

Assessment of the Performance of Water Supply and Management in Zanzibar A Case of Urban West Region, Unguja.

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Abstract- The study intends to assess the performance of water supply and management in Zanzibar. This study is conducted in Zanzibar. The study used descriptive survey, based on cross-sectional design. The study uses a total of 95 samples. The information was collected using questionnaire, structured interview and documentation. The study results indicate that the performance of water supply and management in the study area is not conducive. This is due to the fact that single source of water is in the study area, poor water accessibility in the study area, rough using of water in the study area with minimal water storage devices in the study area. On the side of the factors for improving water supply and management in the study area, it was highly agreed that rain water harvesting, paying for water services, waste water re-use and household water storage were agreed as the factors for improving water supply and management in the study area. Lastly on the matter of the challenges facing water supply and management in the study area, it was found that technological failure in the study area, population growth in the study area and financial and human resource shortage on water related sectors were the major challenges faces water supply and management in the study area. The study recommends that it is important for the government, to privatize the important social services such as water so that to diversify the sources of clean and safe water in the study area. In addition to that there is the need provide enough budgets for education and training on how to implement the factors as well as buying required technology and knowhow on how to implement the project.

Index Terms- Cross-sectional, Privatize, Technological failure, Zanzibar Water Authority and Zanzibar West Urban.

I. INTRODUCTION

Water is important for supporting human life and it plays a crucial role in many human activities, some of which include industrial production, agriculture, energy, sanitation, and transportation, as it also maintains ecosystems that give valuable services to both the environment and human beings (Tidwell 2016), (Cosgrove 2015). They further report that, even though water seems to be plentiful on the planet, 97% of it is seawater, which makes it not fit for most human application. Out of the remaining 3%, 87% is unattainable, because it is either in deep

underground aquifers or locked in polar icecaps making, only 0.4% of all of the earth's water usable and accessible by human beings (Tidwell 2016), (Cosgrove 2015). Safe drinking water and sanitation are primary to health, growth, survival and development (UNICEF 2015). (WHO 2015), indicated that Under Goal 7 (which was aiming at ensuring environmental sustainability), world leaders committed themselves to Target 10: which was to halve the proportion of people without sustainable access to sanitation and safe drinking water by 2015. WHO & UNICEF joint monitoring report 2014, indicated that this target was met by 2010 but 40 countries were still not on track to meet the target by 2015 and most of these were in sub-Saharan Africa. The post 2015, agenda 2030 for sustainable development is now in place as the world leaders adopted the agenda in 2015. The SDGs cover a wide range of drivers across the three sustainable development pillars, and include a goal dedicated on water and sanitation (SDG 6) so as to "ensure availability and sustainable management of water and sanitation for all" (Water 2015).

In the past two decades the water supply situation in Zanzibar, along with other social services, has been deteriorating. The water shortage and drop in water quality in Zanzibar Town have been caused and aggravated by multiple factors. These include an aged and poorly maintained water supply system, rapid urban expansion, limited natural supply sources, and the degradation of watersheds. The problems are further exacerbated by the current government policy of providing "free" water service to the general public for domestic use. In spite of the laudable intentions of the policy to provide the society with access to water at no or minimum costs, over time one of the main outcomes of the policy has been the deterioration of the quality of water supply services provided. The fact that Zanzibar Island (Tanzania) is surrounded by sea without any neighboring fresh water body except its groundwater reserve makes the issue more complex and sensitive. Like other small islands, this reserve in Zanzibar is nourished only by rainfall at current researched information available and therefore sustainability of these resources depends upon the nature. The availability of fresh water on small islands is frequently critical because it is dependent upon the temporal and spatial distribution of precipitation and on the storage potential above and below the ground. Thus water resources must be thoroughly investigated and their development carefully managed (Haji 2010). According to (Shah 2018), piped water supply in

Zanzibar - that today serves about 75% of the town's population - dates back to the 1920's with the development of Mtoni and Bububu springs. Utilization of Water services in Zanzibar used to be charged until 1982 when tariffs for domestic users were abolished. The abolition was adopted when the state of the economy had started to take a downward spiral and life was becoming harder for common people. Thus, the government adopted the policy so as to appease the populace. Today, in Zanzibar the water services provision fulfills all the conditions of socially managed water services. The conditions include commitment to state ownership of the principal water services utilities, consideration of water as a fundamental right that households should have access without paying a price, creation of a department of water as a statutory organization, and non-metering of water that flows to households (Merret 2015). As it has happened elsewhere in the world – for example Europe- the long-term subsidization of the water supply services has encouraged the perception that the basic water services are free services (OECD 2015). The water services management situation in Zanzibar today is in crisis. The situation can be described as an example of the common conflicts within the urban water supply sector in many developing countries (Lee 2017). The conflicts include financial constraints versus the desire for improved infrastructure; the need for cost recovery versus the desire to provide free services. Where the available financial resources are meager, the conflicts are manifested in the form of resources allocation competition between the need for system expansion versus maintenance and operation of the existing system (Lee 2017). This crisis situation can be described by a phenomenon known as “Low-level Equilibria.” As described by (Sayedoff and Spiller 2013), the phenomenon is attained when water prices are kept low or non-existent (as is the case in Zanzibar), when government funding is limited and when service coverage is low and all the interested stakeholders do not want to change their positions. While the situation described by (Sayedoff and Spiller 2013) is for Latin American countries, it fits very well with the current situation in Zanzibar where government opportunism has led to the near-collapse of the water service provision. The long-term continuation of this condition has significant economic, social, and environmental costs, most of which are already faced by Zanzibar Town inhabitants. For example, people in different localities spend substantial amounts of time every day searching for water, time that would otherwise be used productively elsewhere.

Existing policy and institutional frameworks in water provision planning

In the year 2004, Zanzibar government drafted the first Zanzibar Water Policy, and later in 2006, passed an Act for the formation of ZAWA that was established in 2008, together with adjoining water laws and rules to safeguard the sector. However, the urban land use planning and associated urban infrastructure provision is still guided by an outdated physical planning Act that was formulated by the colonial government in 1955.

Water Institutional frameworks – (Zanzibar water Authority-ZAWA)

ZAWA is a corporate authority that was established following the enactment of the Water Act of 2006 and started its

operation in 2008. Its mandate is to provide water service and infrastructure provision in both urban and rural areas. Among Act. Since its inception, ambitious water management policies, legislation, and management frameworks have been formulated and are in the process of being implemented. The uses of pipe water account about 65% of dwellers in Zanzibar. The policy governing water supply and management in Zanzibar was flexible and change over the time. Before independent pipe water supply was paid in Zanzibar, however 1980 this policy was abolished (Worrall et al. 2017). Even though after the policy failure and observing the piped water delivery is not a natural system it is a man-made infrastructure that needs investment in financial and other resources to build, operate, maintain and sustain (Worrall et al. 2017). The investments turn water into an economic good and not only a social service and the policy change. Pipe water was again paid in Zanzibar however at the low cost and poor performance (Worrall et al. 2017). ZAWA is a corporate authority that was established following the enactment of the Water Act of 2006 and started its operation in 2008. Its mandate is to provide water service and infrastructure provision in both urban and rural areas.

1.2 Objectives of the Study

In this study there are general objectives and specific objectives. Here below are as follows:

1.3 General Objective

To assess the performance of water supply and management in Zanzibar

1.3.1 Specific Objectives

- To find out the existing performance of water supply and management of the study area
- To determine the factors for improving water supply and management in the study area
- To assess the challenges faces water supply and management in the study area

II. SCOPE AND METHODS

2.1 Research Design

(Mkombe et al. 2015) define research design as 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. This study used descriptive survey, based on cross-sectional design. It was cross section in the sense that it cover across Zanzibar islands. (Anguera et al. 2016) depicts that descriptive survey involves gathering data that describe events. The design was used since data was collected at one point in time from a sample selected to represent a larger population.

2.2 Target Population

According to (Bryman et al. 2016), Population-basically is the universe of units from which the sample is to be selected. The targeted population for this study was ministerial official, ZAWA officials and local community in Zanzibar.



Map of Zanzibar-Unguja.

2.3 Sample Size

According to (Cohen et al. 2014), a sample is a representative group drawn from the population in such a way that the findings from the sample can be generalized on population. This study uses 95 sample sizes.

2.4 Sampling Procedures

The sample is selected using non-probable sampling procedures. In non-probable sampling procedure, purposive sampling will be used (Kothari 2017).

2.4.1 Purposive sampling

Purposive Sampling is a non-probability sampling technique whereby the researcher selects participants on the strength of their experience of the phenomenon under study (Fenny et al. 2018). Purposive sampling will be used in this study since it suited both quantitative and qualitative methodology (Kombo et al. 2015). The purposive sampling was involved the ministerial officials and ZAWA officials.

2.4.2 Convenience sampling

(Abraham 2015) define convenience sampling method is set of techniques in which respondents are selected by convenience due to their proximity, availability, accessibility or other way that researcher decides. In conducting the survey, convenience sampling was used to select local community in the Urban West Region.

2.5 Data Collection Methods

Data collection methods were fall under two categories. These were those that were used during the field (in the field) and those after the field. Those during the field include structured interviews and questionnaire. While after the field the researcher collected the data through documentation in various libraries and departments.

2.6 Data Analysis

Data analysis refers to examining what has been collected in a survey or experiment and making deductions and inferences (Kombo et al. 2015). Data analyses were carried out as soon as questionnaires received from the field. The first stage included questionnaire reception and manual checking of filled questionnaires. A special data entry program SPSS will be used to enter data. Data cleaning and validation was done by experienced data processing expert who will be hired by the researcher. In this study both quantitative and qualitative techniques were applied. Here it involved descriptive statistics and explanation of the thought of the respondents on a particular entity.

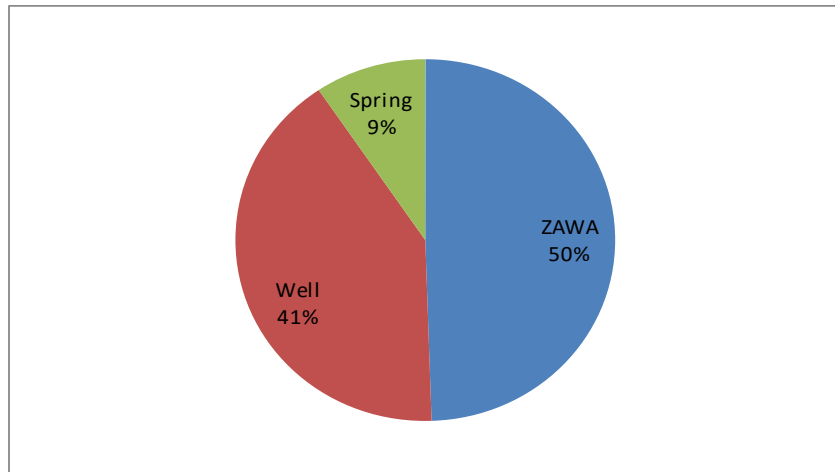
III. RESULTS AND DISCUSSION

3.1 Performance of Water Supply and Management

The first objective of this study is to find out the exiting performance of water supply and management in the study area. To be able to show that five areas have to be shown namely sources of water supply, water accessibility, frequency of doing

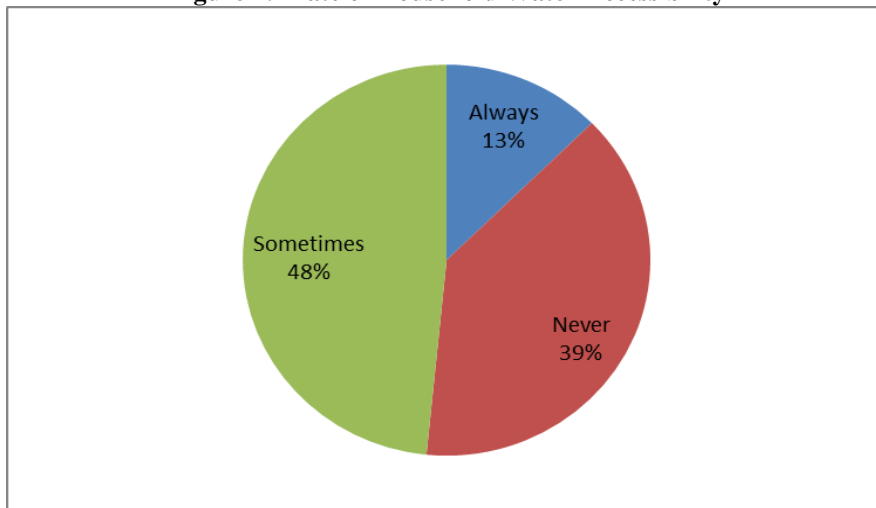
laundry, water saving measures and water expenditure. This section respond to the question: What are the situation of water supply and management in the study area?

Figure 1: Source of Water Supply



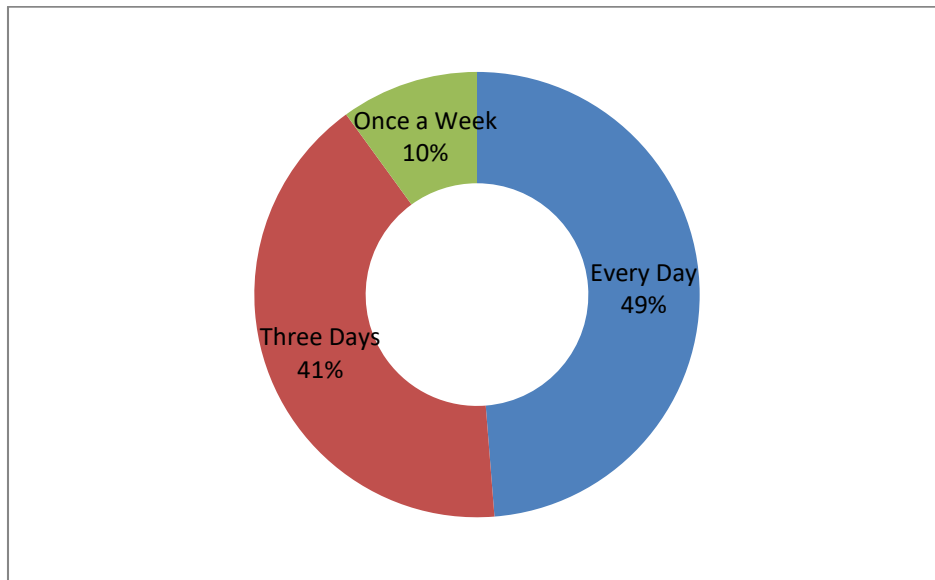
Source: (field survey, 2018)

Figure 2: Rate of Household Water Accessibility



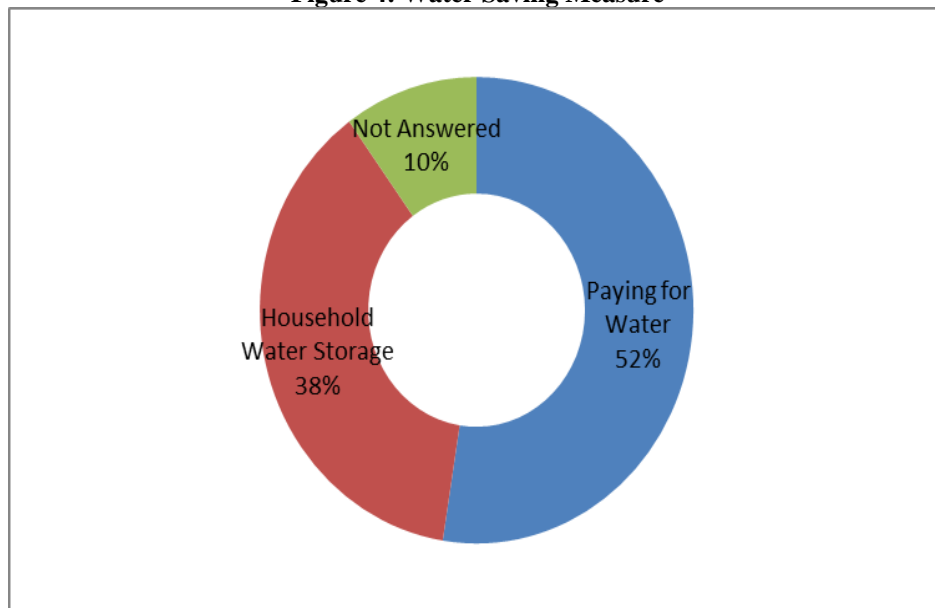
Source: (field survey, 2018)

Figure 3: Frequency of Doing Laundry



Source: (field survey, 2018)

Figure 4: Water Saving Measure



Source: (field survey, 2018)

Findings indicate that large proportion of respondent, forty seven (47) respondent who are equal to 49.5 percent out of the total respondent explained that ZAWA is the source of water supply in the study area. While thirty seven (37) respondents who are equal to 41% out of the total respondent depicted that wells are the sources of water in the study area. The rests of respondents nine (9) respondent who are equal to 9.5% out of the total respondents put that spring is the source of water in the study area. The findings signified that ZAWA is the source of water supply in the study area. (Diemand et al. 2016) showed that the use of boreholes was also common in Tsumkwe where water was pumped from four boreholes into an elevated reservoir and then distributed to community taps and personal storage tanks. Another research done by (Telmo 2018) showed that in Gouansolo in Mali the two types of water supplies that exist in the village were hand

dug wells and borehole pumps. There were two types of hand dug wells the village: traditional and modern. Traditional hand dug wells were unlined and unprotected holes, generally less than 15 meters deep, that are hand-dug with picks and shovels into the water table. These are very common in rural areas. Generally the data indicate that large percentage of respondent, forty six (46) respondents who are equal to 48.4% out of the total respondents agreed that water is sometime accessible in the households in the study area. The rests of respondent's thirty seven (37) respondents who are equal to 39% out of the total respondents complained that water is never accessible in the household in the study area. The data implied that water is sometime accessible in the households in the study area. The available amount of water per person in Africa is far below the universal average and is diminishing with per capita availability annually at 4,000 cubic metres compared to

a global average of 6,500 cubic metres (UNEP 2016). (Jacobsen et al. 2016), reported that water demand is growing at a higher rate than population growth as urban dwellers' income levels rise and the demands for better services increase while availability of water is decreasing due to competing demands from mining, agriculture, and industry and from deteriorating water quality and climate change. (Review 2011) Local Government Budgets and Expenditure Review indicate that ground water resources are also not abundant, as most of South Africa is made up of hard rock formations that do not contain major ground aquifers that can be used on a national scale. It was estimated that only 20 percent of South Africa's groundwater can currently be used. Groundwater resources are extremely used in rural areas. South Africa's water resources are comprised of 77 percent surface water, 9 percent groundwater, and 14 percent re-use of return flows. In addition to that the results indicate that large proportion of respondents, thirty nine (39) respondents who are equal to 48.7% out of 80 respondents who attempted on this question depicted that laundering takes place every day. However thirty three (33) respondents who are equal to 41.3% out of the total respondents who attempted on this question explained that laundering takes place three days a week. The rest of respondents, eight (8) respondents who are equal to 10% out of the total respondents conveyed that laundering takes place once a week. This implied that laundering takes place every day in the study area.

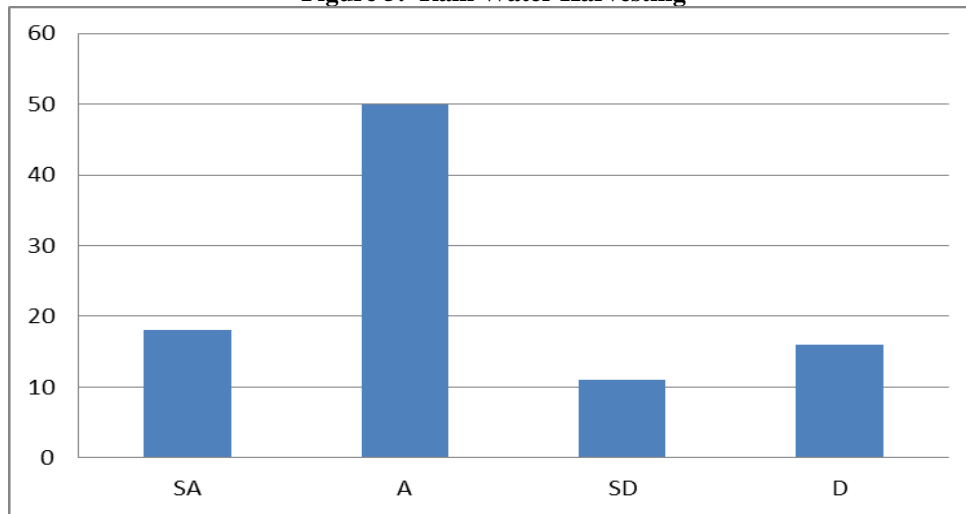
However, data indicate that large proportion of respondent, fifty two (52) respondents who are over fifty percent (54.7%) out of the total respondents explained that paying for water is the largest water saving measure in the study area. Even though, thirty five (35) respondents who are equal to 36.8% out of the total

respondents depicted that household water storage is one among water saving measure in the study area. This is observed throughout several settlements in Zanzibar that there are water tanks to save and store water. This signified that paying for water is the largest water saving measure in the study area. Water pricing policy in developing countries can be seen to comprise of a lot of financial considerations like economic efficiency, cost recovery, equity and water conservation (Diakite et al. 2013). Water policy therefore needs to focus on the income of those who actually pay for the resource that is used by the household in order to encourage its use for sustainability and the achievement of the MDG

3.2 Factors for Improving Water Supply and Management

The second objective of this study is exploring the factors for improving water supply and management in the study area. To be able to show that four important aspects have to be addressed namely rain water harvesting, paying for water services, waste water re-use and household water storage. This section responds to the question what are the factors for improving water supply and management in the study area?

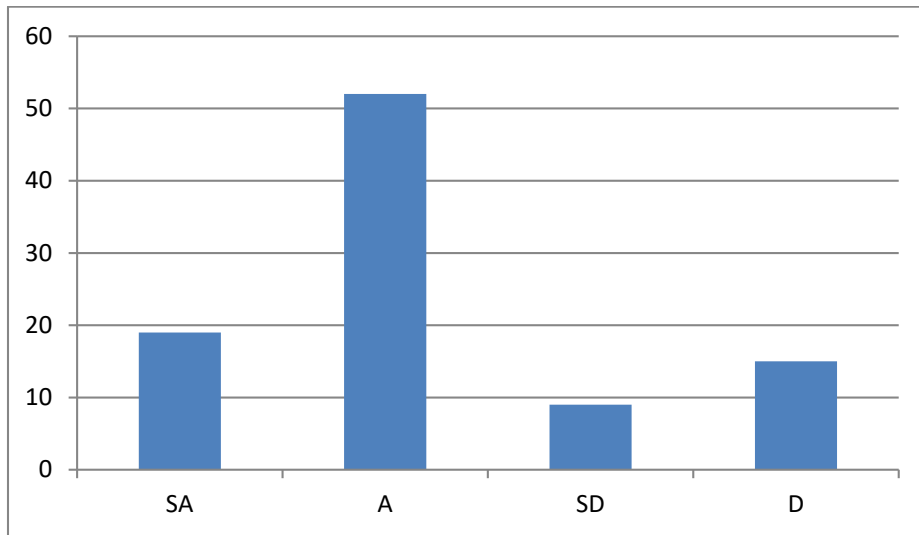
Figure 5: Rain Water Harvesting



Source: (field survey, 2018)

Where by SA – Strongly Agree, A – Agree, SD – Strongly Dis-Agree, D – Disagree

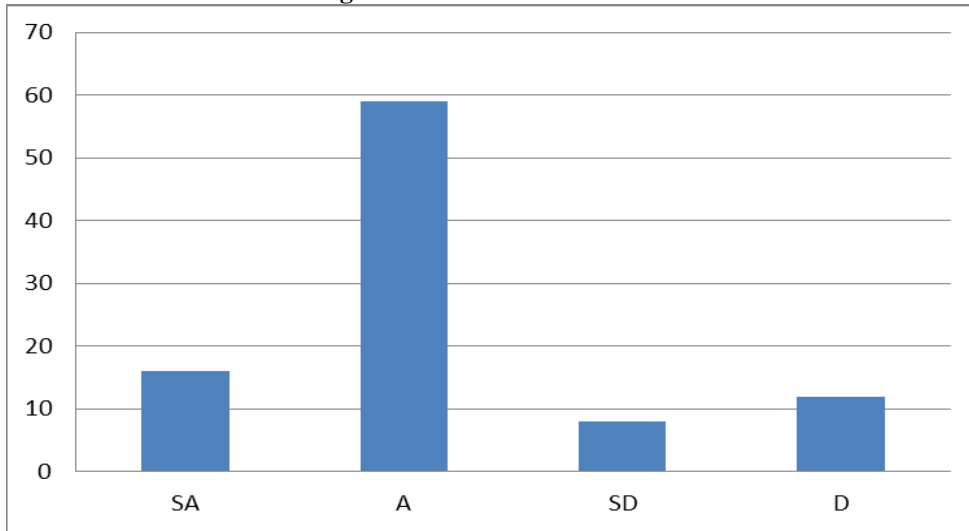
Figure 6: Paying for Water Services



Source: (field survey, 2018)

Where by SA – Strongly Agree, A – Agree, SD – Strongly Dis -Agree, D – Disagree

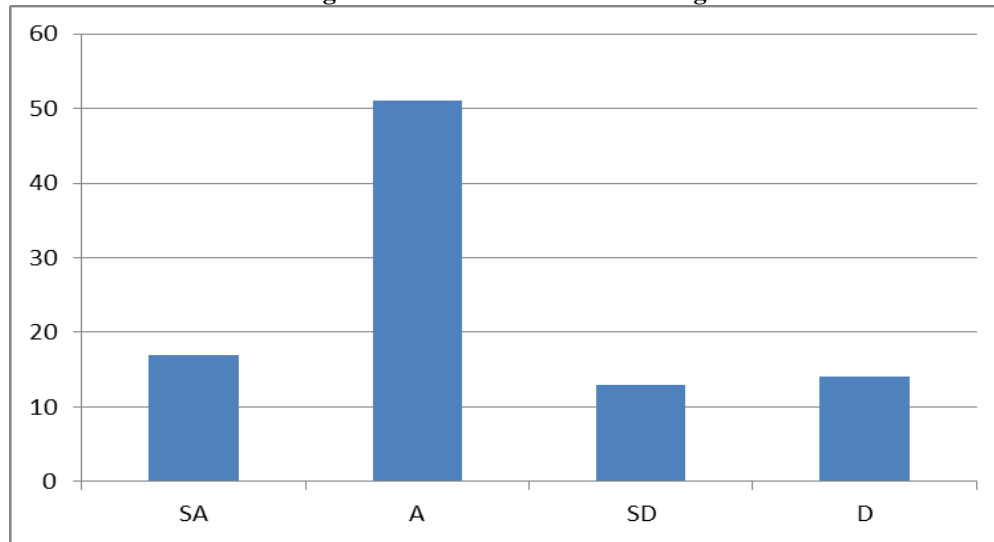
Figure 7: Waste water Re-Use



Source: (field survey, 2018)

Where by SA – Strongly Agree, A – Agree, SD – Strongly Dis- Agree, D – Disagree

Figure 8: Household Water Storage



Source: (field survey, 2018)

Where by SA – Strongly Agree, A – Agree, SD – Strongly Dis-Agree, D – Disagree

In generally the results indicate that large proportion of respondents fifty (50) respondents who are equal to 52.6% out of the total respondents agreed that rain water harvesting is the factor for improving water supply and management in the study area. The remains respondent eleven (11) who are equal to 11.6% out of the total respondents complained that they strong disagreed that rain water harvesting is the factor for improving water supply and management in the study area. The results implied that rain water harvesting is the factor for improving water supply and management in the study area. Harvesting of rainwater is one of the common means of accessing water by urban residents during rainy seasons. It refers to the means of accumulating and storing of rainwater for use, before it gets to the aquifers. The water is collected from the roofs of houses and tents (Geerts et al. 2016). It is a temporal source of drinking water for some households in urban cities. It is also use for washing clothes and utensils, cooking, as well as other usual uses of water in the house. It is usually beneficial to the poor household for who finds it difficult to purchase water daily. For some households, rainwater may be the only available or economical water source for some number of days for the entire household to depend on. In addition to that findings indicate that large proportion of respondents, fifty two (52) who are equal to 54.7% out of the total respondents agreed that paying for water services is the major factor for improving water supply and management in the study area. Contrarily nine (9) respondents who are equal to 9.5% out of the total respondents were strongly disagreed that paying for water services is the factor for improving water supply and management in the study area. This implied that paying for water services is the major factor for improving water supply and management in the study area.

Water pricing policy in developing countries can be seen to comprise of a lot of financial considerations like economic efficiency, cost recovery, equity and water conservation (Diakite et al. 2013). Water policy therefore needs to focus on the income of those who actually pay for the resource that is used by the household in order to encourage its use for sustainability and the

achievement of the MDG. Moreover the data indicate that large proportion of respondents, over fifty percent (62%) out of the total respondents agreed that waste water re-use is the major factor for improving water supply and management in the study area. Even though, eight (8) respondents who are equal to 8.4% out of the total responses protested that they strongly dis-agree that waste water re-se is the factor for improving water supply and management in the study area. This implied that waste water re-use is the major factor for improving water supply and management in the study area. Reusing of household wastewater is rapidly becoming one of the developing trends of managing water in the house especially in areas with poor access. It has become a more rational choice for many households in balancing water deficiencies as a results of the inadequate water supply. Globally, the increase in water reuse is due to number of reasons including rising water demands, inadequate water resources, and regulatory and political influences (Awad 2014). Increasing households’ demand for water coupled with the limited water supply causes the need for most households to adopt reusing of the little they have (Arias 2014). A study conducted by (Amnesty 2017) International (2009:17) mentioned that Palestinian families who do not have enough water to meet their needs often have no choice but to resort to coping strategies. These include, buying water from unsafe sources such as agricultural wells, which were not monitored for quality. They also reuse the same water for several tasks: water used to boiled vegetables was reused to wash dishes, then reuse again to wash floors and then finally reuse to flush toilet. Toilets were flushed less frequently. Washing less regularly and fully, using a bucket or jug to limit the water used instead of showering. Washing clothes and floors as infrequently as possible and using a small quantity of water to hand-wash clothes in a bucket rather than using a washing machine. Only growing rain-fed crops in their home gardens or not keeping a home garden at all in dryer areas. They keep fewer animals or none at all. Furthermore, findings indicate that large proportion of respondents 51 who are equal to 53.7% out of the total respondents

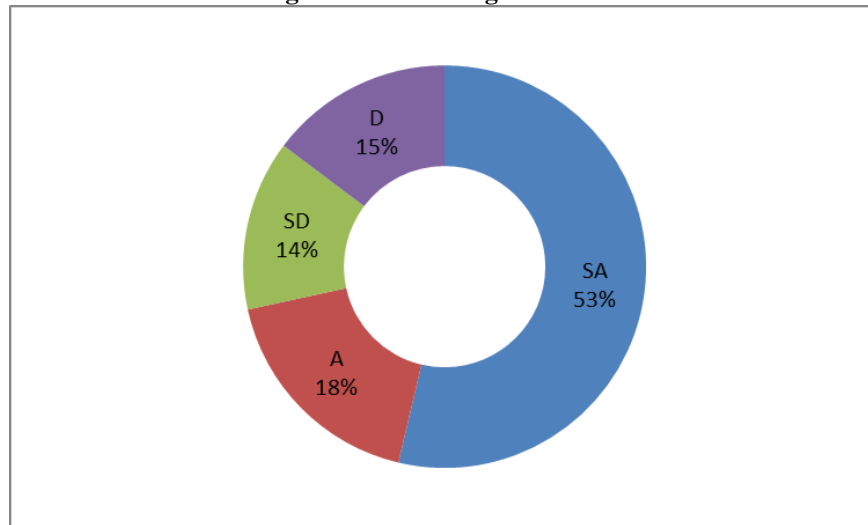
agreed that household water storage is the factor for improving water supply and management in the study area. However, the rests of respondents thirteen (13) respondents who are equal to 13.7% out of the total respondents were strongly disagreed that household water storage is the factor for improving water supply and management in the study area. This implied that household water storage is the factor for improving water supply and management in the study area. Storing of water in households has increasingly become the only fastest method of getting water for future use. This is because; water providers have resorted to supplying the water intermittently to the consumers (Vairavamoorthy 2016); (Hardoy et al. 2016). Consumers are therefore forced by the nature of the supply to use over-sized household water facilities such as storage tanks, barrels, gallons or

other means to cope with service intermittency (Criminisiet et al. 2016) with the aim of storing as much water as possible when supply resumes.

3.3 Challenges Faces Water Supply and Management

The third objective of this study is to assess the challenges faced water supply and management in the study area. To be able to show that three areas have to be addressed namely technological failure, population growth and financial and human resources shortage. This section respond to the question what are the challenges faces water supply and management in the study area?

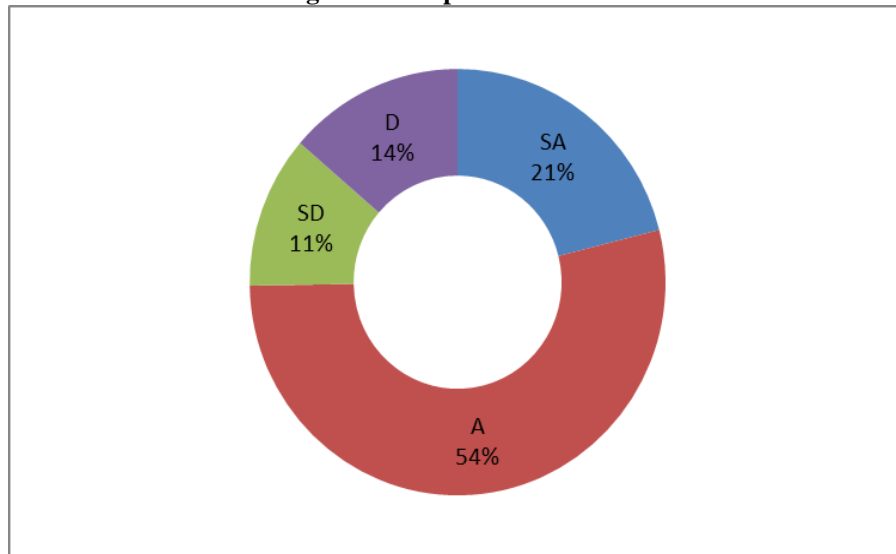
Figure 9: Technological Failure



Source: (field survey, 2018)

Where by SA – Strongly Agree, A – Agree, SD – Strongly Dis-Agree, D – Disagree

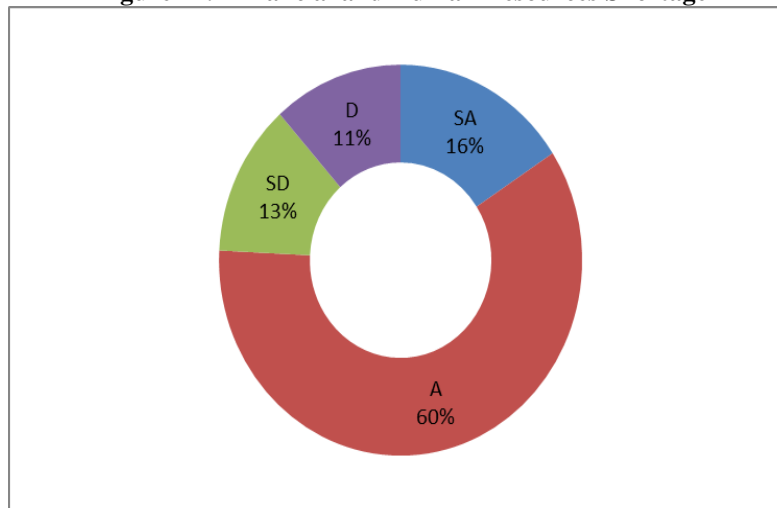
Figure 10: Population Growth



Source: (field survey, 2018)

Where by SA – Strongly Agree, A – Agree, SD – Strongly Dis-Agree, D – Disagree

Figure 11: Financial and Human Resources Shortage



Source: (field survey, 2018)

Where by SA – Strongly Agree, A – Agree, SD – Strongly Dis-Agree, D – Disagree

Generally findings indicate that large proportion of respondents 51 respondent who are equal to 53.7% out of the total respondents were strongly agreed that technological failure is the greater challenge of water supply and management in the study area. Conversely thirteen respondents who are equal to 13.7% out of the total respondents were strongly disagreed that technological failure is the challenge of water supply and management in the study area. This signified that technological failure is the greater challenge of water supply and management in the study area.

The findings supplemented by (Sanders and Fitts 2015) that in Pawaga village in Tanzania, the problems with water supply facilities were due to systems which were not repaired and were falling into disuse. Another study done by (Kaguru and Kanyagia 2013) revealed that a lot infrastructure in Uganda was old

fashioned and it was not maintained and therefore makes service delivery less efficient. A similar study conducted by (Diemand 2010):30 showed that the problems with water and sanitation systems in Tsumkwe were primarily caused by lack of maintenance. Nearly all the taps were in need of repair or replacement. The next section focuses on an infrastructure assessment in BLM. Infrastructural and urban planning are key for sustainable Integrated water resource management (IWRM) but require large investment and long term planning. An estimated 41 trillion US\$ (41 x 10¹² US\$) is needed to refurbish the urban infrastructure in the period between 2005-2030. Over 50%, 22.6 trillion US\$ of these investments will be needed to refurbish the water systems (UNEP 2013). This is roughly 60% more than is spent on infrastructure in the same period until now (McKinsey

and McKinsey 2013). Yearly expenditures on water infrastructure for developed countries are currently around 1% of the GDP. (Cashman and Ashley 2015). The widespread need to accelerated investments in infrastructure are exacerbated by increased climate change related adaptation costs to combat weather anomalies, extreme rainfall and water scarcity (Gessner et al. 2014). Meanwhile, fifty one (51) respondents who are equal to 53.7% out of the total respondents agreed that population growth is the challenge of water supply and management in the study area. Oppositely eleven (11) respondents who are equal to 11.6% out of the total respondents were strongly agreed that population growth is the challenge of water supply and management in the study area. The data implied that population growth is the challenge of water supply and management in the study area. This is supported by a study done by (Gleick 2011):574) mentioned that water availability was affected by anthropogenic factor which was the population growth. For example a research done by (Katri and Vairavamoorthy 2014):2-9) showed that the availability water sources throughout the world were becoming depleted and this was aggravated by the rate at which populations were increasing, especially in developing countries. According to (Gleick 2012):574 increasing population leads directly to decreasing per capita water availability. For example, (Fletcher 2012):6 clearly outlined that India's population was less than 400 million and per capita water availability over 5.000 cubic meters per year. Fifty years later, population has grown to over a billion and per capita water availability has fallen to hardly more than 2.000 cubic meters per year. According to Singh (Singh 2013) s.p it was estimated that by the year 2050, half of India's population will be living in urban areas and will face acute water problems. A number of studies have calculated the effect of population growth on water resources, holding water resources constant. Above all, forty six (46) respondents who are equal to 60% out of the total respondents agreed that financial and human resources shortage is the challenge of water supply and management in the study area. Nevertheless, twelve (12) respondents who are equal to 12.6% out of the total respondents were strongly disagreed that financial and human resource shortage is the challenge of water supply and management in the study area. The findings mean that financial and human resources shortage is the challenge of water supply and management in the study area.

IV. CONCLUSION AND RECOMMENDATION

4.1 Conclusion

Basing on the findings of this study, it is safe to conclude that the performance of water supply and management in Zanzibar is not good. This is due to the fact that that single source of water is in the study area, poor water accessibility in the study area, rough using of water in the study area with minimal water storage devices in the study area. These were the results of some challenges of water supply and management such as technological failure in the study area, population growth in the study area and financial and human resource shortage on water related sectors were the major challenges faces water supply and management in the study area.

4.2 Recommendation

Based on the findings the study recommends the followings:

4.2.1 Performance of Water Supply and Management

It is important for the government, to privatize the important social services such as water so that to diversify the sources of clean and safe water in the study area, to monitor the water utilization in the study area and enact the proper water saving methods in the study area. Hence water supply and management will be improved in the study area.

4.2.2 Factors for Improving Water Supply and Management

The study recommend that there is the need to formulate proper policies, law and strategic plan in one hand to direct on how to implement the factors for improving water supply and management in the study area. In addition to that there is the need provide enough budgets for education and training on how to implement the factors as well as buying required technology and knowhow on how to implement the project.

4.2.3 Challenges Faces Water Supply and Management

It is recommended that there is the need provide enough budgets for education and training on how to implement the factors as well as buying required technology and knowhow on how to implement the project.

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