

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

James Karori Nyabuto\*, Charles Mburu, PhD\*, Margaret Gichuhi, PhD\*

\* Institute of Energy and Environmental Technology, Jomo Kenyatta University of Agriculture and Technology, Kenya.

DOI: 10.29322/IJSRP.10.04.2020.p10003  
<http://dx.doi.org/10.29322/IJSRP.10.04.2020.p10003>

**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.

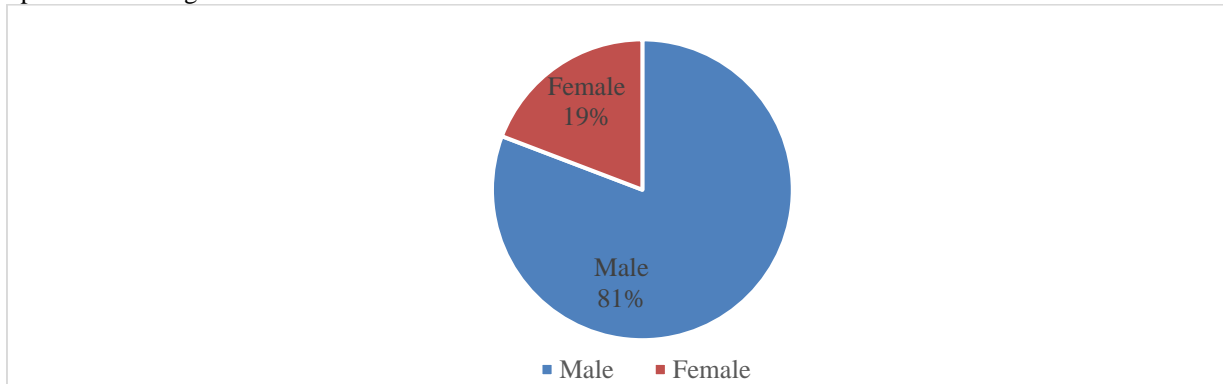


Figure 1: Gender distribution of respondents

#### 3.2.2 Age distribution of respondents

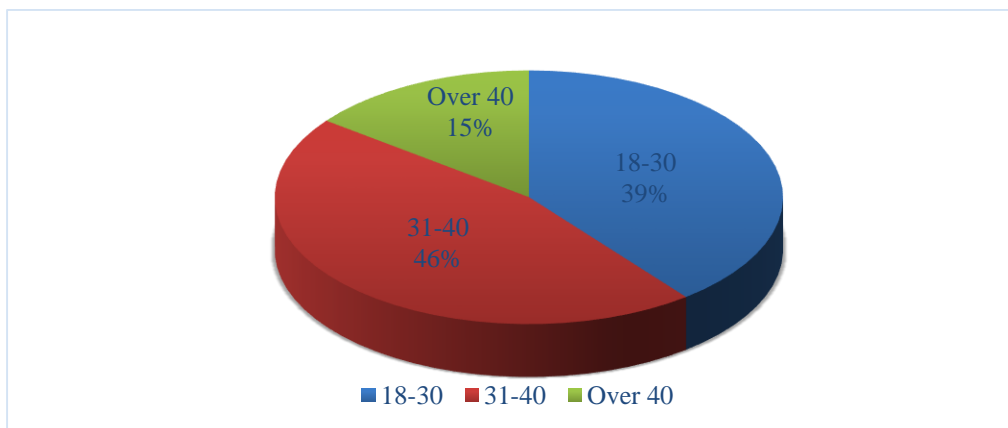


Figure 2: Age distribution of respondents

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).

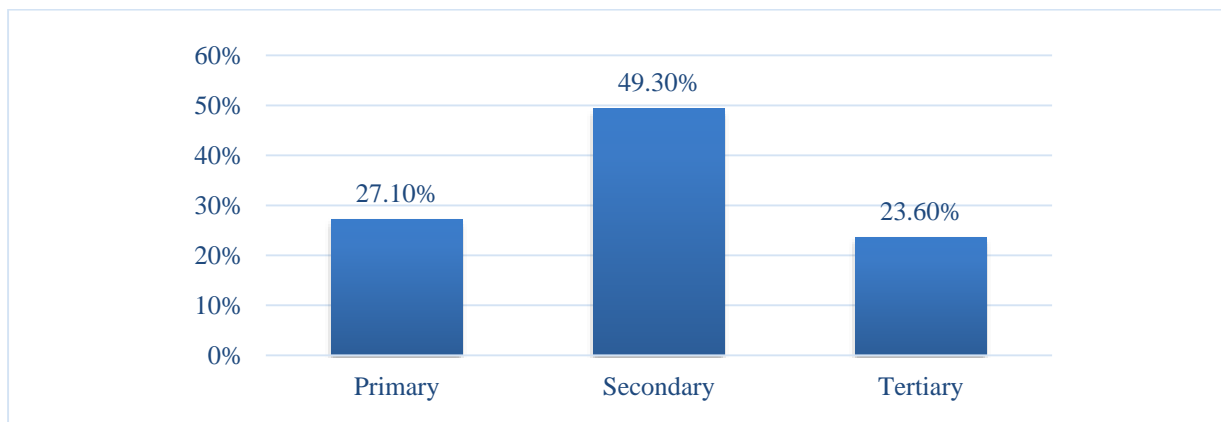


Figure 3: Education levels distribution of respondents

3.2.4 Distribution of respondents by Lpg retailing experience

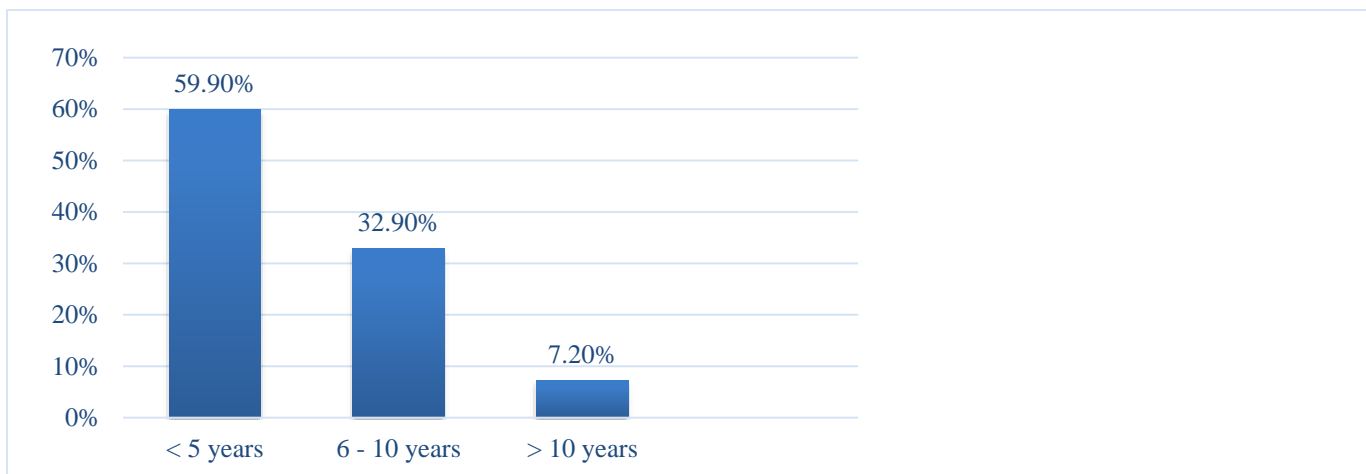


Figure 4: Lpg retailing experience of respondents

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.

#### REFERENCES

- [1] Alli, B. (2008). *Fundamental principles of occupational health and safety*. Geneva: International Labour Organization.
- [2] Babbie, E. (2002). *Survey research methods*. Belmont, CA: Wadsworth.
- [3] Bartlett, J., Kotrlík, J., Higgins, C. (2001). Organizational research: determining appropriate sample size in survey research. *Information Technology, Learning, and Performance Journal*, Vol. 19, No. 1, Spring
- [4] Beheshti, M., Dehghan, S., Hajizadeh, R., Jafari, S., & Koohpaei, A. (2018). Modelling the consequences of explosion, fire and gas leakage in domestic cylinders containing Lpg. *Annals of Medical & Health Sciences Research*. 2018; 8: 83-88
- [5] Competition Commission of South Africa, [www.compcom.co.za](http://www.compcom.co.za), (2017). Market inquiry into the Lpg sector. Pretoria: Government Gazette.
- [6] County Government of Kiambu. (2015). County Integrated Development Plan, 2013 – 2017. Kiambu: CGK.
- [7] County Government of Kiambu. (2018). County Integrated Development Plan, 2018 – 2022. Kiambu: CGK.
- [8] County Government of Kiambu. (2018). County Annual Development Plan 2018/2019. Kiambu: CGK.
- [9] Kariithi, S, C.Mburu, & R. Kinyua. (2017). Awareness of occupational safety and health issues in Roadway maintenance works in Nyeri County, Kenya. *International journal of innovative research and development*, October 2017 Vol 6 Issue 10.
- [10] Kothari, C. (2004). *Research Methodology (Methods and Techniques)*. New Delhi: New Age International Publishers.
- [11] Kothari, C.R & Garg Gaurav. (2014). *Research Methodology, Third Edition*. New Delhi: New Age International Publishers.
- [12] *Occupational Safety and Health Act (2007)*. Nairobi: Government Press.
- [13] Rubin, A. & Babbie, R. (2012). Brooks/Cole empowerment series: Essential research methods for social work. Cengage Learning. ISBN:9781133709640.

#### AUTHORS

**First Author** – James Karori Nyabuto, Student, Institute of Energy and Environmental Technology, Jomo Kenyatta University of Agriculture and Technology, Kenya, [Jameskarori4@gmail.com](mailto:Jameskarori4@gmail.com).

**Second Author** – Dr. Charles Mburu, Senior Research Fellow, Institute of Energy and Environmental Technology, Jomo Kenyatta University of Agriculture and Technology, Kenya, [mburu.charles@gmail.com](mailto:mburu.charles@gmail.com).

**Third Author** – Dr. Margaret Gichuhi, Senior Research Fellow, Institute of Energy and Environmental Technology, Jomo Kenyatta University of Agriculture and Technology, Kenya, [mgichuhi@jkuat.ac.ke](mailto:mgichuhi@jkuat.ac.ke).

**Correspondence Author** – James Karori Nyabuto, [jameskarori4@gmail.com](mailto:jameskarori4@gmail.com), +254728628110.