

## **IMPACTS OF POPULATION GROWTH ON WATER SUPPLY TO THE SURROUNDING COMMUNITY IN MOSHI MUNICIPALITY, TANZANIA**

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**ABSTRACT:** The purpose of this study was to assess impact of population growth on water supply to the surrounding community in Moshi Municipality. This study was guided by three research objectives which are the to identify the nature and forms of water distribution in Moshi Municipality, to examine the relationship between population growth on water distribution in Moshi Municipality and to identify the measures taken to improve water supply in Moshi Municipality. The targeted population of the study was included household, Ward Executive officer and water supply and sanitation. The study was comprised a Sample of at least 100 of samples who was household, (key informants) ward executive officer and water supply and sanitation. Purposive sampling was used select key informants and systematic sampling technique whereas stratified sampling was used to select Ward's which was included in the study. The instruments which used to collect data were guided questions. The guided questions were used for both household and key informants. The collected data was analyzed in both quantitatively. In quantitative analysis the collected information was coded then entered in a computer by the use of statistical package for social sciences (SPSS) software. Qualitative data was analyzed using content analysis

whereby the researcher assign code to theme described by respondent and counted the frequency the theme occurred the analyzed data was presented in table of frequencies and percentage. The finding concluded that population growth increasing water demands hence lead to insufficient water supply in the study area and population growth lead to destruction of water supply infrastructures and destruction of water resource because it leads to discharge of harmful chemicals and destruction of river banks. The study recommended that there is need for adequate government and other stakeholder involvement in the goal of ensuring that every member of the ward has adequate access to clean and safe service supply, and follow up and close collaboration among different actors is very important in order to ensure good operations and management then sustainability of water schemes, especially those managed by people who have no expertise on water issues.

## **INTRODUCTION**

### **1.1 Background of the Problem**

Globally, water is very crucial element in human life, without water there is no life (Chappelle, 2005) The quality of life is directly depends on the quality of water, poor water affects the environment and human wellbeing (Fogden 2009) The sustainable development goals (SDGs) goal number six emphasize on clean water and sanitation to ensure management of water and sanitation for all. Some 742,000 people are estimated to die each year from diarrhea as a result of drinking contaminated water, poor sanitation, and hand hygiene (Genevieve, 2008). 159 million people collecting untreated surface water from the lakes, ponds, rivers, and streams, 263 million people with limited services or an improved water sources requiring more than 30 minutes to collect water, A Huge global effort is focusing on reducing the number which have measure the progress made on access to drinking water and sanitation since 1990, shows that there have improvement in certain areas ( Anderson, 2012)

In Africa, hundreds of millions of people suffers from a lack of access for clean water (UNICEF, 2012). Women and girls working long distances at a time to gather water from streams and ponds full of waterborne disease that is making them and their families diseases (WHO,2015) Eritrea is the top of the coast with 77%of it's

practicing open defecation, a practice which can lead to the contamination of drinking water and spread of diseases such as cholera, diarrhea, dysentery, hepatitis and typhoid.(Warner,2007). Illness from drinking dirty water and the time lost on fetching it robs entire communities of their futures, hope it put on hold in over half of the developing world's primary schools without access of water and sanitation (Insunju, 2012). However, Africa experiences a contrasting case with 40% of the 783 million people without access to improved sources drinking water from the region (Soweto, 2011). Africa is of track from meeting the Sustainable Development Goals (SDGs) on water with just 61% water coverage and with the current pace cannot reach the 75% target for the region. An analysis of data from 35 countries in Africa (representing 85% of the region's population) should significant different between the poorest and richest faiths of the population in both rural and urban areas. Over 90% of the richest countries in urban areas use improved water sources and over 60% have piped water on premises in rural areas, piped in any form of improved sources of water (Partel, 2012).

In East Africa, Sub Saharan African countries suffer from population growth on water supply than any other countries. The lack of clean and safe water in Africa is caused by prolonged drought, Poverty and population growth, In Africa, more than 315000 children die every year from diarrhea diseases caused by population to be high than distribution of water and poor sanitation (Abu El-Ela, 2006) .They increase the risk for violence since they travel such great distance from their villages on a day basis, urban areas face a whole different host of challenge to provide clean and unsafe water sanitation. More than half of Kenyans population only have to access to unsafe drinking water from river, ponds, and shallow wells.

In Tanzania 23 million people do not have access to safe water even there are so many sources of water from lakes, Lake Victoria, Lake Tanganyika, Lake Nyasa and Lake Manyara. Water shortage in Tanzania has been a problem for many years now; the problem is even bigger in rural areas, According to WHO/ UNICEF report of 2004, 77% of people lack access to safe drinking water because population is increasing faster. It has been documented that water shortage has been caused by population growth, high level consumption and climate change which has shirked the

resources of water. Typically, women spend over two or hour's day collecting water and up to seven hours in remote areas, access to toilet is even lower with 44 million people living without adequate sanitation (UNICEF, 2012). This is particularly problematic in densely populated unplanned settlement over 4000 children under 5 years dies each year from preventable diarrhea diseases. There are wide impacts too participatory on education and live hoods, these impacts of population growth on water supply have been a problem to many Tanzania and therefore this study will assess these impacts of population growth on water supply to the surrounding community in Moshi Municipality.

## **1.2 Statement of the Problem**

Water is a vital resource for the wellbeing of human (UNICEF, 2012). Moshi Municipality is in the process of improving water supply and promotes sanitation to all people in the area, despite of the effort taken by the Government to improve water supply in the area still population growth on water supply is a big challenge. There is a raising concern that the challenge of scarcity of water and uneven distribution of water supply is caused by overpopulation pressure, poor infrastructure as well as inadequate water supply system that correspond to the current population.

Despite of all these challenges, information on the impacts of population growth on water supply to the surrounding community is scant. Therefore, this study will be conducted in order to understand the impacts of population growth on water supply in Moshi Municipality.

## **1.3 General Objective**

The main purpose of this study was to assess the impact of population growth on water supply to the surrounding community a case study in Moshi Municipality.

### **1.3.1 Specific Objectives**

- i. To identify the nature and forms of water distribution in Moshi Municipality
- ii. To examine the relationship between population growth on water distribution in Moshi Municipality

- iii. To identify the measures taken to improve water supply in Moshi Municipality.

#### **1.4 Significance of the Study**

At the end of the study, people were getting the general knowledge on the impacts of rapid population growth on water supply and also the knowledge on how to overcome those challenges. This study was challenging Moshi authority organization as a water transformation organization to visit better systems of supplying water so as to meet the population needs on water supply and protect supply in Moshi. Also, this study was motivating people to manage and protect their environment through afforestation and reforestation and to reduce population growth through the use of family planning and how to maintain their health by using safe and clean water especially after knowing different problems that are resulted from the overpopulation and supplying water.

#### **1.5 Scope and Delimitation of the Study**

The study was conducted in Moshi Municipality within Kilimanjaro region; the study was focused on impact of population growth on water supply to the surrounding community Moshi Municipality. The information was collected from Moshi Water supply and Sanitation Authority (MUWSA) Ward Executive Officers in Moshi municipality. The information which was collected facilitated in answering the research questions of the study.

#### **1.6 Conceptual Framework**

The conceptual framework shown in figure (Fig.) 1.1 originally developed by (Yusuf, 2006) to show the rest the human health against different diseases resulted from the population growth on water relationship between population growth and water planning initiatives for domestic uses as in Tanzania. According to fig. 1.1, The conceptual framework of the study is in the system of concepts , assumptions, expectations, beliefs, and theories that support the study and it in forms that the research is a key of the design and it can be explained either graphically or in narrative form, The main things to be studied the water supply from their main sources to the people and within it shows that water can be from many sources like

water vendors, wells and springs etc. and can be transferred in different forms like lorries, pumps, water gallons and other. However proper utilization of water maintains the safety of water to the human health and improper utilization of water may affect the human health.

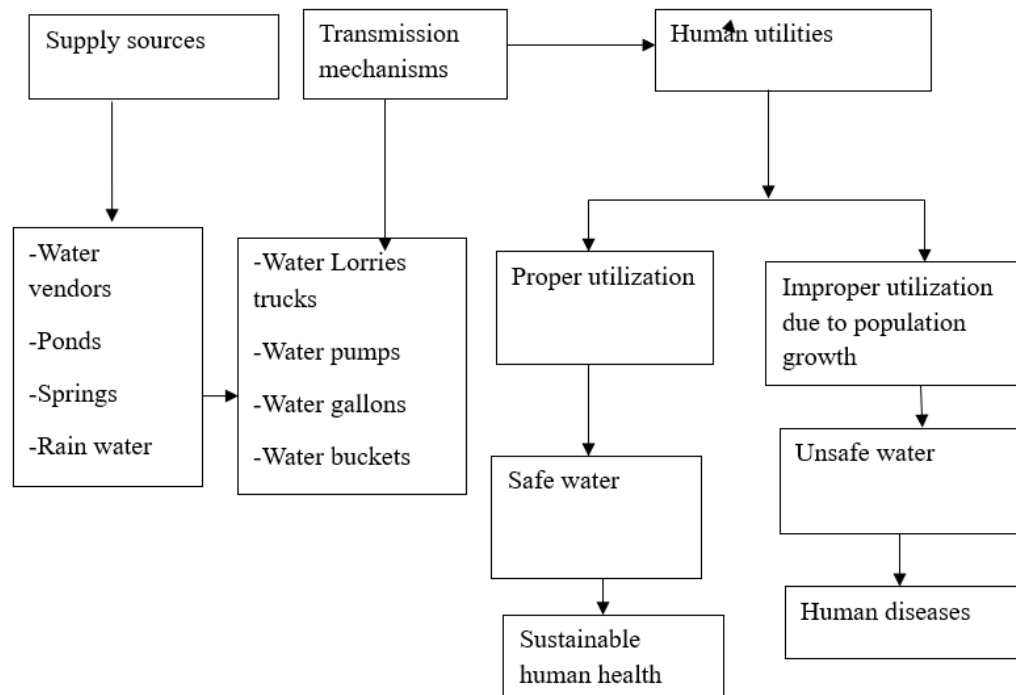


**Figure 1.1:** Conceptual framework showing impact of rapid population growth on water supply to the surrounding community in Moshi Municipality.

Sources: Modified from (Yusuf, 2006)

## 1.7 Definition of the Key Terms

**Population growth-** Is the change in a population overtime, and can be quantified as the change in the number of individuals of any species in a population using per unit time

**Water supply-** Water supply is the provision of water by public utilities, commercial organisations, community endeavors or by individuals, usually via a system of pumps and pipes.

**Community-**A group of people living in the same geographical area or having particular characteristics in common.

## **LITERATURE REVIEW**

### **2.0 Introduction**

In this chapter review was undertaken on related theories and empirical review. In the related theories two theory was reviewed which are Water supply reliability theory, Miasma theory and in empirical review the review was made on the status of water and their distribution, challenges of water distribution and supply system, impacts of population growth on water supply, and the measures that should be taken to improve water supply systems and finally is research gap.

### **2.1 Review Related Theories**

#### **2.1.1 Water Supply Reliability Theory**

The theory developed by Uri Shamir and Charles Howard (1981), in America, as define that water supply system reliability can be defined in term of a system physical component. Reliability factor for a single failure or for selected time period can be defined in term of capacity long during failure which is measured as a fraction of the demand rate or the demand volume. Also understanding and managing the future risk of drinking unsafe and unclean water to the human health. Management of technical reliability of water supply systems arising from risk –based asset management and the theory consider the provision of drinking water to be a” high quality” as a society service.

#### **2.1.2 Relevance of the Theory**

The theory was relevant to the study as it explained water reliability supply system together with the failure of system physical components or system physical components indicates that there are the challenges of the failure of safe and clean water supply to different residents which is a main focus this study.

#### **2.1.3 Weakness of the Theory**

The theory did not explain the relationships which exist between the increase in the population and the failure to have the enough access of water supply to the surrounding community, which is highly targeted issue of this study. Also, the theory

explains only about the access of water supply but did not consider the distribution systems of such water to the surrounding community.

## **2.2 Empirical Review**

### **2.2.1 Water Related Diseases**

According to Victoria, (1988) on water supply, sanitation and housing in relation to the risk of infant mortality from Diarrhea, explained that most of developing countries carry a heavy burden of the waterborne diseases, the heaviest being the diarrhea diseases waterborne diseases are among of one of the major public health problem in developing countries like Ethiopia the problem of waterborne diseases is especially prevalent where general hygiene and environmental sanitation are poor and where there is a shortage of protected water supply. But this study failed to explore the population growth on water supply activities which are going to be assessed by this study.

The study of Peter, (2002) on dirty water and estimated dearth from water related diseases, he explained recreational water and private municipal drinking water supply have implicated as sources of outbreak and causes of sporadic illness. Feces from human and other animal or sewage may be the sources of infection. But the study is not able to explain the systems used for water distribution to the surrounding community which is the interest of this study.

### **2.2.2 Status of Water and Water Distributions**

The study of Wonder, (2005) on ground water and surface water, water issues in developing countries include scarcity of water drinking, the siltation of river systems as well as the contamination of river and dams. 1.1 billion People in developing country have inadequate access to safe and clean water. Challenges of water quality are not only from physical contaminants themselves but also from the sheer volume of contaminants that can overwhelm an areas infrastructure or resources to treat and removes contaminants. Human cultural and cultural norms can reduce the quality of available water. Hence poor water quality is caused by lack of non-point ‘controls example agricultural runoff, lack of chemical controls, lack of awareness of water

quality. The study did not tackle the issue of water supply systems which also can facilitate the problems in water reliability and supply to the surrounding community which was assessed by this study.

According to Nhapi, (2015) on challenges of water supply and sanitation in developing countries, he explained the use of Tanks as small water systems have many storage tank choices depending on volume needed, site access, visual impacts, system pressure, and so forth. Storage tanks are shown in figures 30 through 34. Water tanks may provide storage for treated water, chlorine contact time, and/or water pressure for the distribution system. Water storage tanks must keep the treated water clean. With the exception of pressure tanks, they should have a lid or cover that keeps birds, rodents, insects, dust, and surface runoff out. They also must have a screened vent to allow air to enter the tank as the water level drops, and leave the tank as water level rises. Outside tank access covers must be lockable and weather tight. Water tanks are confined spaces and a confined space warning label should be placed on the tank access. Confined space procedures must be followed by anyone entering the tank. But the study did not show how population growth can impact such system in case of water availability and supply which is going to be assessed by this study.

The study of Reinemann, (2004) on water supply and distribution, he explained that the use of Pipes as one of system used in water systems must be approved for potable water use, NSF International (NSF), American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), and Underwriters Laboratories (UL) test and approve pipe for potable water applications. Polyvinyl chloride, polyethylene, or ductile iron pipe are commonly used in distribution systems. Distribution system pipes are typically buried below the frost line to keep them from freezing and to protect them from vandalism, Valve boxes provide access to distribution system valves. But the study did not state anything about the population increase impacts which can affect the use of such systems of water supply to the surrounding community which is going to be assessed by this study.

The study of Hunter, (2010) on water supply and health, he explained the as Valves are mostly used throughout the distribution system. Valves are used to isolate

equipment, buildings, and other areas of the water system for repair as well as to control the direction and rate of flow. They are used to drain the system for seasonal shutdown. There may be many types of valves in a water system. Check valves are used to control the direction of water flow. Gate valves and ball valves stop water flow. Include the valve types in the operation and maintenance. Still the study did not show the impacts of population growth on water supply system as it's a main focus of this study.

### **2.2.3 Impact of Population Growth on Supply System**

According to the study of Wonder, (2005) on ground water and surface water, he explain the problem in water availability are directly related in delivery, disinfection and conservation which in most areas outside of large towns are minimal or non-existence. It is estimated that only 50% of the rural population have access to hygienic and reliable drinking water sources and even where water is available 30% of rural water systems are not functioning properly due to poor operational land maintenance arrangement. The study fails to examine the water supply systems which also have large effects on water availability and access to the surrounding community which is the main focus of this study.

The study of Wonder, (2005) on ground water and surface water, he explains the available ground water sources from the city are collecting for the domestic and productive consumption is becoming depleted from time to time. This problem is aggravated by the rapid rate of population growth rapid expansion of the city coupled with other avoidable problems such as electric power failure resulted in the existing water supply to be inadequate, the household respondents and the selected officials had common on some factors which result in service interruption, shortage of water at the sources and rapid population growth electric power failure and rapid urbanization were classified to be main causes of water supply shortage to the community. However frequent broken down of pipelines lack of enough pressure in the system and illegitimate connections categorized as minor courses. The study explained the availability of water but did not state the extent on how it can be impacted by population growth as it's the main focus of this study.

According to the study of Genevieve, (2007), on water quality for ecosystems and human health, he explain that the government is struggling to have sustainable domestic water supply for household consumption, but water supply to different community residents is still a problem as water to be supplied is unreliable and of low quality which cannot satisfy domestic needs. As he explained that the major impacts to the reliability of water supply to the community is highly consumption of water in different socio-economic activities in most urban areas. The study basis on the consumption of water but did not show how the water supply systems, can also impact the water supply and reliability as it's a target issue of this study. The study is not show how the population growth can also impact the systems of water supply to the surrounding community.

The study of Hunter, (2010) on water supply and health, he state that population increase due to the low rent of houses is a major problem worldwide on the access of water supply. Hence he explain that a sustainable domestic water supply needs water infrastructure among other requirement which can supply water according to the existing population demand. But is not state anything about the systems of water supply which also can affect the water supply and reliability to the surrounding community which it the focus of this study.

The study of Reinemann, (2004) on water supply and distribution, explain that increase in the population it increases the rate of destruction of the water supply systems, as most of people uses to make illegal connections to the main pipelines which distributes water to the community residents. Which is largely increases the risks of losses of water and failure to have the clear and sustainable systems of water supply. The planning and designing of the projects uses top-down approach which does not recognize the population increase and involvement, which leads to the difficulty in achieving the sustainable community water supply projects without some degree of community involvement. But the study did not state some measures which can be adopted to enhance efficient supply of water to the community.

According to the study of Hanjra, (2015) on investment in agricultural water management of poverty reduction in Africa, he emphasizes that with proper consultation and guidance of people in consideration can make motivation to help in

planning and maintenance of water supply. Also he explains that community involvement in water project is key instrument for people in informal settlements. And the big impact affecting the water supply agencies is to fail to recognize community involvements and population growth. The study is not show some measures to be reached to ensure clear supply of water to the surrounding community.

#### **2.2.4 Measures Taken to Improve Water Supply Systems**

According to the study of Genevieve, (2007), on water quality for ecosystems and human health, examine developing water filtration systems as its one thing to have access to water, and it's another to have access to water that is safe to drink. Effective water filtration systems help ensure freshwater can be put to good use not making us sick. That's one of the reasons why companies worldwide are committed to developing sophisticated water filtration systems that produce purified water free from bacteria, microbes, and other contaminants, and bringing this clean drinking water to as many schools, hospitals, workplaces, and homes as possible. But is not state on how the population growth which impacts such water supply can be controlled.

According to the study of Fogden, (2009), on access to safe drinking water and its impacts on global economic growth, examined promoting water stewardship it takes every community in the world to reduce the threat of water scarcity. Now more than ever, the world needs water stewards in all forms. Whether that means taking shorter showers, installing low-flow toilets, and collecting rainwater for garden use at home; reusing gray water and eradicating leaks and other water inefficiencies at schools and offices; or investing in sustainable energy and water reduction initiatives by companies, water stewardship is a big part of the puzzle when it comes to limiting water scarcity. But the study failed to explain about the systems which can be used to distribute such water to the surrounding community.

According to the study of Aller, (2013). Water Sources Quality in Northern and Central African, he examined the act of protecting wetlands as remember when we mention that wetlands are natural water filtration systems well, that means they have

a big role in collecting and purifying water. Wetlands are disappearing at an alarming rate, but conserving wetlands could have a major payoff. Currently, an international treaty called the Ramsar Convention has helped protect more than 2,000 wetlands. More aggressive conservation measures will be required if we want wetlands to assist our efforts to reduce water scarcity. But the study is not state to which extent the population growth can impact water supply and reliability.

According to the study of Genevieve, (2007), on water quality for ecosystems and human health, explain the improving irrigation efficiency in industrial agriculture as one of the biggest drains on water resources. Simply switching from flood irrigation systems to sprinklers or drip irrigation systems could help the agricultural sector save a tremendous amount of water. When combine with better soil management practices such as no-till or limited tillage and mulching, which reduces evaporation from the soil, more efficient irrigation systems can significantly reduce water usage. The study did not state anything on the access of such water which can also be impacted by population growth.

### **2.3 Research Knowledge Gap**

Maleke Demen (2003) explains the burden of water scarcity that are in developing countries. Deborah M. Aller (2013) explained the water sources quality in North and central Tanzania, case study in rural community. Daselegn Berhane Asgedom (2004). Explain the causes and impacts of urban water supply in East Africa due to population growth. Issa Yusuf (2005). Explained the impacts of water scarcity in Zanzibar. Douglas J. Reinemman (2004). Explained water supply and distribution means.

However, none of these studies have explained the impact of population growth on water supply to the surrounding community in Moshi Municipality. The failure of many of these studies to explore the impacts of population growth on water supply to the community is what make this problem to be still exist in Moshi Municipality but other this study the problem will solved through the people getting knowledge and be aware on the negative impacts of population growth on water supply to the surrounding community.

## **RESEARCH DESIGN AND METHODOLOGY**

### **3.0 Introduction**

This chapter consisted of selection of the study area, description of the study area, research design, target population, economic activities, description of sample and sampling procedures, description of data collection instruments, description of data collection procedures, reliability and validity of research instruments, description of data analysis procedures, limitation of the study and ethical consideration in research.

### **3.1 Selection of the Study Area**

The study was about the impacts of population growth on water supply to the surrounding community in Moshi Municipality. This study conducted in three wards of Moshi Municipality, including Mawenzi, Soweto and Miembeni in Moshi Municipality, the area is selected to be the study area because is one among of the areas suffering with the population growth on water supply and due to population growth in the area cause lack of sufficient water in Kilimanjaro region, Moshi municipality is much characterized with unplanned settlements, number of migrants both internal and external migrant because of the social and economic reason which in one case

or another led to water scarcity in the selected area. With regard to the presence of population control and improvement of water supply and distribution to the people, hence it will aim on the community people.

### **3.2 Description of the Study Area**

#### **3.2.1 Geographical Location**

Moshi Municipal is located on the fertile southern slopes of Mt. Kilimanjaro at an altitude of 950 meters above sea level in the North to 700 meters above sea level in the South. The area of Moshi Municipality is 58sq.km. Moshi Municipal council lies at the Latitude and longitude of 3°20'5.579" S and 37°20'25.372" E, Sand slopes from about 950m above sea level to the North to 700m above sea level to the South. The town is virtually divided into three unequal parts by two permanent rivers: Rau

to the East and Karanga to the West while Kiladeda forms the western boundary. Moshi is originally established as a military camp at Kolila in present day-Old Moshi Division of Moshi District Council in 1892. In 1956, it attained the status of a Town Council the town was designated a Municipal Council in 1988. It is planned to become a City by 2016.

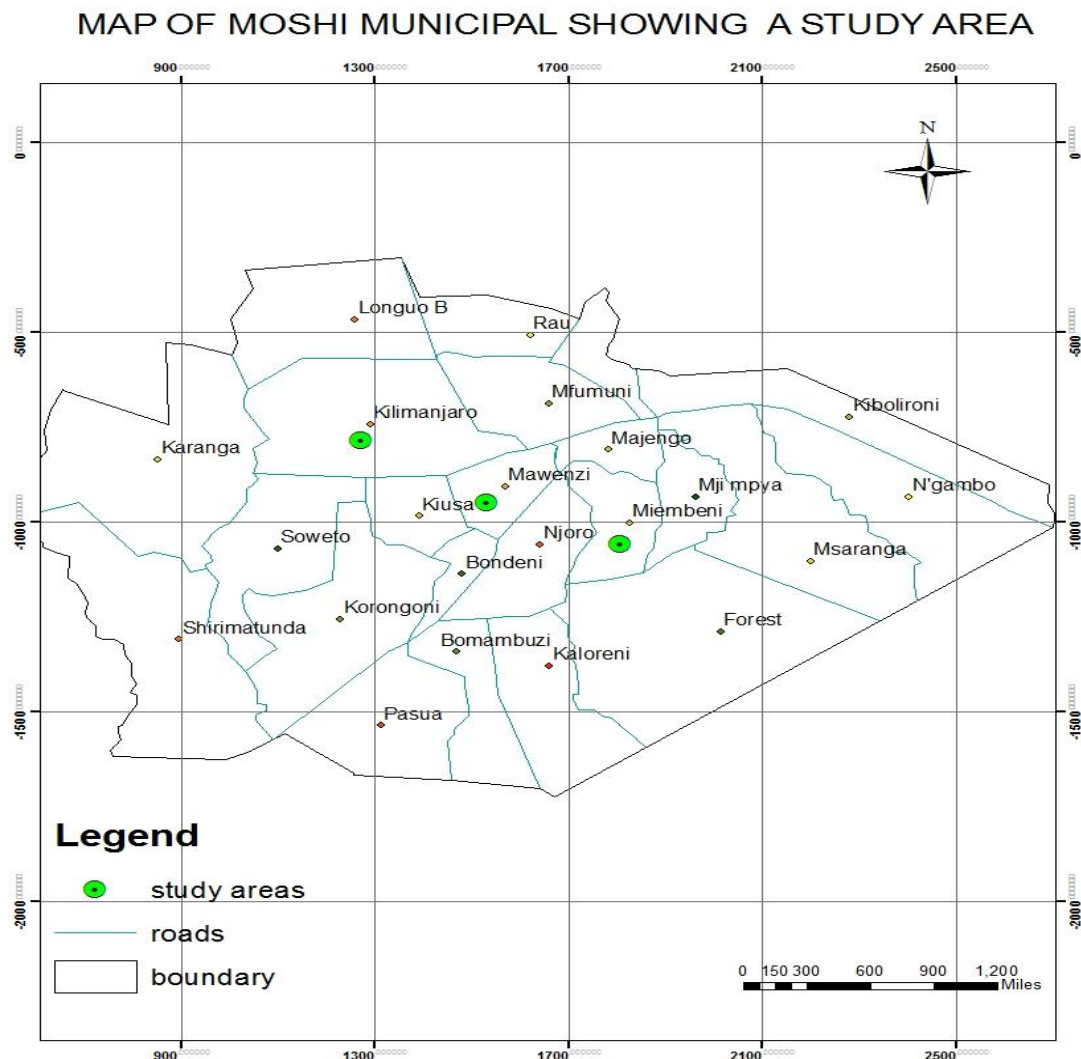


**Figure 3. 1:** Map showing study area

Source: Modified from Olipa (2025)

### 3.2.2 Administration Units and Boundaries

Moshi urban district is bordered to the north by the Moshi Rural District, to the east by the Mwanga District and to the south and west by the Manyara region. The Municipality is divided into two administrative divisions namely Moshi East and Moshi West. The divisions are further subdivided into 21 smaller administrative

units called Wards which are Kaloleni, Bombambuzi, Longuob, Pasua, Njoro, Mawenzi, Kiusa, Korongoni, Majengo, Kilimanjaro, Soweto, Shirimatunda, Ng’Ambo, Miembeni, Mjimpya, Kiboriloni, Karanga, Msaranga, Bondeni and Rau and further subdivided into 60 “streets.

### **3.2.3 Population Size, Growth and Density**

Moshi has grown from a small urban area of 8,048 residents in 1948 to 13,762 people in 1957. In 1969, the population was 26,969 people that grew to reach 52,223 people in 1978 and 96,838 people in 1988. According to the 2002 Population Housing Census General Report, the population was 143,799 people with growth rate of 2.8% including 70,678 males and 73,121 females. In year 2009 the population was estimated to reach 178,000 people including 78,932 males and 81,661 females. In the year 2012 Population and Housing Census the Municipal population was 184,292 distributed by sex as 95,118 females and 89,174 males. In this year 2022 the population is estimated to be 198,997 people. The Municipal is said to be highly populated with 4,426 people per square km. Unlike other towns in the country, current realistic estimates of the urban population should include additional estimates of 80,000 to 85,000 day-residents working in the town but spending nights in the surrounding rich and developed hinterland.

### **3.2.4 Socio-Economic Activities**

The economy of Moshi Municipality was not discussed fully without being related to the economy of Kilimanjaro Region as a whole. Along the slopes of the mountain are coffee and barley plantations as well as dairy and flower farms. To the South are the Tanganyika planters Company (TPC) sugar plantations and the Japanese-sponsored Lower Moshi Paddy Irrigation Project. Bananas, beans and maize are the main food crops for the indigenous people of the area. Though the primary sector has a negligible importance as a source of wage income, the role played by the many small “shambas” as well as poultry and animal keeping cannot be underestimated.

The economy of Moshi also depends on commerce, industry and tourism. The Municipality has a wide range of industries dealing with coffee curing, match production, pharmaceuticals, beverages and foodstuffs. It has good access to other towns in the country and abroad through roads, the Kilimanjaro International Airport

(KIA) and modern communication facilities. The favorable location of the Municipal relative to markets in the country and the world over single it an obvious choice for potential investors in commerce, industry, agriculture and tourism. However, economic growth of the Municipality is adversely affected by the recent country's adoption of free market economy.

### **3.2.5 Climatic Conditions**

The mean annual temperature is 25<sup>0</sup>C, the coldest month being July with an average of 17<sup>0</sup>C and the warmest month is December with an average of 34<sup>0</sup>C. The town receives short rains from October to December and long rains from March to May.

### **3.3.6 Ethnicity of the Study Area**

Moshi Municipal Council hosts two major tribes; Chagga and Pare as indigenous tribes. However, the district is now accommodating different tribes ranging from indigenous to out siders from within and outside African continent in due of various aspects of life, (Socio-economic, political, cultural etc.). In general, the Municipal hosts almost all tribes available in Tanzania who come from different place inside and outside the country for various purposes like trade/business and industrial tourism.

### **3.3 Research Design**

The research use survey design, the design selected due to a fact that it assesses the phenomenon with the actual context of life. The design was useful to this research as itl enabled the researcher to gather data on relatively large number of people at the same time. Also, the design was enabled the researcher to increase knowledge about social phenomena and help to understand fully behavior pattern of the concerned unit during data collection. Furthermore, this research design helped the researcher to get the detailed information and data about the impact of population growth on water supply to the surrounding community. Hence the researcher was able to do in depth study of the study area. The survey design was also flexible in data collection and analysis.

This study used quantitative and qualitative research approaches. The research employed case study quantitative and qualitative research design because the

approach was help the researcher to provide in depth information about the impact of population growth on water supply to the surrounding community in Moshi Municipality.

### 3.4 Sample and Sampling Plan

This section included the selection of the sample that a researcher deals with for the sake of representing the whole population of Moshi Municipality. Hence involved the selection of the sample size for each ward in the studied area.

#### 3.4.1 Sampling Frame

The sample frame of this study was to attain and to obtain information during data collection in the study area. The sampling frame of this study was consisting of different target population including household in selected wards, Ward Executive Officer (WEO) water supply officer (MUWSA) in the study area of Mawenzi, Miembeni and Soweto wards in which they were present members of the whole population of Moshi Municipality.

#### 3.4.2 Sample Size

For the sake of the study sampling size of the participants was to attain which were included sample size of Household, Ward Executive officer and water supply and sanitation officer for both Mawenzi, Miembeni and Soweto wards in which presented the entire population of the study area, The sample size is an important feature of any empirical study in which the goal is to make inferences about a population from a sample, Therefore Israel glyn formula of ( 2009) used to find sample size as shows below.

$$S = \frac{N}{1 + N(e)^2}$$

$$1 + N(e)^2$$

Whereby

S = Sample Size

N = Household (Total population 22223)

e = Precision level (90%)

Therefore,

$$S = \frac{22223}{1 + 22223 (0.1)^2}$$

$$S = \frac{22223}{1 + 22223 (0.01)}$$

$$S = \frac{22223}{223.23}$$

$$S = 99$$

$$S = 99$$

$$S = 99$$

$$S = 99$$

### 3.4.3 Ratio of Household heads to be sampled on each ward

$$\text{Soweto} = \frac{5233}{22223} \times 99$$

$$= 23 \text{ Households}$$

$$\text{Miembeni} = \frac{15220}{22223} \times 99$$

$$= 68 \text{ Households}$$

$$\text{Mawenzi} = \frac{1770}{22223} \times 99$$

$$= 8 \text{ Households}$$

**Table 3.1** Overall Sample Size of the Target Population in the Study Area

| S/N   | Categories of sample size           | Number of sample size | Percentage (%) of sample size | Sampling technique  |
|-------|-------------------------------------|-----------------------|-------------------------------|---------------------|
| 1     | Households                          | 99                    | 96                            | Systematic sampling |
| 2     | Ward Executive Officer              | 3                     | 3                             | Purposive sampling  |
| 3     | Water supply and sanitation officer | 1                     | 1                             | Purposive sampling  |
| Total |                                     | 103                   | 100%                          |                     |

Source: Researcher own adaptation (2019)

#### **3.4.4 Sampling Procedure**

This section encompasses the sampling of the sample size of each sampled unit of Households, Ward Executive Officer and Water supply and sanitation through different sampling techniques.

#### **3.4.5 Sampling of Ward**

Stratified sampling was employed to select the 3-sample ward from 21 wards of Moshi Municipality. 21 wards were divided into 3 major groups including core, semi periphery and periphery wards of the Moshi Municipality. Hence the sample selected from every group through purposive sampling basing on the wards which were vulnerable to the problem of population growth on water supply to the surrounding community were Mawenzi, Soweto and Miembeni wards were selected from both core, semi periphery and periphery wards respectively.

#### **3.4.6 Sampling of Households**

Systematic sampling technique was employed to obtain the sample of households, in which each sample ward the list of houses was obtained and such total was

divided to the number of sample of households assessed in each ward and the rate of kipping was obtained. For example, for the case of Soweto had the total number 5233 houses such population was divided into the sample of 23 household of such ward as it was 227 skipped intervals, hence the systematic technique was followed where one household was selected randomly from first house and 226 households was to be skipped. For the case of Miembeni ward 15220 household heads was divided to 68 sample of households, and the skipped interval was 223. Also, for the case of Mawenzi ward 1770 households was divided to 8 sample of households, of the respective wards and the skipped interval was 221.

#### **3.4.7 Sampling of Key Informant**

The key informant was sampled using the purposive sampling, where such key informants were selected basing on the knowledge, experience and awareness of the study problem in the study area. Hence the key informants included WEO and Moshi

Municipality water supply and sanitation officer from (MUWSA) and was employed the presumed social that exists between members of the targeted population to build a sample. So attained the detailed information about the study.

### **3.5 Data Types and Source**

Both primary and secondary data collected was used to gather the information for the study, qualitative and quantitative methods involved questionnaire, in depth interviews and observation employed in obtaining information for the impacts of population growth on water supply in Babati district

#### **3.5.1 Primary Data**

The primary data that involved in this study for the issues of impacts of population growth on water supply to the surrounding community. Systems of water supply and distribution the challenges they have been experience of water scant, and measures that should be taken to improve water supply system in the study area. Such primary data obtained from three selected ward of Soweto, Mawenzi and Miembeni (households and WEO) and from the water supply and sanitation (MUWSA) through the application of techniques of primary data collection as follows.

Apart from primary data source also secondary data was used to get information example official documents, internet, research report books, and published journals like magazine and newspapers, these data that collected by the researcher from the field serve vital in bringing the answers to the research objectives and research questions.

#### **3.5.2 Secondary Data**

Secondary data as one which have been already collected and analyzed by someone else, hence this study acquired the secondary data material from both document data available in offices of MUWSA on the distribution and water system to the people of Moshi Municipality and wards offices. For material like of census, organizational records and data which already collected through the qualitative methodologies. And other secondary data obtained from journals of water supply, government records from government surveys and other statistical reports for the sake of providing

information about the impacts of population growth on water supply to the surrounding community.

### **3.6 Data Collection Techniques/Methods**

#### **3.6.1 Structured Interview**

For the sake of this study structured interview was used which involved the creation of questionnaires, a similar set of structured question was prepared by the researcher in the format of English language concern the research topic for the target population, as such include the households residing in both Mawenzi, Miembeni and Soweto wards. The interpretation of prepared questions was awarded by the researcher to the respondents who was not be able to understand the language which used in such questionnaires. On the other hand, structured questions helped to provide information on the status of the variables under the investigation in the study area base on the impacts of population growth on water supply to the surrounding community. Moreover, it becomes possible to check on the reliability of a response by asking them question differently and at different stages of the interview. In this method the questions were asked to the respondent in order to get wide information. Researcher used written questionnaires to collect the information because written questionnaires is convenient, low cost, minimum staff time required, easy to administer, so quick, no interviewer bias and large outreach.

The questionnaire was used as a tool for collecting and recording information about this study. It is mainly made up of a list of questions, which included clear instructions and space for answering and administrative details. It has definite purpose that related to the objectives of the research, and clear from the outset how the finding was used. And they used as structured or closed questionnaire for the collection of the most of quantitative data and unstructured or open questionnaire was used for the collection of the most qualitative data.

#### **3.6.2 In- Depth Interview**

In-depth interview was conducted during the study by asking questions orally and record respondent answers. Researcher collected the information that receive from

the respondent about the study that were provided insight into the nature of social reality, Researcher was understand their feelings and attitudes more clearly, and seek for additional information wherever it necessary. In- depth. Interview also provided a guard confusing items. If a respondent has misunderstood a question, the in -depth interview can clarify.

For the sake of this study the in-depth interview was carried by the researcher to the respondents in gathering first-hand information from the study area particular in Soweto, Mawenzi and Miembeni wards. Before conducting a research interview guided prepared concerning the research topic, the in- depth interview was included executive officers of both three wards and Water supply and sanitation from (MUWSA) The in-depth interview conducted within 10 to 15 minutes for each participant, the information that provided during in- depth interview was recorded by the researcher using a note book. However, the in-depth interview helped a researcher to obtain accurate information from the respondents.

### **3.6.3 Observation**

In this study direct field observation used and it takes the non-participatory observation, on the real conditions of the informal settlements' growth in the study area and the extent of controlling it. The method enabled a researcher to gain first-hand information concerning informal settlement growth and its management strategies under the implementation of the urban land use policies. Information obtains during field observation in the study area collected through taking a record as well as capturing of image.

### **3.6.4 Documentary Review**

Secondary data was obtained from various secondary sources such as mainly publications, internet sources, journal, and articles, academic this, organization departmental reports or official documents, library materials, literatures and reports. This method requires critical analysis and citation of the secondary data sources to be reviewed. Secondary data sources enabled the study to obtain information about the impacts of population growth on water supply to the surrounding community. Secondary data resource is also instrumental in the development of the field survey

questionnaire and in provided further evidence to analyze and explain data findings from the field.

### **3.7 Data Analysis and Presentation**

Analysis of data is a process of inspecting, cleaning, transforming, and modeling data with the goal of discovering useful information, suggesting conclusions, and supporting decision making both quantitative and qualitative data was analyzed in the study, which included Statistical Package and Software System, data presentation and Microsoft excel.

### **3.8 Description of Data Analysis Procedures**

Data which obtained from, in-depth interview and from direct observation data as a qualitative data was in terms of Narrative and discourse analyses. Also, quantitative data from structured interview analyzed in terms of frequency; means and percentages by the help of computer software called International Business Market Statistical Package for Social Science (IBM SPSS) version 22. Furthermore, data analysis of Microsoft excel is going used as a cooperating tool for analysis of information, example data for ages, education status, time of residents in the area was analyzed by (IBM SPSS) version 22 also data for explanations on informal settlements managements strategies analyzed by Narrative and discourse analyses.

## **CHAPTER FOUR**

### **DATA PRESENTATION AND DISCUSION OF THE FINDINGS**

#### **4.0 Introduction**

This chapter presents and discusses the finding on the impacts of population growth on water supply in Moshi municipality. This chapter consists of various numbers of sections. The first section presents the demographic characteristics of the respondents including wards, gender, age, educational level, and size of households, time of residences and status of houses of respondents. The second section presents and discuss about the status and water distributions systems in field area, third section

presents and discusses the impacts of population growth on water distribution in study area, and last section presents and discusses the measures adapted to improve water supply in the study area.

#### 4.1 Demographic characteristics of respondents

The demographic information of the respondents including Wards of residence, origin of the respondents, size of family members, gender, age, education level, residence time, and the status of the residence houses in Moshi municipality.

##### 4.1.1 Ward and Place of Origin of Respondents

The finding shows that 50.5% of respondents is indigenous and 49.5% is migrants where 8% are residents are from Mawenzi ward, 68 % of residents are from Miembeni ward and 23% of residents are from Soweto ward (Table 4.1). The study noted that higher number of respondents are originated from the study area and hence mostly are using local sources of water supply. This implies that the study attained clear and relevant data from indigenous residents whom have wider knowledge about the impact of population growth on water supply in the study area.

**Table 4. 1:** Ward and Place of Origin of Respondents

| Ward     | Origin     |         | Total | % Percentage |
|----------|------------|---------|-------|--------------|
|          | Indigenous | Migrant |       |              |
| Mawenzi  | 4          | 4       | 8     | 8.1          |
| Soweto   | 35         | 33      | 68    | 68.7         |
| Miembeni | 11         | 12      | 23    | 23.2         |
| Total    | 50         | 49      | 99    | 100          |

Sources; Field Data (2025)

##### 4.1.2 Household Size and Educational Level of Respondents

The finding shows that 18.18% of respondents they have informal education, 35.35% they have primary education, 25.25% they have secondary education and 20.20% they have university education (Table 4.2) However, the majority of respondents about 15% have primary education found in 5-9 household size, hence the finding

noted that having the large number of household size implies the increasing of water demands

**Table 4. 2:** Household Size and Educational Level

| Household size | Education level |         |           |            | Total | %Percentage |
|----------------|-----------------|---------|-----------|------------|-------|-------------|
|                | None            | Primary | Secondary | University |       |             |
| 1-4            | 3               | 15      | 9         | 5          | 32    | 32.3        |
| 5-9            | 5               | 12      | 14        | 6          | 37    | 37.4        |
| 9 and above    | 10              | 8       | 3         | 9          | 30    | 30.3        |
| Total          | 18              | 35      | 26        | 20         | 99    | 100         |

Sources; Field Data (2025)

#### 4.1.3 Gender and Age of Respondents

The findings shows that 19% of the respondents Have 15-25 age, 25% of the respondents have 26-36 age, 17% of the respondents have 37-47 age, 20% of the respondents have 48-58 age, and 16% Of the respondents have greater than 59 age where 49.5% are male and 50.5% are female. The study noted that number of females is larger than number of males which indicates that the life expectancy of male is low than female and there is high number of youths in the study area. This implies that the higher number of people in the study area were female they unable to pay water services bringing challenges on water supply to the area.

**Table 4. 3:** Gender and Age of Respondents

| Gender | Age   |       |       |       |              | Total | %Percentage |
|--------|-------|-------|-------|-------|--------------|-------|-------------|
|        | 15-25 | 26-36 | 37-47 | 48-58 | 59 and above |       |             |
| Male   | 13    | 16    | 6     | 8     | 6            | 49    | 49.5        |
| Female | 6     | 10    | 12    | 12    | 10           | 50    | 50.5        |
| Total  | 19    | 26    | 18    | 20    | 16           | 99    | 100         |

Sources: Field Data (2025)

#### 4.1.4 Time of Residence of Respondent

The findings shows that 20% of residents dwells the area below 5 years, 25% of residents dwells the area within 5-10 years, 18% of residents dwells the area within

10-15 years and 37% of residents dwells the area between 16 years and above (Figure 4.1). The study notified that majority of the household heads resides the area for 16 years and above as they were not likely to migrate from one place to another. Having interviewed such kind of respondents in a wider context empowers the study with accurate information with regard to impact of population growth on water supply as respondents have wider knowledge of the study.



Source: Field Data (2025)

#### 4.1.5 Status of House of the Respondents

The findings in shows that 48.5% of respondents were living in formal settlements and 51.5% of respondents were living in informal settlements (Figure 4.2). The study noted that majority of residents were living in informal settlements due to several factors of inability to access formal settlements. This implies that most of the community people were suffering from inadequate water supply.

**Table 4. 4:** Status of House of the Respondents

|          | F  | %     |
|----------|----|-------|
| Formal   | 48 | 48.5  |
| Informal | 51 | 51.5  |
| Total    | 99 | 100.0 |

Sources. Field Data (2025)

The findings about availability of water supply challenges were also supported by the interviews from the key informants as narrated below,

*“Population is increasing faster compare to the water available hence water demand increases which will lead to insufficient water supply to the people”*

Source: Field Survey (2025)

## 4.2 Availability and Water Supply in the Study Area

This part present and discuss the findings pertaining to sources of water in the study area, water supplying condition, household daily water consumption and status of water demand.

### 4.2.1 Sources of Water in the Study Area

The findings shows that 50.51% of the respondents obtain water from river as their water source Likewise 27.27% of the respondents sampled are supplied with water by the water agency (MUWSA) and 22.22% of the respondents get water from other sources like rainfall, wells and springs (Table 4.5). The findings noted that the majority of respondents do not get water from MUWSA, this implies that a big number of respondents in the study area were not connected to the system hence they obtain water from other sources as their source of water supply. However same information was given by Ward Executive Officer (WEO) that water supply system is a major challenge since most of the respondents were not connected to the systems.

**Table 4. 5:** Various Source of Water in Ward

| Source of water | f  | %     |
|-----------------|----|-------|
| MUWSA           | 27 | 50.51 |
| River           | 50 | 27.27 |
| Other sources   | 22 | 22.22 |
| Total           | 99 | 100.0 |

Source: Field Data, March (2016)

#### 4.2.2 Water Supplying Condition

Data obtained from the study area indicate the condition of getting water services where 17.17% of the respondents paid 1000-5000tsh per month,34.34% of the respondent paid 5000-10000tsh per month,31.31% of the respondents paid 10000-15000tsh per month and 17.17 % of the respondents do not pay water services. The study noted that majority of the respondents obtain water from other sources such as river, wells and springs that are not safe for human consumption because they cannot afford to buy safe and clean water from MUWSA and they experience challenge of insufficient water supply during the summer season, this implies that most of the payment services were for those who obtained water from MUWSA they pay water services per month where the charges depends on household size where large population experience challenges of high water bill due to the increasing water demand for domestic use. The situation impact directly people's livelihood and explains the dissatisfaction of the poor on water supply services.

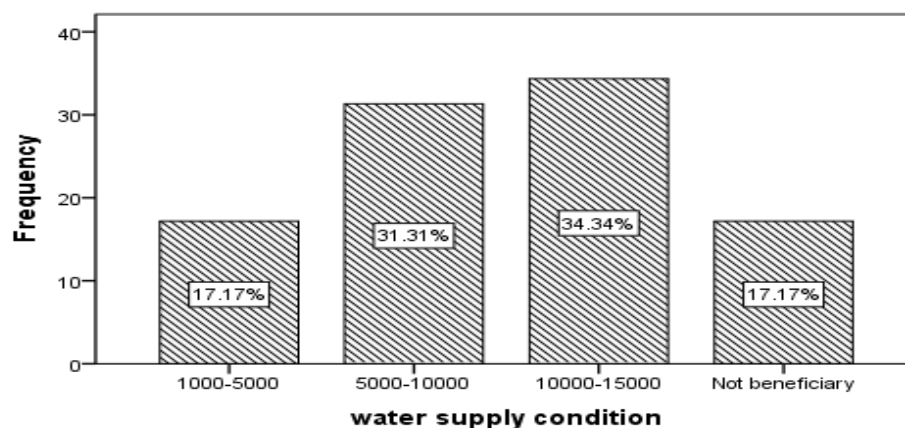


Figure 4. 2: Water Supply Condition

Source: Field Data (2025)

#### 4.2.3 Household Daily Water Consumption

The findings showed that 22% of the respondents consume 0-50 liters per day, 35% of the respondents consume 50-100 liters per day and 43% of the respondents consume 100 and above liter per day, The study noted that the majority of respondents consume more than 100 litres per day, this implies that having the large number of household size increasing water demands. The study is also related to the study of (Elliot, 2012) supported that the higher number of people in the household

as a major challenge of water supply among the individual due to the increasing water demands in the large population.

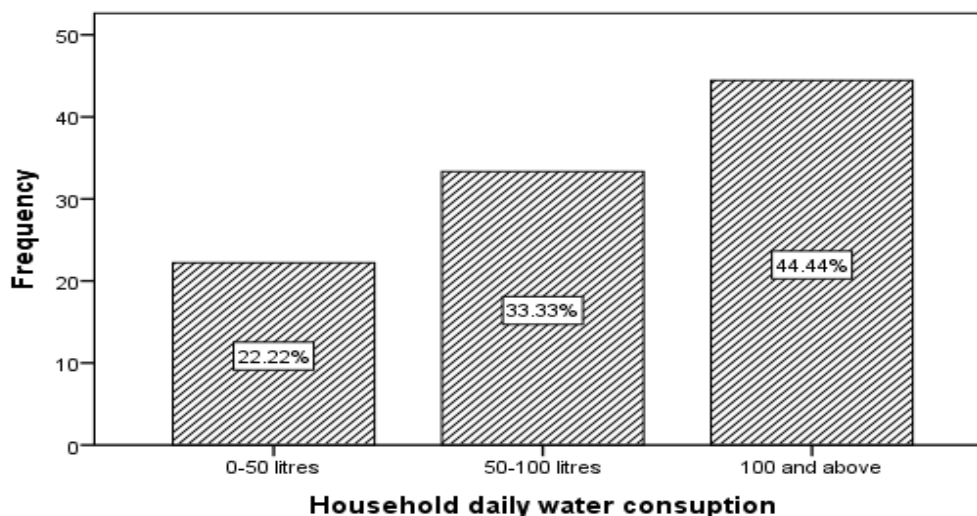


**Figure 4. 3:** Consumption of Water per Day

Source: Field Data (2025)

#### 4.2.4 Status of Water Demands

The findings showed that majority of the respondents about 88.9% agreed that population growth increase water demands and 12% of the respondents disagreed the population to be in state if increasing. The findings noted that MUWSA do not satisfies people's needs therefore they were forced to use other sources of water in order to meet their needs, this implies that population growth lead to insufficient water supply. The finding is also related to the study of (Aller, 2013) supported population growth reduces the supply of qualified water due to the increasing of domestic waste generation. The findings were also supported by the interview with water supply officer as follow,

**Table 4. 6:** Status Water Supply Demands

|          | F  | %     |
|----------|----|-------|
| Increase | 88 | 88.9  |
| Decrease | 11 | 11.1  |
| Total    | 99 | 100.0 |

Source: Field Data (2025)

### **4.3 Challenges of Water Supply in the Area**

These sections discussed and present the findings about population increase, destruction of water supply infrastructure, lack of reliable water supply, insufficient water supply infrastructure and low level of income.

#### **4.3.1 Population increase**

The findings shows that about 37.37% of respondents replied that increase in population to be the prominent factor for the inefficient water supply to the community in the study area, as the study noted the population increase to increase the demand of water for the emerging population in the study area as the consumption of water is likely to increase for the same sources of water as the result water services is inefficiently provided to people. The information goes similarly with the data given by the ward officer whom stated that the increasing population is enlarging the pressure on the uses of water while the sources of water for MUWSA is stagnant which retards the development in water supply. Furthermore, the study concurs the study of Kentucky (1999) whom sated the same concept that having fast growth of the population results into poor access of social services like water, education and health to the community of such geographical area.

#### **4.3.2 Destruction of water supply infrastructure**

The study found that 27.27% of respondents commented on the destruction of water supply infrastructure by the community surrounding them to the intermediate factor constraining the improvement in the water supply service at the study area. The study under observation noted the stealing of water valves and water meters as well as destruction of the water pipelines for the sake of illegal connections of water to the residential of people whom are not willing to pay for water services of MUWSA. However, the information concurs the narration from the water supply officer whom stated the stealing of water supply equipment and failure to connect to the main water supply pipeline legally drawback the development of water supply services at the study area. Furthermore, the findings go similarly with the study of Syonga (2023) whom stated the same idea that community is likely to destruct the

government infrastructures established for the case of improving social services like water service which results into poor social services.

#### 4.3.3 Lack of reliable water supply

The findings shows that 21.2% of respondents agreed the presence of reliable water and 78.8% argued against the present of reliable water at the study area (Table 4.7:)

The study noted that larger number pressure on the increase of population at the study area it affects the process of timely supply of clean and safe water to people as it noted the condition of releasing water to the residential while smelling of treatment chemicals and also noted the absence of water to some area regardless of being connected to water supply system of pipeline for MUWSA as well as decrease in water sources volume of River Karanga resulting from climatic changes which impacted a lot of timely water supply to the community. As the data goes similarly with the information given by the ward officer whom stated that now day's water in decreasing in terms of volume at the sources of water due to climate change as it reaches a time water is not timely supplied to some areas. The findings also go similarly with the study made by (Kathleen, 2010) whom stated that the world is suffering inefficient water due to the increasing climate change which reduces the volume of water and result to several families to lack the access of quality water in sub-Saharan Africa.

**Table 4. 7:** Lack of reliable water supply

|                       | F  | %     |
|-----------------------|----|-------|
| Water is reliable     | 21 | 21.2  |
| Water is not reliable | 78 | 78.8  |
| Total                 | 99 | 100.0 |

Source: Field Data (2025)

#### 4.3.4 Insufficient water supply infrastructure

The findings shows that 35.35% of respondents replied the insufficient of water supply infrastructure to the major constraint which faces the process of supplying clean and safe water to the communities at the study area. As the study noted the lacking of water valves in the main pipeline system of MUWSA also noted the

presence of communities at the study area whom they are not connected to the water supply system of MUWSA due to lacking of infrastructures like pipeline to connect them to the central channel of water supply. However, the information given by water supply officer stated the same issue that MUWSA fails to connect the whole community in the pipeline system as it suffers from insufficient capital to expand such infrastructure to the communities which are not yet connected. Furthermore, the findings concur the study done by (Rio, 2009) whom stated that insufficient infrastructures is the major problem that faces the poor communities which results to face the problem of lacking to access to social services like water, health and electricity.

#### **4.3.5 Low level of income**

The finding shows that about 42.32% of respondents agreed for the lower income access to people to be the major problem which is hindering the process of water supply at the study area. As the study noted the presence of wider range of people whom were not capable to pay for the water service which is provided by MUWSA hence results to lower access of capital for MUWSA to improve their water service as well as limiting the community to access the service of water. However, the information concurs to the data given out by the ward officer whom stated that people are living lower living standard as the result they fail to pay for water services for MUWSA. The findings also go similarly to the study undertaken by (Kentucky, 1999) whom stated that community services fail to be expanded due to the fact that community fails to pay for the services established in the given geographical area.

The findings about challenges facing water supply challenges were also supported by the interviews from the key informants as narrated below,

Narrative from WEO

*"Population in Moshi Municipality is increasing every day due to different reasons such as tourism, migration, employment opportunities and birth rate. The demand of water is increasingly by 80% due to population growth and also it limits the amount of water available per person"*

Source: Field Survey (2025)

Narrative from Water supply officer

*"A major impact driven by the increase of population on water supply includes pollution of water bodies through human activities of both industries, domestic activities and agriculture activities increasing water usage destructing water supply system insufficient water supply to the community".*

Source: Field Survey (2025)

#### **4.4 Measures to Improve Water Supply in the Study**

This section presents and discusses the measures taken to improve water supply in the study area, participation in planning of community water supply in the area, harvesting rain water, drilling of wells and committee for water supply planning and management.

##### **4.4.1 Participation in Planning of Community Water Supply in the Area**

The findings shows that 25.3% of the respondents said they participate in planning of community water supply and 74.7% of the respondents do not participate in planning of community water supply in the area. The study noted that the majority of the respondents do not participate in the planning of the water supply in the area as there was no any programme which facilitates the community ideation towards water supply planning at the study area, the data concur the information given by the water supply and water planning authority whom stated that that the local community do not provide their views concerning the planning of community water supply and the process of improving water supply in the community at the study area. This finding is also related the study of (Kathleen, 2010) whom stated that local community participation in decision making process helps in improving the community services however the government fails to recognize community participation in higher extent

Table 4.8 Participate in Planning of Community water supply in the Area.

##### **4.4.2 Harvesting rain water**

The finding shows that 42.42% of respondents replied the mode of harvesting rain water to be the efficient method for ensuring the availability and sufficient water at the study area. However, the study noted some of the communities to be setting the

rain water capturing system around their houses also they own plastic tanks for storing such captured rain water but such communities with the given system of rain water harvesting was small in number. As the information goes similarly with the data given by the water supply officer whom stated that community lacks the knowledge on the exploitation of rain water as they fail to access water when water is not supplied from MUWSA. Still the findings concur to the study made by (Mosi (1996) whom stated that community should harvest the rain water as one of the prominent strategies for the ensuring the efficient access of sufficient water among communities.

#### **4.4.3 Drilling of wells**

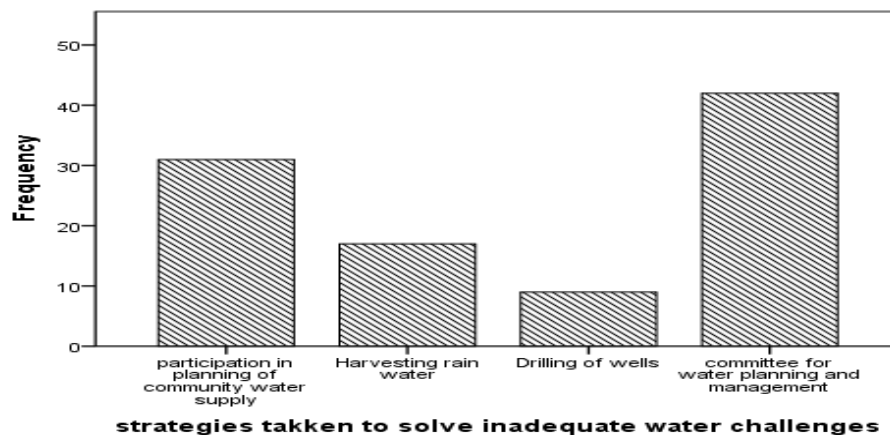
The findings shows that 31.31% of respondents agreed the approach of drilling wells to be the prominent strategy for ensuring sufficient water for different communities at the study area. The study noted the presence of small number of wells which was already placed in the community for ensuring water service at the study area but the wider number of people proposed for the establishment of wells for ensuring sufficient water among communities with the respect to reduce pressure in the consumption of water from MUWSA water supply system. However, the findings went similarly with the information from the ward officer whom stated that drilling of wells ensures sustainable water access for the community as they are likely to release water for the whole time. Furthermore, the in formations given goes concurrently with the study undertaken by (Kentucky, 1999) whom stated that wells is likely to favor to community which is likely to suffer from the problem of access to clean and safe water sufficiently.

#### **4.4.4 Committee for water supply planning and management**

The findings shows that 38.4% of respondents replied the presence of the committee which deals with the water planning and management and 61.6% of respondents replied the absence of committee which deals with the planning and management of water supply (Figure 4.). The study noted the presence of the Ward development Committee (WODC) which is likely to deal with planning for the development programme and projects for the wards including development plans for water supply

services. The in formations goes similarly with data given by ward officer whom stated that the development programmes and projects for developing water supply services at the study area is discussed and undertaken by the ward development committee. However, the finding goes similarly with study made by (Aller, 2013) whom viewed the assistance of development committees in the given society to be more helper for the improvement of the community services.

Figure 4. 4: Strategies Taken to Solve Inadequate Water Challenges



Sources: Field Data (2025)

The findings about measures for solving water supply challenges was also supported by the interviews from the key informants as narrated below,

Narrative from WEO;

*"The strategies taken by MUWSA to improve water supply in Moshi Municipality is expansion of distribution line, construction of pumping station and construction of a storage reservoir (Mawenzi reservoir)."*

Source: Field Survey (2025)

Narrative from Water supply officer

*"The best measure for improving water distribution is increasing air valves in pipeline system, increasing different sources of water for MUWSA conservation and protection of water bodies to enhance the cleanness of water supplies efficient setting of water services price from MUWSA for the sake of benefiting even the lower income earning population in the community as well as improving water supply".*

Source: Field Survey (2025)

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