with social obligation as the basis of compliance. The cultural-cognitive pillar rests on shared understanding on common beliefs, symbols, and shared understanding.

### **Legitimacy Theory**

Legitimacy theory derived from the concept of organizational legitimacy, was defined by Dowling and Pfeffer, (1975) as a condition or status which exists when an entity's value system is congruent with the value system of the larger social system of which the entity is a part (Guthrie, Cuganesan& Ward, 2016). When a disparity, actual or potential, exists between the two value systems, there is a threat to the entity's legitimacy. Legitimacy theory posits that organizations continually seek to ensure that they operate within the bounds and norms of their respective societies. According to Wilmshurst and Frost (2010), the legitimacy theory postulates that the organization is responsible to disclose its practices to the stakeholders, especially to the public and justify its existence within the boundaries of society. This theory, which focuses on the relationship and interaction between an organization and the society, provides a sufficient and superior way for understanding state corporations procurement practices (Hui et al., 2011).

### **Empirical Literature Review**

Gelderman et al., (2015) undertook a study on non-compliance of EU tendering directives. The study surveyed 147 purchasing professional of the Dutch Ministry of Defense and the findings

revealed that both purchaser's familiarity with the rules and organizational incentives have a positive, statistically significant impact on compliance. On the other hand, inefficiency of the directives and supplier resistance did not influence compliance with the directives. The study however failed to give recommendations on how both developed and developing nations can improve regulatory compliance and increase organizational performance.

Sasheka, (2018) as well undertook a study among 99 local government stakeholders selected from 11 districts of Uganda. Using a correlation research design, study aimed at identifying the critical components of procurement planning and accountable Government system. Data was analyzed using principal component factor analysis and results indicate a significant positive relationship between procurement planning and accountable local government procurement systems.

Geo, (2015) on the other hand carried out a study on factors influencing compliance with the Public Procurement Law (Act 663). The research used data from a survey of 58 responding PP purchasers from procurement entities within the public sector of Ghana. Study established that both organizational goal achievement and familiarity of rules by PP practitioners have a positive, statistically significant impact on compliance. The study focused on non-compliance and failed to show how it affects the performance of public entities.

Ogot, Mulinge and Muriuki, (2016) studied the impact of the PP law and Regulations on 54 profit oriented public corporations in Kenya. The study established that regulating procurement in profit oriented public corporations had significantly promoted transparency, quality and value for money in procurement carried out. However, the study revealed that the ability by the PEs to bargain with suppliers for the best deal and speedy response to business opportunities were some of the areas adversely impacted by the law. The study did not indicate the impact of the inability to bargain with suppliers and failure of speedy response to business opportunities had on the firms' profitability and growth; for accountability of the firms; profit generation and growth cannot be alienated from the managers' discretion to control cost of inputs, that is, procurement (Ogot et al., 2010). In other words, there is no rationale to task managers of regulated firms for failure to generate profits if they are denied control over costs. The managers' denial of discretion and control over operating costs may have significant adverse effect on business planning and the overall firm's performance. However, using data collected from semi structured interviews in Atlanta Georgia, Schnequa and Alexandra (2012) noted that the Public Private Partnerships in public procurement are possible only under rigid constraint. In their study, they found that there are two decision making patterns, the-broker and the purist-correlated with length of employment by the same organization and the political context of the agency.

Ivar et al., (2011) conducted a survey of over 7300 procurers and participating firms and in-depth interviews with 150 procurement professionals on the patterns of use, costs and effectiveness of EU procurement. The study sought to directly assess the costs of procurement and to compare costs across procedures, countries, authorities and sectors. Findings indicate that procurement costs and effectiveness vary significantly across countries and that the procurement directives support the core objectives of PP policy.

In particular, PP markets are highly competitive and this helps to bring about efficient purchasing outcomes. The regulatory dilemma is how to balance the positive core features of the system, while responding to a perceived need for increased efficiency and flexibility.

PPOA (2011), undertook a survey on the level of compliance to the procurement law and established that the introduction of the legal and regulatory procurement framework; the establishment of PPOA as an oversight body; the development of a framework for contract administration and the appeals mechanism were among the aspects of the procurement system rated as having been positively affected by the law. In contrast, the existing institutional development capacity in PEs and functioning of the procurement market were assessed as being among the weakest aspects of the system. The study noted that although procedures supporting systematic procurement planning had been established were not complied with, that there was a low share of procurements that were done through open tendering, meaning most procurements were done on an ad hoc basis, by RFQs and direct procurements, thus suggesting a lack of procurement planning in most of the surveyed PEs. One of the strong points about the public procurement law according to the study was that procurement decision making had been fully delegated.

Eyaaet al., (2017) conducted a cross sectional study on the causes of non-compliance in PP in Uganda using a structured questionnaire. The target population was 120 Central Government Procuring and Disposing Entities (PDEs). The sample size selected was 92 using random sampling technique and the response was 46, giving a response rate of 50%. Collected data was analyzed using correlation analysis. The reliability of the measures was determined using the Cronbach Alpha Co-efficient. All coefficient of the variables were above 0.5, implying that the measures were adequate. The findings indicate that only familiarity with rules is a significant predictor of compliance. The implication is that the more procurement personnel are familiar with the regulations, the more compliant they will be. The authors' model indicates a 52.4% variation in compliance with the regulations. The study did not explore the structure of the country's procurement legal framework and how it affects the performance of PEs.

Osei-Tutuet al., (2016) studied the level of compliance with the public procurement Act in Ghana targeting PEs in local government, education and health as representation of procurement activities of the Ashanti and BrongAhafo regions. Four main compliance areas with sub-criteria adopted were management systems, information and communication, procurement process and contract management. The simple method of calculating averages was employed in the computations to determine the degree of compliance and obtaining a 100% would imply that the PE fully complied with the requirements of the procurement law in that particular area.

The study by Ntayiet al., (2018) examined the perceptions and effects of social value orientation, expected utility, fairness in procurement procedures, the legitimacy of the procurement law and the procurement law enforcement authority on compliance with the procurement law, guidelines, procedures and regulations. Data were collected from a sample of 110 Procurement and Disposing Entities (PDEs) and analyzed using confirmatory factor analysis (CFA) and structural equation

modeling (SEM). Findings indicate that social value orientation, expected utility, legitimacy of the procurement law enforcement agency and perceptions of procedural justice were significant predictors of the PP regulatory compliance (Ntayiet al., 2015). CFA demonstrates that PP staffs are driven by individualistic self-interest, pro-social and competitive social value orientations while performing the procurement functions and follow rules which they do not believe in, but which are perceived by government to promote transparency and accountability.

A study by Kenyanya et al., (2016) sought to determine the influence of the PPDA, (2016) on procurement practices in PEs in Kenya. Data were collected from 95 respondents of tender committee members, the suppliers and the principals of the schools. Study established that the regulations have had a significant influence on pricing of goods procured and lead time. On the other hand, the same regulations have had a less significant influence on transparency of the procurement process and quality of goods procured.

Achuora, Arasa and Onchiri (2017) conducted a study on the factors affecting effectiveness of PP audits for constituency development funds in Kenya. Specifically it sought to investigate the effect of the legal framework, auditor's specific professional qualities, technical audit factors and client-related factors on effectiveness of PP audits. The study adopted a descriptive research design using a stratified random sampling to ensure representativeness. The study findings indicate that technical audit factors have greatest influence on effectiveness of PP audit, followed by regulatory framework, client related factors and auditor's professional qualities respectively. The study narrowed its research undertakings on PP audits and hence failed to demonstrate the influence of PP rules and regulations on performance of PEs.

European Union Chamber of Commerce in China (2015) conducted a study on European business experiences competing for public contracts in China. The study targeted foreign-invested enterprises (FIEs) competing in China's PP markets. The study established that the regulatory framework governing procurement is fragmented, inconsistent and unevenly implemented and that it is a drag on efficiency and innovation for the Chinese economy as a whole. However, the study failed to demonstrate the influence of the Chinese government procurement legal framework and performance of government corporations.

A study by PPRA (2016) assessed the Country's Procurement System in 20 PEs that were sampled randomly. The assessment methodology was based on the OECD-DAC/WB structure of four pillars, namely: legislative and regulatory framework; institutional framework and management capacity; procurement operations and market practice; and integrity of the public procurement system. The study found out that tenders which did not use standard bidding documents accounted to 55% and most of the interviewed stake holders were not familiar with the Act and Regulations. The study recommended enforcement and close monitoring of all PEs to ensure compliance.

In another study by Belisario et al., (2018) on Asia Pacific Economic Cooperation procurement transparency standards in the Philippines, entailed consultations with the private sector whether those laws and regulations are implemented in practice and actually help reduce corruption. Study failed to demonstrate

the influence of the employed procurement legal framework on performance of government corporations in Philippines.

Tadeo et al., (2018) studied the extent to which procurement officers at local governments in Uganda comply with the legal framework and the relationship between compliance and service delivery. The study adopted a combination of qualitative and quantitative approaches to collect and analyze the data. The findings indicate a moderate level (70%) of compliance to the law and a weak relationship between compliance and timeliness ( $r = .13$ ,  $p = .57$ ), cost ( $r = .38$ ,  $p = .63$ ), and quality ( $r = .18$ ,  $p = .49$ ). Study failed to show the effect of compliance with procurement rules and regulations on organizational performance.

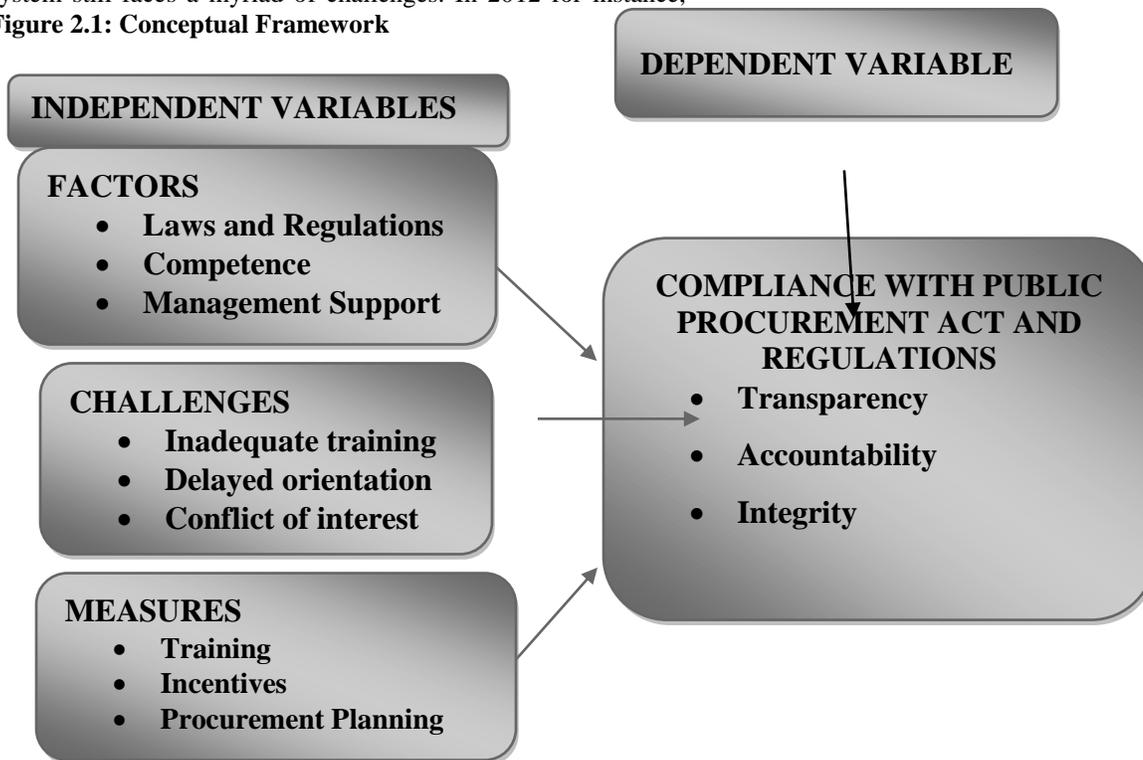
Okundi (2017) carried out a study on Procurement Laws Review Key to the Success of Devolution with the aim of establishing how procurement law can help implementation of county governments. Study revealed that despite the progress made since the operationalization of the law, the Kenyan procurement system still faces a myriad of challenges. In 2012 for instance,

the then Permanent Secretary for Finance noted that up to 30 per cent of the national budget is lost in procurement related malpractices.

**Conceptual Framework**

A conceptual framework is simply a structure of the research idea or concept and how it is put together when describing the expected outcome of the study. It is a logically developed described and elaborated network of associations among variable that have been identified through processes as interview observations and literature survey (Sekaran, 1992). Conceptual framework of this study explains relationship between independent variables and dependent variable. Independent variables in this study are factors, challenges and measures for effective stakeholders' compliance with Public Procurement Act of 2011 and its regulations. Dependent variable of this study is compliance with Public Procurement Act of 2011 and its regulations.

**Figure 2.1: Conceptual Framework**



Source: Researcher 2019

**Variable Measurements**

The dependent and independent variables above was measured by various measurements as indicated in the table below:

**Table 2.1: Variable measurements**

Variable	Measurements
Factors	Laws and Regulations
	Competence
	Management Support
Challenges	Inadequate training

	Delayed orientation Conflict of interest
Measures	Training Incentives Procurement Planning
Compliance with Public Procurement Act and regulations	Transparency Accountability Integrity

Source: Researcher, 2019

### III. METHODOLOGY

#### Research Philosophy and Approaches

The selection of an approach to be employed in any research normally rest on the nature of the question under consideration and objectives of the research itself (Best & Khan 1993). There are two basic approaches to research, namely, quantitative approach (involving the generation of data in a quantitative form) and qualitative research (involving the subjective assessment of attitude, opinions and behavior) (Kothari, 2003). Both quantitative research approach and qualitative research approach was adopted in this study to complement each other. Creswell (1994) asserts that, although triangulation was an important reason to combine the qualitative and quantitative methods.

#### Research Design and Techniques

A research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure. In fact, the research design is the conceptual structure within which research is conducted; it constitutes the blueprint for the collection, measurement and analysis of data. As such the design includes an outline of what the researcher will do from writing the hypothesis and its operational implications to the final analysis of data (Kothari, 2004). Different researchers have classified Research design using different criteria. Among those is a topical scope criterion in which classification base on scope of the study (breadth and depth). Basing on the criterion, research designs can be classified into three types, which include case study design, survey design and experimental design. In this study, the case study design was used because of its flexibility for data collection, appropriateness and is efficient.

#### Types of measurements

The researcher made various measurements on collection of data that included the adherence of procurement act and its regulation to Longido District Council procurement, problems that arise in compliance with Public Procurement Act of 2011 and its regulations, relationship between compliance with Public Procurement Act of 2011 and its regulations and factors, challenges and measures for according to respondents at Longido District Council.

#### Data Collection Methods

This section describes the types of data that collected in the field which was both qualitative and quantitative data.

#### Primary Data

Primary data are those, which are collected afresh and for the first time and thus happen to be original in character. Primary data involves direct experience and observation and thus, distortion by other observers are avoided and therefore reliable. These data was obtained through questionnaires. Questionnaire is a research instrument consisting of a series of questions and other prompts for the purpose of gathering information from respondents. This consist of a number of questions printed or typed in a definite order on a form or set of forms. The questionnaires were issued to the respondents who read and

wrote down reply of their own. The researcher used the structured questionnaire during the case study in which questions; a set of questions seeking data from respondents was organized and handled to them. The researcher used questionnaire because they are reliable, simple, needs minimum costs and the required data collected with a minimum number of errors. Questionnaires were designed to bring out silent aspects of the research which may not be covered by interviews. Open and closed questions were used.

#### Secondary Data

These are data which are resulted from secondary sources, so are data already exist (Mugenda, 2003). Secondary data was gathered from various sources include both published and unpublished sources such as books, journal articles (printed and electronic) research reports, dissertations, seminar and conference proceedings

#### Sampling Design

##### Target Population

According to Kombo & Tromp (2006) population is a group of individuals, objects or items from which samples are taken for measurement. The population of this study included PMU Staff, Member of Finance Committee, and Head of PMU District Executive Director and Human Resource Managing Longido DC as summarized in the Table 3.1

##### Sample Frame

Sampling frame consists of a list of items from which the sample is to be drawn (Kothari, 2004). In this study, the sampling frame consisted of staff of Longido DC, This sampling frame expected to suitable for this study because it consists of people who are aware of procurement act and its regulation they are in position to assess its compliance.

#### Sampling Procedures and Techniques

According to Kothari (2004) sampling design and procedures involves the decision to the type of sample and technique to be used in selecting the items for sample. The study used purposive sampling design which is non probability sampling in selecting sample of this study. Non Probability Sampling Procedures used in some situations, where the population may not be well defined. According to Singh (2006), the purposive sampling is selected by some arbitrary method because it is known to be representative of the total population, or it is known that it will produce well matched groups. The idea is to pick out the sample in relation to some criterion, which is considered important for the particular study. Henceforth, the researcher used simple random sampling in selecting district officials.

#### Sample Size

Sampling is the process by which a relatively small number of individual, object or event is selected and analyzed in order to find out something about the entire population from which was selected (Kothari, 2004). A sample is a small proportion of targeted population selected using some systematic form. The research used the sample size of the 50 employees.

**Table 3.1: The targeted population with respective sample size**

S.N	Department	Population	Sample Size	Sampling Technique
1	PMU Staff and Head of PMU	5	5	Purposive Sampling
2	Finance staff and Head of finance	9	9	Purposive Sampling
3	District Executive Director	1	1	Purposive Sampling
4	Human Resource officers	4	4	Purposive Sampling
5	Internal Auditors	2	2	Purposive Sampling
6	Other District Officials	70	29	Simple Random Sampling
	<b>TOTAL</b>	<b>90</b>	<b>50</b>	

Source: Researcher, 2019

**Validity and Reliability of Data**

Reliability: for a research to be reliable, it must demonstrate that if it were carried out on a similar group of respondents in a similar context, the similar results will be found (Kothari, 2004). Data reliability is a cornerstone of making a successful and meaningful study. In order to collect reliable data, the researcher designed the questionnaires in a simple, short and hence not boring format, this was through an elaborate procedure which involved a series of revisions under the guidance of the study supervisors to ensure that the fieldwork was conducted by the use of high quality data collection methods. In order to measure internal consistency, researcher used Cronbach’s alpha method to test reliability of the data.

Validity refers to the extent to which the concept one wishes to measure is actually being measured by a particular scale or index (Babbie, 1992). To ensure validity, the study used the triangulation technique by using questionnaires and secondary data analysis concurrently and this was done through piloting of the data collection instruments used to collect data. The data collection instrument was designed in such a way that they measure attitudes and opinions of respondents towards stakeholders’ compliance with Public Procurement Act of 2011 and its regulations. Issues developed from conceptual framework were compared with issues obtained from answers acquired from questionnaires so as to ensure construct validity the Kaiser Meyer Olkin, (KMO) method was used.

**Management and analysis of Data**

**Data management**

Data Management refers to any activity concerned with looking after and processing the information. It includes; looking after field data sheets, entering data into computer files and checking data and preparing for analysis (Muraya, 2002). Data management is the process of controlling the information

generated during a research project. Any research will require some level of data management. The data in this study was analyzed by using simple excel where by tables, graphs and histograms will be used to present.

**Data Analysis Methods**

After data collection, the completed questionnaires were checked for errors before subjecting them to analysis. Statistical techniques such as descriptive statistics; frequencies, mean, standard deviation was carried out using SPSS (Statistical Package for Social Sciences version 25) computer package. Data was analyzed descriptively to provide frequency ranges and percentages of the results. Cross-tabulation will be used to determine the relationships between the study variables. Inferential statistics such as chi-square tests was used to analyze significant effects between variables. The findings were presented in form of tables, charts and narrative statements.

**IV. FACTS FINDINGS AND ANALYSIS**

**Demographic Information**

This section shows demographic characteristics of the respondents who were involved in this study. 50 respondents were involved in the study based on four aspects: age, gender, marital status, education level and working experience. Their descriptions are therefore presented below:

**Table 4.1: Demographic Characteristics of the Respondents**

Demographic Characteristics		Frequency	Percent (%)
<b>Gender</b>	Male	23	46
	Female	27	54
<b>Age</b>	Less than 18 years	0	0
	19-30 years	20	40
	31 - 40 years	17	34
	41 - 50 years	10	20
	Over 50 years	3	6
<b>Education</b>	Certificate Level	4	8
	Diploma Level	15	30
	Degree Level	28	56
	Masters	3	6
<b>Working Experience</b>	Below 2 Years	8	16
	3 - 5 Years	17	34
	6 - 10 Years	15	30
	Above 10 Years	10	20

Source: Field Data 2019

**Gender**

Gender was seriously taken into consideration to collect data from the respondents as revealed in Table 4.1 above. During data collection phase respondents were required to specify their

gender characteristics. From the representation, the majority of the respondents were female, with (54%) while male was by 46%. As from this depiction, majority of the employees are female as studied in Longido DC.

**Age distribution**

Furthermore, the age ranges of the respondents were of particular importance for a deeper analysis of the employees. As from the depiction, majority of the respondents ranged in 31 to 40 years with a 34% rate. 40% aged between 19 to 30 years, 20% ranged between 41 to 50 years, none of the respondents were less than 18 years and 6% aged above 50 years as analyzed in the respective figure above. This indicates that the majority of staff at Longido DC are in their most productive age group. Such employees are likely to perform better at their jobs

**Education**

As shown in Table 4.1 above, majority of the respondents (56%) were undergraduate degree holders as the remaining, 30% were diploma holders, 8% had certificate while the remaining 4% Master's Degree holders. This was an indication that indeed most employees working in Longido DC - Iringa were highly qualified and therefore well suited to serve in their respective service industry. This practically implies that the Longido DChas adequately educated employees who are likely to perform better at their jobs.

**Working Experience**

As shown above, majority of the respondents (34%) had worked for 3-5 years. Specifically, 20% of the respondents had worked between 6-10 years; similarly, 20% of the respondents had worked above 10 years. On the other hand, 16% had experience of less than two years. The results show that the Longido DChas experienced staff. Experienced staffs are likely to perform better at their jobs due to the job experience gained over time.

**Test of Validity and Reliability**

**Reliability**

In this study reliability test was done using Cronbach alpha, Cronbach's alpha is the most common measure of internal consistency ("reliability"). It is most commonly used when you have multiple Likert questions in a survey/questionnaire that form a scale and you wish to determine if the scale is reliable (Adriano, 2010)Therefore in this study the findings of Cronbach's Alpha is 0.780, the coefficient are significant as shown in the table 4.5 below.

**Table 4.2:** Reliability Statistics

**Reliability Statistics**

Cronbach's Alpha	N of Items
.780	26

Source: Field Data, 2019

**Validity**

Factor analysis was done using Kaiser-Meyer-Olkin (KMO) and Bartlett's Test of Sphericity so as to determine the level of adequacy of factor analysis. Kaiser-Meyer-Olkin (KMO) Test is a measure of how suited your data is for Factor Analysis. The test measures sampling adequacy for each variable in the model

and for the complete model. The statistic is a measure of the proportion of variance among variables that might be common variance. The KMO measure of sampling adequacy reflects score of (0.750), which is well above the recommended 0.50 level as suggested by (Khan, 2010) and the Bartlett's test of sphericity is significant at 0.000 ( $p \leq 0.000-0.05$ ) levels

**Table 4.3: KMO and Bartlett's Test**

<b>KMO and Bartlett's Test</b>		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.750
Bartlett's Test of Sphericity	Approx. Chi-Square	303.885
	Df	3
	Sig.	.000

Source: Field Data, 2019

**Finding in relation to Objectives**

**Factors affecting stakeholders' compliance**

The objective was to examine factors affecting stakeholders' compliance with PPA of 2011 and its regulations. Table 4.4 shows the findings with regard to the factors affecting stakeholders' compliance. The findings from the 50 respondents show that the Seventy four percent agreed that laws and regulations are among factors that affect the stakeholders' compliance. Understanding and knowledge of stakeholders towards the laws and regulations governing Public Procurement Acts seemed to inspire their compliance. Seventy two percent asserted that preparation of Procurement proceedings especially in designing stage impact stakeholders' compliance with PPA of 2011 and its regulations.

From the table 4.2 below, with weighted mean of 4.33 majorities of respondents agreed that flow of funds impact the stakeholders' compliance with PPA of 2011 and its regulations. This meant that limited flow of funds during tendering process may limit achievement of competitive priced bids, timely completion of the project and even the meeting the standard quality of the projects intended. The study findings also uncovered that competence and commitment of suppliers/contractors have influence acquiescence of stakeholders with PPA of 2011 and its regulations. It is important to offer training to tendering committee members in order to ensure they serve in ultimate objectivity, accountability, and non-discrimination (Jany, 2013). Study findings unveiled that 74 percent of the respondents stated that staff training influence the stakeholders' compliance with PPA 2011 and its regulations. It cannot be denied that Information and Communication Technology has simplified and enhanced efficiency and transparency in many public activities. The study findings of this study showed that the majority of respondents agreed that the Information and Communication Technology affect the stakeholders' compliance with PPA of 2011 and its regulations.

About 74 percent of the respondents asserted that top management support has something to do with stakeholders' compliance with PPA of 2011 and its regulations. By having efficient management which has effective preventive mechanisms promotes transparency and accountability for stakeholders' compliance with PPA of 2011 and its regulations. Form the table below, the study findings revealed that with

weighted mean of 4.20 majority of respondents (48 percent) felt that the internal process affects the stakeholders' compliance with PPA of 2011 and its regulations.

**Table 4.4: Factors affecting stakeholders' compliance**

Factors affecting stakeholders' compliance with PPA of 2011 and its regulations.	Weighted Mean
Laws and Regulations	4.25
Preparation of Procurement Proceedings especially in designing stage	4.23
Flow of funds	4.33
Competence and commitment of suppliers/contractors	4.31
Staff Training	4.05
Information, Communication and Technology	3.09
Top Management Support	4.01
Internal processes	4.20

Source: Field Data, 2019

Factors affecting stakeholders' compliance with PPA of 2011 and its regulations.	Strongly disagree		Disagree		Neutral		Agree		Strongly agree	
	F	%	F	%	F	%	F	%	F	%
Laws and Regulations	0	0	6	12	7	14	8	16	2	5
Preparation of Procurement Proceedings especially in designing stage	0	0	3	6	1	2	9	18	2	5
Flow of funds	0	0	2	4	1	2	4	8	3	6
Competence and commitment of suppliers/contractors	4	8	9	18	0	0	1	2	2	4
Staff Training	0	0	5	10	8	16	3	6	7	14
Information and Communication technology	0	0	1	2	0	0	1	2	2	4
Top Management Support	1	2	1	2	0	0	3	6	7	14
Internal processes	9	18	4	8	1	2	2	4	0	0

Source: Field Data, 2019

**Challenges facing stakeholders' in complying with PPA and its regulations**

This section sought to disclose major challenges facing stakeholders' in complying with PPA of 2011 and its regulations. Table 4.5 shows that the weighted mean for all the items was greater than 4.1 indicating that respondents agreed with the statements.

The study revealed that 74 percent of the respondents felt that the inadequate training of procurement staff is among challenge encounter stakeholders' in complying with PPA of 2011 and its regulations. Majority of the respondents (70 percent) asserted that lack and poor use of technical Experts for preparation of Procurement Proceedings especially in designing stage is among challenges facing stakeholders' in complying with PPA of 2011 and its regulations

The study revealed that lack of knowledge is a challenge to stakeholders in complying with PPA and its regulations. This was shown by 74percent of the respondents who felt that Lack of knowledge of legal framework caused by poor dissemination of the Procurement Act and Regulation.

This study further revealed that 64 percent thought that lack of incentives to follow proper procedures, caused by weak monitoring and enforcement while 74 percent agreed that the delayed orientation in Key stakeholders in new procurement reforms/ laws to Tender and Review Board members, procurement staff and services providers is among challenges facing stakeholders' in complying with PPA of 2011 and its regulations.

Respondents agreed that the delays in establishing full time operational Procurement Units with the full complement of staff by 74% and 82% of the respondents agreed that inadequate/lack of funding to execute procurement activities meanwhile 84% of the respondents agreed that failure to attract qualified and competent service providers at the local level.

From the findings above, the majority of the respondents (84%) agreed that Illiteracy and inadequate contract management skills among some service providers. Respondents from Longido District Council agreed that accusation of conflict of interest, bribery and corruption in some procurement processes defy stakeholders' in complying with PPA of 2011 and its regulations by seventy four percent. Moreover, the study finding depicted that inadequate capacity in effective procurement planning confront stakeholders' in complying with PPA of 2011 and its regulations.

**Table 4.5: Challenges facing stakeholders' in complying with PPA of 2011 and its regulations**

Challenges facing stakeholders' in complying with PPA of 2011 and its regulations	Weighted Mean
Inadequate training of procurement staff	4.26
Lack and poor use of technical Experts for preparation of Procurement Proceedings especially in designing stage	4.11
Lack of knowledge of legal framework caused by poor dissemination of the Procurement Act and Regulation	4.28
Lack of incentives to follow proper procedures, caused by weak monitoring and enforcement	4.13
The delayed orientation in Key stakeholders in new procurement reforms/ laws to Tender and Review Board members, procurement staff and services providers	4.28
The delays in establishing full time operational Procurement Units with the full complement of staff	4.21

Inadequate/lack of funding to execute procurement activities	4.31	Accusation of conflict of interest, bribery and corruption in some procurement processes.	4.12
Failure to attract qualified and competent service providers at the local level	4.20	Inadequate capacity in effective procurement planning	4.31
Illiteracy and inadequate contract management skills among some service providers	4.20	<b>Source:</b> Field Data, 2018	

**Table 4.5: Challenges facing stakeholders’ in complying with PPA and its regulations**

Challenges facing stakeholders’ in complying with PPA and its regulations	Strongly disagree		Disagree		Neutral		Agree		Strongly agree	
	F	%	F	%	F	%	F	%	F	%
Inadequate training of procurement staff	0	0	0	0	13	26	17	34	20	40
Lack and poor use of technical Experts for preparation of Procurement Proceedings especially in designing stage	13	26	2	4	0	0	20	40	15	30
Lack of knowledge of legal framework	0	0	0	0	13	26	6	12	31	62
Lack of incentives to follow proper procedures	0	0	5	10	14	28	18	36	13	26
The delayed orientation in Key stakeholders in new procurement reforms/ laws to Tender and Review Board members, procurement staff and services providers	0	0	8	16	5	10	16	32	21	42
The delays in establishing full time operational Procurement Units with the full complement of staff	0	0	5	10	8	16	7	14	30	60
Inadequate/lack of funding to execute procurement activities	0	0	0	0	9	18	13	26	28	56
Failure to attract qualified and competent service providers at the local level	0	0	6	12	7	14	8	16	29	58
Illiteracy and inadequate contract management skills among some service providers	0	0	3	6	10	20	9	18	28	56
Accusation of conflict of interest, bribery and corruption in some procurement processes.	0	0	2	4	11	22	4	8	33	66
Inadequate capacity in effective procurement planning	4	8	9	18	0	0	14	28	23	46

**Source:** Field Data, 2019

**Measures for effective stakeholders’ compliance**

This section sought to unveil the possible measures for effective stakeholders’ compliance with Public Procurement Act of 2011 and its regulations. This study revealed that the Reward stakeholders who fully adhere Public Procurement Act and its regulations accordingly influence effective stakeholders’ compliance with Public Procurement Act of 2011 and its regulations. This was shown by 80 percent of the respondents who were in agreement with the proposition.

About 70 percent of the respondents were of the opinion that disciplinary measure for stakeholders who fail to adhere Public Procurement Act and regulations should be put in place.

Majority of respondents, 62 percent said that by setting incentives for complying with Public Procurement Act and regulations would ensure effective stakeholders’ compliance with Public Procurement Act of 2011 and its regulations.

A further 58 percent of respondents agreed that by addressing stakeholders’ problems concerning Public Procurement Act and its regulations would ensure effective stakeholders’ compliance with Public Procurement Act of 2011 and its regulations.

Study findings revealed that stakeholders' engagement on public procurement training and development may upsurge stakeholders' compliance with Public Procurement Act of 2011 and its regulations. This was shown by 56 percent of the respondents who were in agreement with the proposition.

Majority of the respondents, 64 percent were of the opinion that establishment objectives for Public Procurement Act of 2011 and its regulations compliance would ensure effective stakeholders' compliance with Public Procurement Act of 2011 and its regulations.

This study further revealed Enhance transparency to curb corruption may enhance stakeholders' compliance with Public Procurement Act of 2011 and its regulations; this was shown by 51.3 percent of the respondents who agreed to this statement.

**Table 4.6: Measures for effective stakeholders' compliance**

Measures for effective stakeholders' compliance	Weighted Mean
Reward stakeholders who fully adhere Public Procurement Act and its regulations accordingly	4.26
Disciplinary measure for stakeholders who fail to adhere Public Procurement Act and regulations	3.93
Set incentives for complying with Public Procurement Act and regulations	4.28
Address stakeholders problems concerning Public Procurement Act and its regulations	4.13
Stakeholders engagement on public procurement training and development	4.28
Establish objectives for Public Procurement Act of 2011 and its regulations compliance	3.21
Enhance transparency to curb corruption	3.24

Source: Field Data, 2019

Measures for effective stakeholders' compliance	Strongly disagree		Disagree		Neutral		Agree		Strongly agree	
	F	%	F	%	F	%	F	%	F	%
Reward stakeholders who fully adhere PPA and its regulations accordingly	0	0	0	0	10	20	30	60	10	20
Disciplinary measure for stakeholders who fail to adhere PPA and regulations	5	10	1	2	9	18	15	30	20	40
Set incentives for complying with PPA and regulations	0	0	6	12	13	26	14	28	17	34
Address stakeholders problems concerning PPA and its regulations	12	24	0	0	9	18	29	58	0	0
Stakeholders engagement on public procurement training and development	4	8	8	16	10	20	28	56	0	0
Establish objectives for PPA of 2011 and its regulations compliance	0	0	3	6	14	28	24	48	9	18
Enhance transparency to curb corruption	2	4	2	4	3	6	26	52	17	34

Source: Field Data, 2019

**Correlation and Regression Analysis**

**Correlation Analysis**

Correlation method was used to test relationship between variables, the association of both independent variable and dependent variable were tested in order to assess whether the study objectives were achieved and the relations are stated below are met.

**Table 4.7: Correlations**

Correlations					
		Factors	Challenges	Measures	Compliance
Factors	Pearson Correlation	1	.873**	.956**	.637*
	Sig. (2-tailed)		.000	.000	.034
	N	50	50	50	50
Challenges	Pearson Correlation	.873**	1	.868**	.790**
	Sig. (2-tailed)	.000		.000	.000
	N	50	50	50	50

Measures	Pearson Correlation	.956**	.868**	1	.680*
	Sig. (2-tailed)	.000	.000		.012
	N	50	50	50	50
Compliance	Pearson Correlation	.637*	.790**	.680*	1
	Sig. (2-tailed)	.034	.000	.012	
	N	50	50	50	50
**. Correlation is significant at the 0.01 level (2-tailed).					
*. Correlation is significant at the 0.05 level (2-tailed).					

Source: Field Data, 2019

Findings shown in Table 4.7 indicate that Factors has a positive moderate significant relationship with Compliance with Public Procurement Act of 2011 and its regulations with a coefficient of 0.637. Challenges have a positive moderate significant relationship with Compliance with Public Procurement Act of 2011 and its regulations with a coefficient of 0.790. Measures also have a positive moderate significant relationship with Compliance with a coefficient of 0.680. The correlations are significant at the 0.01 level. The above results imply that all independent variables have a positive significant relationship with Compliance with Public Procurement Act of 2011 and its regulations.

**Regression Analysis**

Coefficient of determination ( $r^2$ ) in the model summary explains 31.8% of the independent variables. This implies that independent variables under *Factors, Challenges, and Measures*, explain only 31.8 % that affecting stakeholders’ compliance with Public Procurement Act of 2011 and its regulations. The coefficient of determination is not very significant because 68.2% of variations are brought about by characteristics not captured in the independent variables.

**Table 4.8: Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.564 <sup>a</sup>	.318	.282	2.73353	.318	8.867	3	57	.000

a. Predictors: (Constant), Measures, Factors, Challenges

Source: Field Data, 2019

Table 4.9 is a summary of the Analysis of the Variance. The significant (p-value) at 5% level of significance and 95% of confidence level was 0.000. As is illustrated in the table, thus the model is statistically significant and the assumption which states that at 5% level of significance and 95% confidence level, the significance value (P-value) in the ANOVA should be P, 0.000-0.05 was held.

**Table 4.9: ANOVA<sup>a</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	198.772	3	66.257	8.867	.000 <sup>b</sup>
	Residual	425.916	57	7.472		
	Total	624.688	60			
a. Dependent Variable: Compliance with PPA of 2011 and its regulations						
b. Predictors: (Constant), Measures, Factors, Challenges						

**Source:** Field Data, 2019

Table 4.10 explains the overall relationship between the independent variables and the dependent variable and the significance of each relationship. The table depicts that Factors and Measures are prominent in Stakeholders' compliance with Public Procurement Act of 2011 and its regulations.

**Table 4.10: Coefficients**

Model		Un standardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	22.918	4.059		5.647	.000
	Factors	.181	.101	.247	1.789	.049
	Challenges	.109	.103	.171	1.056	.025
	Measures	.196	.108	.257	1.811	.045
a. Dependent Variable: Compliance with Public Procurement Act of 2011 and its regulations						

**Source:** Field Data, 2019

Using the results above, we have the regression equation as:

$$(Y = \beta + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \alpha)$$

$$Y = 22.918 + 0.181X_1 + 0.109X_2 + 0.196X_3 + 4.059\alpha$$

Whereby Y = Compliance with Public Procurement Act of 2011 and its regulations.

X1 = Factors

X2 = Challenges

X3 = Measures

According to the regression equation established, taking all factors into account with constant at zero, outcomes will be 22.918. The data analyzed also show that organization Compliance is greatly contributed Factors, Challenges and Measures for effective stakeholders' compliance with Public Procurement Act of 2011 and its regulations. Taking all other independent variables at zero, Factors increases effectiveness of Stakeholders' Compliance with Public Procurement Act of 2011 and its regulations by 0.181. While Challenges will result in 0.109 increases in effectiveness in Compliance and Measures will result in a 0.196 increase in effectiveness in Stakeholders' Compliance with Public Procurement Act of 2011 and its regulations.

## V. DISCUSSION

### **Factors affecting stakeholders' compliance**

Study findings revealed that majority of respondents agreed that laws and regulations are among factors that affect the stakeholders' compliance. Laws and regulations enforcement to users particularly procurement Actors were the major contributing factor for the stakeholders to comply with Public procurement. This is in line with Mamuya et al, (2015) on their study found the same findings, but the findings were contrary with the study conducted by Abukari, (2014) who argued that presence of laws and regulations is nothing towards stakeholders' compliance with Public Procurement Act because of the challenge related to contradiction of the law itself. Preparation of procurement proceedings especially in designing stage is very important hence worthy considered. The study findings revealed that preparation of procurement proceedings especially in designing stage impact stakeholders' compliance with PPA of 2011 and its regulations.

While examining the factors, it is important to note that public procurement is performed through a logical flow of activities and predetermined time limits (work plan) all of which have got cost implications. The performance of each activity is largely influenced by time management and competence of the Procurement Entity staff involved in Procurement Planning, Budget Confirmation and Allocation, Solicitation of Bids, Bids Evaluation and Contract Award and Management which are major components of the process (Mlinga, 2015). Different scholars considered dependence on funds from donors and unreliable source of income leads to poor implementation of procurement deeds and regulations. Reliable flow of funds influences the stakeholders' compliance in procurement process (Doe, 2015). This correspond with findings of this study where by majority of respondents agreed that flow of funds impact the stakeholders' compliance with PPA of 2011 and its regulations. The study findings also uncovered that competence and commitment of suppliers/contractors have influence acquiescence of stakeholders with PPA of 2011 and its regulations. This means that by having competent and committed undertaking of Public Procurement process and its regulations would not be an issue. Study findings unveiled that majority of the respondents stated that staff training influence the stakeholders' compliance with PPA 2011 and its regulations. These findings support findings of Oliva et al., (2016) who found that availability of training for staff in government procurement activities facilitate and enhance stakeholders' way of dealing with public procurement activities.

ICT in public procurement is intended to serve a number of objectives which include: Broadening participation in public tendering, To speed up the procurement process and make it more efficient by expanding supply and demand; and to provide transparency in public procurement by reviewing established procedures and public information, and by developing an easy auditing system. Similarly, study findings of this study showed that the majority of respondents agreed that the Information and Communication Technology affect the stakeholders' compliance with PPA of 2011 and its regulations. Njeru, (2015) conducted study on the factors affecting effective Implementation of Procurement Practices. The objective of the study was to

determine factors affecting effective implementation of public procurement practices. Findings revealed that the top management support was the major factors that mostly affected effective implementation of procurement practices. In this study, researcher revealed that majority of respondents asserted that top management support has something to do with stakeholders' compliance with PPA of 2011 and its regulations. An organization with a genuine commitment to legal compliance is evidenced by top management's dedication to ethical corporate behavior (Krawiec, 2016). As cited in Heneghan and O'Donnell, (2017), a compliance culture in an organization must start in the boardroom and should be reflected and evidenced in directors' own behaviors and attitudes. In a related argument, Obanda, (2015) stipulated that strong institutional support at top levels of government is needed by procurement personnel in order to promote integrity, monitor the public procurement process and apply procurement law appropriately.

### **Challenges facing stakeholders' in complying with PPA and its regulations**

Manyanya, (2018) conducted a study on challenges in implementation of PPA procedures in Public Institutions. Findings revealed lack of procurement knowledge, inadequacy of funds (highly dependency from donors) and improper positioning of Procurement Management Unit (PMU) were the most salient factors that hindered application of PPA procedures. The study revealed that respondents felt that the inadequate training of procurement staff is among challenge encounter stakeholders' in complying with PPA of 2011 and its regulations. Untrained staffs that lack the full range of procurement planning and implementation skills and experience were in charge of the procurement functions. This supports the assertion by Kwagbenu (2016) that procurement staffs lack range of skills and expertise require to handle the full complement of procurement function within public entities, and departmental heads.

Section 31 (5) of PPA of 2011 requires the PEs to appoint members of Tender board based on their technical competences to discharge procurement function, also section 37 (2) insists to have PMU with procurement other technical specialists with technical staff. Moreover, section 39 (1) (c) and (d) requires to have competent and qualified staff from procuring departments who will manage to prepare technical specifications, drawings, Bill of quantities and Terms of reference to PMU for procurement activities. Majority of the respondents asserted that lack and poor use of technical Experts for preparation of Procurement Proceedings especially in designing stage is among challenges facing stakeholders' in complying with PPA of 2011 and its regulations. Despite the presence of a good number of procurement Actors within and even out of the organizations', still there is poor use of those experts due to personal interest among actors and other factors like political influences, this leads to poor implementation PPA.

Preparation of proper and comprehensive procurement legal framework demands that those undertaking the work possess a combination of good legal skills and sustainable knowledge of good procurement practices and procedures including related institutional issues (Hunja, 2015). However, the study revealed that lack of knowledge is a challenge to stakeholders in complying with PPA and its regulations. This study unveiled that

lack of incentives to follow proper procedures, caused by weak monitoring and enforcement. This is in line with Velnampy, (2017) who asserted that some challenges facing the procurement process include; Hostility to procurement controls, the unique reliance on private contractors to provide support on their processes, lack of incentives to follow proper procedures, inadequate insistence and monitoring of contractor performance and increased toleration of conflicts of interest.

Researcher discovered that delayed orientation in key stakeholders in new procurement reforms/ laws to Tender and Review Board members, procurement staff and services providers is among challenges facing stakeholders' in complying with PPA of 2011 and its regulations. Orientation and training should be providing before and after implementation of the new procurement reform. By doing to it will increase awareness and understanding of the legal framework hence improve stakeholders' compliance with procurement regulation.

The stakeholders' compliance with PPA and its regulations has been challenged by lack of funds, lack of technical capacity, poor planning and lack of sufficient involvement of experts (Bashuna, 2013). The researcher discovered that delays in establishing full time operational Procurement Units with the full complement of staff and inadequate/lack of funding to execute procurement activities as well as failure to attract qualified and competent service providers at the local level are challenges facing stakeholders' in complying with PPA and its regulations. From the findings, the majority of the respondents agreed that Illiteracy and inadequate contract management skills among some service providers. The inadequacy in contract management skills leads to increased costs, delay in completion and non-completion of procurement process and contracts.

Corruption is the dishonest behavior by those in positions of power, such as managers or government officials. In this study, Researcher discovered that accusation of conflict of interest, bribery and corruption in some procurement processes defy stakeholders' in complying with PPA of 2011 and its regulations by seventy four percent. Transparency and accountability have been recognized as key conditions for promoting integrity and preventing corruption in public procurement. However, they must be balanced with other good governance imperatives, such as ensuring an efficient management of public resources "administrative efficiency" or providing guarantees for fair competition. In order to ensure stakeholders' compliance with PPA decision makers need to define an appropriate degree of transparency and accountability to reduce corruption and risks to integrity in public procurement while pursuing other aims of public procurement (OECD, 2017).

Poor planning and management of the procurement process which include needs that are not well identified and estimated, unrealistic budgets and inadequacy of the skills of staff responsible for procurement is featuring as one of the major setbacks in public procurement. According to Kirungu (2010) though procurement planning is legal requirement, lack of it is still a major cause of inefficiencies which has led to end-of year artificial emergency procurements, failure to absorb allocated funds and application of inappropriate procurement methods circumvention of legal & regulatory procedures. Also, Public Procurement forestalling the challenge by issuance of mandatory procurement planning circular and enhanced surveillance through

procurement assessments and reviews. The study finding depicted that inadequate capacity in effective procurement planning confront stakeholders' in complying with PPA of 2011 and its regulations. Procurement planning effort will succeed only with the complete commitment and involvement of top management, along with appropriate personnel that have a stake. The consequences of poor or lack of procurement planning can never therefore be amusing (Lary, 2016).

### **Measures for effective stakeholders' compliance**

This study revealed that the rewarding stakeholders who fully adhere Public Procurement Act and its regulations accordingly influence effective stakeholders' compliance with Public Procurement Act of 2011 and its regulations. By providing reward to stakeholders who fully comply public procurement process and regulations would make them happier and provide encouragement as well as give them something to aim for. According to Ben, (2015) Disciplinary action may come in the form of a verbal or written reprimand or the loss of employee privileges. Employer disciplinary action is a response by the employer to problems with employee performance or behavior. The purpose of disciplinary action is to correct behavior and document issues. Majority of the respondents were of the opinion that disciplinary measure for stakeholders who fail to adhere Public Procurement Act and regulations should be put in place. Professional board like PSPTB should stress to ensure that those who are employed and engaged in the position public procurement should abide to the legal procedure in procurement process.

Incentive plans are tools used by owners to encourage, recognize and reward exceptional performance in their employees. Incentive plans typically surpass standard salary and benefit agreements and usually are given in the form of cash bonuses, extra paid vacation days or gift items of non-monetary value. Majority of respondents said that by setting incentives for complying with Public Procurement Act and regulations would ensure effective stakeholders' compliance with Public Procurement Act of 2011 and its regulations.

Public entities must ensure that suitable candidates are employed on the basis of merit and placed in their relevant qualifications, skills, and experience with their roles and responsibilities clearly defined to avoid role conflicts with other professions and department. The procurement officers must be trained and aware about all regulations in relation to procurement and related procedures (Hui et al 2011). Study findings revealed that stakeholders' engagement on public procurement training and development may upsurge stakeholders' compliance with Public Procurement Act of 2011 and its regulations. According to Rossi (2010), compliance with the formal elements gives an indication of knowledge of the rules. Gelderman et al; (2006) maintained that through training, public procurement actors will comply with the rules if they learn them well.

From the discussion it has been noted that there is huge corruption in procurement, researcher recommends that procurement professionals need to increase room for transparency, by doing so corruption will be eliminated automatically. Mally, (2016) said by providing clearly procedures and directions of procurement process that enhance transparency, like advertising, openness during opening the

tender, evaluation of the tender and awarding will reduce corruption. This is in line with findings of this study where by researcher revealed that by enhancing transparency to curb corruption will improve stakeholders' compliance with Public Procurement Act of 2011 and its regulations.

## VI. SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

### Summary of Findings

The first objective was to examine factors affecting stakeholders' compliance with PPA of 2011 and its regulations. The findings revealed that majority of respondents agreed that laws and regulations and preparation of Procurement proceedings especially in designing stage impact stakeholders' compliance with PPA of 2011 and its regulations. Study findings revealed that respondents agreed that flow of funds and competence and commitment of suppliers/contractors have influence acquiescence of stakeholders with PPA of 2011 and its regulations. Also, study findings unveiled that 74 percent of the respondents stated that staff training influence the stakeholders' compliance with PPA 2011 and its regulations. Researcher discovered that majority of respondents agreed that the Information and Communication and top management support has something to do with stakeholders' compliance with PPA of 2011 and its regulations. By having efficient management which has effective preventive mechanisms promotes transparency and accountability for stakeholders' compliance with PPA of 2011 and its regulations. Moreover, the study findings revealed that with weighted mean of 4.20 majorities of respondents (48 percent) felt that the internal process affects the stakeholders' compliance with PPA of 2011 and its regulations.

The second objective to disclosed major challenges facing stakeholders' in complying with PPA of 2011 and its regulations. The study revealed majority of the respondents felt that the inadequate training of procurement staff and lack and poor use of technical Experts for preparation of Procurement Proceedings especially in designing stage is among challenges facing stakeholders' in complying with PPA of 2011 and its regulations. The study revealed that lack of knowledge and lack of incentives to follow proper procedures, caused by weak monitoring and enforcement are among challenges facing stakeholders' in complying with PPA of 2011 and its regulations.

Respondents agreed that the delays in establishing full time operational Procurement Units with the full complement of staff, inadequate of funding to execute procurement activities and failure to attract qualified and competent service providers at the local level as well as illiteracy and inadequate contract management skills among some service providers defy stakeholders' in complying with PPA of 2011 and its regulations. Either respondent agreed that accusation of conflict of interest, bribery and corruption in some procurement processes defy stakeholders' in complying with PPA of 2011 and its regulations. The fight against corruption in public procurement should be intensified by more collaborative initiatives among key stakeholders. Effective control and review systems and measures increase transparency and play an important role in preventing corruption in public procurement. Warning systems and effective

sanctioning systems should be included in a good public procurement system that effectively fights corruption.

The third objective sought to unveil the possible measures for effective stakeholders' compliance with Public Procurement Act of 2011 and its regulations. This study revealed that the Reward stakeholders who fully adhere Public Procurement Act and its regulations accordingly influence effective stakeholders' compliance with Public Procurement Act of 2011 and its regulations. About 70 percent of the respondents were of the opinion that disciplinary measure for stakeholders who fail to adhere Public Procurement Act and regulations should be put in place. Majority of respondents said that by setting incentives and by addressing stakeholder's problems concerning Public Procurement Act and its regulations would ensure effective stakeholders' compliance with Public Procurement Act and its regulations. Study findings revealed that stakeholders' engagement on public procurement training and development as well as establishment objectives for Public Procurement Act of 2011 and its regulations compliance would ensure effective stakeholders' compliance with Public Procurement Act and its regulations. The study further revealed that providing follow-up action of deficiencies in Public Procurement Act of 2011 and its regulations compliance may enhance stakeholders' compliance with Public Procurement Act of 2011 and its regulations.

### Conclusion

Based on the study findings we can conclude that stakeholders' compliance with Public Procurement Act of 2011 and its regulations in Tanzania Local Government Authorities significantly affected by numerous factors as revealed by the study findings. Flow of funds, competence and commitment of suppliers/contractors, staff training, and information and communication technology, top management support and internal processes were rated as the key factor affecting stakeholders in complying with Public Procurement Act of 2011 and its regulations in Tanzania Local Government Authorities to a great extent. Inadequate training of procurement staff, Lack and poor use of technical Experts for preparation of Procurement Proceedings especially in designing stage, Lack of knowledge of legal framework caused by poor dissemination of the Procurement Act and Regulation. Also, Lack of incentives to follow proper procedures, Illiteracy and inadequate contract management skills among some service providers and Accusation of conflict of interest, bribery and corruption in some procurement processes were rated as major challenges facing stakeholders' in complying with PPA of 2011 and its regulations. However, addressing stakeholder's problems concerning Public Procurement Act and its regulations, stakeholder's engagement on public procurement training and development, establishing objectives for Public Procurement Act of 2011 and its regulations compliance and enhancing transparency to curb corruption were rated as possible measures for effective stakeholders' compliance with Public Procurement Act of 2011 and its regulations. This conclusion is supported by both the descriptive and inferential statistics as indicated. With due regard to the ever increasing desire to have high compliance with public procurement Act of 2011 and its regulations in Tanzania, there is need to invest in various strategies. This therefore calls upon the management of various government ministries to come up with a procurement

policy which outlines the strategies and guidelines of applying the same effectively in the Tanzania Local Government Authorities. This should be done in a manner in which all the stakeholders are happy. This ensures that they are acceptable, accessible, ethically sound, have a positive perceived impact, relevant, appropriate, innovative, efficient, sustainable and replicable.

### Recommendations

#### Recommendations for Action

Based on the research findings it is therefore recommended that there were some suggestion and improvement to be done to improve stakeholders' compliance with PPA and its regulations based on the findings of the study:

- i. All Local Government Authorities at least in Tanzania if not the whole of Africa share common characteristics. We do recommend to Local Government Authorities to make sure that public money is spent in accordance to the planned activities. Local Government Authorities need to avoid corruptions, nepotism and personal gain of individual employees and managers. Adherence to the law and principles will guarantee success in procurement process and hence good governance.
- ii. It is important for the procurement department to involve the users as they are carrying out their procurement process. User sensitization in the procurement process enables them to know the challenges faced as the procurement process is being carried out therefore they are in a position to make alternative decisions.
- iii. Top management support is crucial in the procurement process as it ensures that there is smooth flow of the procurement process and that training for the right stakeholders is done. Therefore the top management of organizations should be informed on the importance of ensuring that the procurement process is conducted successfully and their part in ensuring that it is done successfully.
- iv. Stakeholder interaction enables the exchange of ideas and promotes team building. This ensures that there is continuous improvement of the procurement process due to the smooth flow of information. Therefore all stakeholders should be made aware of their importance in carrying out the procurement process.

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# Tourism Sector Policy Implementation in the Talaud Islands Regency

## (Study of the Development of Panulan Waterfall Destinations)

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**Abstract-** This study aims to describe, analyze, and interpret the implementation of the Panulan waterfall destination development policy in the Talaud Islands Regency which is focused on the development plan, the potential, community response, and its determinants. The research method uses a qualitative approach and research instruments are the researchers themselves assisted with assistive devices such as Digital Cameras, Mobile Phones, Tape Recorder. Primary data sources are informants who were determined purposively. Data analysis techniques using steps, namely: data reduction, data display, and Verification and Conclusions. The results showed that the local government of the Talaud Islands regency already had a plan to develop Panulan Waterfall tourist destination which was integrated or integrated with the Regional Tourism Development Master Plan (RIPPARDA), with reference to or based on the Regional Development Master Plan. Panulan Waterfall has a very prospective potential or has a very big opportunity to be developed due to its charming appeal, clear water, not yet contaminated with various pollutants, its water flow is quite heavy with uninterrupted water sources during the dry season and attracts tourists to visiting, especially natural attractions. In principle, the community is very respectful and supportive of this plan. The determinants for the implementation of the Panulan waterfall destination development policy are the availability of policies or legislation specifically regulating tourism as a juridical guideline for implementing a national tourism business, coordinating the local government, the Culture and Tourism office. as a technical service with other agencies / SKPD in Talaud Islands Regency and with other stakeholders, commitment and consistency in running the programs that have been prepared, as well as the availability of funds to finance programs and activities as well as public support and government officials who will determine the implementation of the program.

**Index Terms-** Development, Tourism, Policy, destination

### I. PRELIMINARY

#### A 1.1 Background of the Problem

Article 1 of Law No. 10/2009 affirms that a Tourism Destination, hereinafter referred to as a tourism destination, is a geographical area within one or more administrative regions in which there are tourist attractions, public facilities, tourism facilities, accessibility, and interrelated communities and complete the realization of tourism. Furthermore, it was also conveyed that Tourism is a whole activity related to tourism and is multidimensional and multidisciplinary in nature which emerges as a manifestation of the needs of every person and country providing and interacting between tourists and the local community, fellow tourists, the Government, Regional Government and entrepreneurs.

The waterfall is located in Panulan Village, Kabaruan sub-district which can be reached by vehicle in 25 minutes with a distance of 6 km from the capital of the district. Panulan waterfall has a height of approximately 25 meters from the top of the mountain. The water is very clear, natural panorama around the area such as, mountains and many trees over hundreds of years old. This situation was apparently not able to attract visitors to come. Based on data showing that the access road to the Panulan waterfall tourist attraction does not support. To go to these attractions must take the slippery, steep rocks that can endanger visitors, the location is not maintained, overgrown with weeds, dirty and a lot of trash scattered over the waterfall area. There is no resting place or food stalls provided for visitors to enjoy the beauty of the Panulan waterfall, seeing the problems that exist make visitors less interested in traveling to the Panulan waterfall.

#### 1.2 Problem Formulation

Based on the above background, the formulation of the problem in this study are: (1) How is the development of the Panulan Waterfall destination in the Talaud Islands Regency, (2) What factors determine the development of the Panulan Waterfall destination in the Talaud Islands Regency?

#### 1.3 Research Objectives

Starting from the formulation of the problem, the objectives of this study are: (1) To describe, analyze, and interpret the development of the Panulan waterfall destination in the Talaud Islands Regency; (2) To describe, analyze, and interpret the determinants of the development of the Panulan waterfall destination in the Talaud Islands Regency.

#### 1.4 Research Benefits

The expected benefits of this research are as follows: (1). Theoretically, it is expected to provide scientific benefits to increase knowledge, especially in the field of State administration at Manado State University; (2). Practically it is expected to be a useful and valuable input for the Government of the Talaud Regency more specifically the Culture and Tourism Office in developing the tourism sector in the Talaud Islands Regency and the Panulan Village Government to continue to improve for the progress of the Panulan village.

## II. THEORITICAL REVIEW

### 2.1 Public Policy

Public policy is a unit of interrelated processes between policy formulation (policy formulation), policy implementation (policy implementation) to the assessment (policy evaluation). Policy formulation or policy making (policy making) is essentially closely related to the decision making process (decision making). Decision is a choice of various alternatives (Dill, in Reach, 2012). According to Indiahono (2009: 17), public policy is often understood as an instrument used by the government to solve public problems technocratically. In a sense the government uses a rational choice approach to choose the best alternative to solve the problems faced by the community.

### 2.2 Public Policy Implementation

Bernadine R. Wijaya & Susilo Supardo (Pasolong 2010: 57), said that implementation is the process of transforming a plan into practice. People often assume that implementation is only an implementation of what has been decided, as if this stage is less influential. However, in reality it can be seen that however good a plan has been made but it is of no use if it is not implemented properly and correctly. Implementation is basically the operation of various activities in order to achieve a goal.

Furthermore according to Gordon (in Pasolong 2010: 58) that the implementation relates to various activities directed at the realization of the program. In this case the administrator manages how to organize, interpret, and implement the selected policies.

### 2.3 Policy Implementation Model

Meter and Horn Implementation Model (in Indiahono 2009: 58) namely, (1) policy standards and objectives, policy standards and objectives are basically what the program or policy wants to achieve, whether tangible or not, short, medium or long term (2) policy performance, is an assessment of the achievement of standards and policy targets that have been set at the beginning. (3) resources refer to how much financial and human resources to implement the program or policy. (4) communication between implementing agencies, refers to the procedure mechanism that is planned to achieve the goals and objectives of the program. (5) the characteristics of the implementing agency, designating how much

support the organizational structure, developing values, relationships and communication that occur in the internal bureaucracy. (6) social, economic and political environment, pointed out that the environment in the realm of implementation can influence the success of the implementation of the policy itself. (7) the attitude of the executor, pointed out that the attitude of the executor became an important variable in the implementation of the policy.

George C. Edward III (in Agustino 2008: 149) this model is called Direct and Indirect Impact on Implementation. In this approach there are 4 variables that determine the success of implementing a policy, namely, (1) Communication, effective implementation occurs when decision makers already know what they are going to do. (2) Resources, indicators of resource success are staff, and information, authority and facilities. (3) Disposition or attitude of the executor of the activity, the implementation of the policy will be effective if the implementers of the policy must not only know what they have to do but also have the ability to carry it out. (4) Bureaucratic structure, complex policies require the cooperation of many people, therefore a conducive bureaucratic structure is needed so as not to impede the course of the policy.

## III. RESEARCH METHODS

### 3.1. Research Approach

The method used in this research is a qualitative method. Where Bogdan and Biklen (Sugiono 2009: 13-14) suggest that qualitative research is carried out in natural conditions, (as opposed to being an experiment), directly to data sources and researchers are key instruments. Qualitative research is more descriptive, the data collected in the form of words or images, so it does not emphasize numbers. Thus this research is aimed at analyzing and interpreting the Implementation of Tourism Sector Policy in Talaud Islands Regency (Study of the Development of Panulan Waterfall Destinations).

### 3.2. Research focus

After observations and interviews with several informants, this research was conducted with a focus of research as follows: (1) Plans for developing Panulan Waterfall tourist destinations in Talaud Islands Regency; (2) Potential of Panulan Waterfall as a tourism destination; (3) Panulan Village community response regarding the development of the Panulan waterfall destination as a tourist attraction.

### 3.3. Research sites

The researcher chose the location of the research, namely in the Regency of Talaud Islands, in the Culture and Tourism Office of Talaud Islands Regency and in Panulan Village. Researchers focus more on waterfall tourist destinations in the village of Panulan.

### 3.4. Research Instruments and Data Sources

The research instrument or research tool is the researcher himself. Where in conducting research, researchers are assisted with assistive devices to facilitate research. Such as Digital Cameras, Mobile Phones, Tape Recorder, and other assistive devices. In accordance with the problem and focus of this research,

the data source is the informant. As for the informants were the Head of the Culture and Tourism Office of Talaud Regency, the Head of the tourism sector, the village government as well as the community members in panulan village.

### 3.5 Data collection technique

Sugiyono (2013) argues that in collecting data researchers must actively involve themselves in spaciousness. This data collection process includes the following stages: (1) The process of entering the research site; (2) When in the research location; (3) Collecting data.

## IV. RESULTS AND DISCUSSION

### 4.1 Presentation of Research Results

#### 4.1.1. Implementation of the Panulan Waterfall Tourism Sector Policy in the Talaud Islands District.

##### 1. Waterfall Destination Development Plan

The business development of the Panulan waterfall destination in Talaud Regency must be drawn up with a good development plan, so that it becomes one of the attractive and fascinating tourist destinations for potential visitors / tourists and even visitors / tourist to come and come back to visit this Panulan Waterfall tourist attraction. These plans are as follows: (1) Plans for developing Panulan Waterfall tourist destination destinations are integrated or integrated with the Regional Tourism Development Master Plan (RIPPARDA), (2) Plans for developing Panulan Waterfall tourist destination destinations in particular and RIPPARDA in general have been adjusted with the master plan by considering the latest changes and developments and anticipating the future, such as the Law on tourism No 10 of 2009; (3) Panulan Waterfall Destination Development Program is the construction of Roads and Site Arrangement, (4) The program has not been realized because it is constrained by funds and land status.

##### 2. Potential of Panulan Waterfall as a tourism destination

1. clear water, (2) the water has not been contaminated with various pollution, (3) the water flow is quite heavy, (4) water sources that are not disturbed during the dry season, (5) Goa which can be used as tourist attractions, (6) Sound bird (endemic) still replies to describe the beauty of nature around the waterfall.

##### 3. The response of the Panulan Village community about the development of the Panulan waterfall destination as a tourist attraction

1. The community is very respectful and supports the plan to develop Panulan waterfall destination as a tourist attraction even though until now there has not been any activity carried out for the development of the destination; (2) Community involvement in meetings with village government to discuss this plan; (3) The community is willing to participate in the form of personnel when asked to build infrastructure for access to places / attractions of this Panulan waterfall.

##### 4.2.2. Determinants of Policy Implementation in the Panulan Waterfall Tourism Sector in Talaud Islands Regency.

1. Availability of policies or legislation specifically regulating tourism (Law Number 10 Year 2009); (2) Coordination and cooperation between the regional government, the Culture and

Tourism service as a technical service with other services / SKPD in Talaud Islands Regency and with other stakeholders; (3) Commitment to run the programs that have been prepared; (4) Allocation of funding sources Public support and government officials.

### 4.3. DISCUSSION

**4.3.1 Plan for the development of the Panulan Waterfall destination**  
The results of study found that the local government of the Talaud Islands district already had a plan to develop Panulan Waterfall tourist destination destinations that were integrated or integrated with the Regional Tourism Development Master Plan (RIPPARDA), with reference to or referring to the Regional Development Master Plan. This development plan was adapted to the master plan and consider the latest changes and developments as well as anticipate the future, in accordance with the Law on tourism No 10 of 2009. Based on the results of this study it can be said that the Talaud Islands Regency government has carried out the mandate that has been affirmed in the regional autonomy law that requires especially to the newly created autonomous region to develop all the potential that exists in the region in order to contribute in improving the welfare of the community and local revenue. Talaud Islands Regency as one of the autonomous regions in North Sulawesi Province can still be said to be a new autonomous region as a division of Sangihe and Talaud Islands Districts based on Law Number 08 of 2002 concerning the Establishment of the Talaud Islands District.

##### 4.3.2 Potential of Panulan Waterfall as a tourism destination

The results of the study found that Panulan waterfall has very prospective potential or has a very large opportunity to be developed due to its charming appeal, clear water, not yet contaminated with various pollutants, its water flow is quite heavy with uninterrupted water sources during the dry season and even more interesting, tourists can visit Goa around the waterfall, especially tourists who are interested in nature tourism.

##### 4.3.3 Community response to the development of the Panulan waterfall destination as a tourist attraction

The results found that the community gave a good and positive response to the development of the Panulan waterfall destination as a tourist attraction revealed. In principle, people are very respectful and supportive of this plan. Various forms of support provided by the community can be seen from their presence and participation when invited by the village government to a meeting to discuss this plan. In addition, they will be willing to participate in the form of personnel when asked to build infrastructure for access to places / attractions of this Panulan waterfall.

## V. CONCLUSIONS AND RECOMMENDATIONS

### 5.1. CONCLUSION

Based on the results of the analysis and discussion, the following conclusions are obtained: the Talaud Islands regional government already has a development plan for the Panulan Waterfall tourist destination that is integrated or integrated with the Regional Tourism Development Master Plan (RIPPARDA), with reference to or based on the Regional Development Master

Plan. Determinants of the Implementation of the Panulan Waterfall Tourism Sector Policy in the Talaud Islands Regency, namely the availability of policies or legislation specifically regulating tourism as a juridical guideline for implementing a national tourism business and the coordination factor of local governments, the Culture and Tourism service as a technical service with other agencies / SKPD in Talaud Islands Regency and with other stakeholders.

## 5.2 SUGGESTIONS

Improve internal coordination within the Department of Culture and tourism and with other agencies / SKPD in the Talaud Islands Regency as well as agencies and the private sector in managing tourism programs especially the Panulan waterfall destination. Increasing the commitment of regional governments in implementing all the tourism programs that have been established by including allocating sufficient funds to finance the implementation of the program and allocating funds specifically for the development of Panulan Waterfall tourist destinations and arranged in the APBD.

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