ASSESSMENT OF TAP WATER SCARCITY AND ALTERNATIVE WATER SOURCES USED AT HOUSEHOLD LEVEL: A CASE OF LUKOBE WARD, MOROGORO MUNICIPALITY, TANZANIA

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ABSTRACT

Water is essential to life because it heavily influences public health and living standard. However, many developing countries face severe challenges with the reliability of water supplies. Until now, water is unequally distributed throughout the world. The study assesses the tap water scarcity and alternative household water sources in Lukobe Ward. The study adopted cross-sectional research design. Mixed method approach was employed involving quantitative and qualitative data. Descriptive statistics and one-way Analysis of Variance (ANOVA) were used for quantitative data while qualitative data were subjected to content analysis. Data were collected from three streets, a household survey of 120 respondents, key-informant interviews (KIIs) and Focus Group Discussions (FGDs). The findings from household survey show that (100%) of the respondents depended on buying water from vendors, (63.1%) depended on fetching water from private sources, (61.1%) use shallow wells and (100%) use harvested rainwater. Further, 81.5 were the mean litres obtained per households per day. In addition, the findings showed that there was no significant difference in litres of water that was gained among the three streets per household per day (f=2.335) and (p=0.101). However, there was a significant difference in litres of water from shallow wells and water from vendors gained between Lukobe Juu and Mgudeni streets (p=0.035). Furthermore, findings showed that the distances from households to water sources were significantly different (f=19.965) and (p=0.000) among streets. While, the overall mean distance from a household to a water source was 633.45 metres with a standard deviation of 1015.77 metres. However, there was no significant difference in distance used between Lukobe Kambi Tano and Lukobe Juu streets (p=0.0581). Additionally, the findings showed that more than 50% of the respondents among streets in the study area purchased water which spent 400 Tshs per 20 litres of water per day from water vendors.

The average proportion of respondents reported the need of up to 5 buckets (100 litres) of water per day which costs 2 000 Tshs per day. Therefore, the households were expected to spend 60 000 Tshs per month implying that 720 000 Tshs was spent per year as costs of buying water. However, the water requirements and the associated costs mainly depended on the size of the households. Moreover, findings showed 60.0% of male respondents spent less than 60 minutes for fetching water than female respondents (58.1%). In addition, findings further showed that 89.5% and 95.4% of the respondents agreed on two statements: poor water supply leads to poor households sanitation and long distance to water points delays other economic activities. Until now, ensuring access to water within 400 metres to domestic water sources by the majority of household is not yet to be achieved in Lukobe Ward. Majority of respondents depend much on water from vendors, use shallow wells and private water sources from neighbours as their alternative water sources for domestic uses. From the findings, it is recommended that in line with the 2002 National Water Policy, the beneficiaries in the peri-urban areas should be encouraged to manage and run the water schemes in partnership with the private sector for sustainable water service delivery in the area.

DECLARATION

I, Frank Bethuel Uhagile, do hereby declare to the Senate of Sokoine University of Agriculture that the work presented is my own and has not been submitted for a higher degree in any other University.

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The above declaration is confirmed by

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May God bless you all infinitely.

DEDICATION

This dissertation is dedicated to my beloved parents, Bethuel Uhagile and Atumalye Kavavila, to my siblings Grace Uhagile, Vivian Uhagile and Neema Fute and lastly to my young brothers Miguel (Manyire), Ethan (Mteule Jr) and Eden who gave me will and reason to fight and progress in life. This one is for you.

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LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
FAO	Food and Agriculture Organisation
FGD	Focus Group Discussion
GT	Game Theory
Hh	Household
ICF	Inner City Fund
JMP	Joint Monitoring Programme
KII	Key Informant Interview
MDG	Millennium Development Goal

MORUWASA	Morogoro Water Supply and Sanitation Authority
NAWAPO	National Water Policy
NBS	National Bureau of Statistics
NWP	National Water Policy
PHC	Population and Housing Census
SDG	Sustainable Development Goal
SPSS	Statistical Package for the Social Science
SWAp	Sector Wide Approach program
UN	United Nation
UNICEF	United Nations Children's Education Fund
URT	United Republic of Tanzania
WHO	World Health Organisation
WRMA	Water Resource Management Act
WSDP	Water Sector Development Program
WUP	Water Utility Partnership

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

By 2025, it is projected that 1.8 billion people will be living with absolute water scarcity, and two-thirds of the world's population could be living under water stressed conditions (UN-Water, 2007). Another report projects that by 2030, water demand will exceed supply by 50% in most developing regions of the world (Negoianu and Goldfaid, 2008). In fact, the climate changes act as a changing pattern of weather and water around the world (https://www.worldwildlife.org). Nearly 51 per cent (300 million people) in sub-Saharan countries lack access to a supply of safe water and 41 per cent lack adequate sanitation (WUP, 2013). This is almost half of the total global population without access to improved drinking water in Sub-Saharan Africa. However, limited access to clean and safe water associated with poor water supply, hygiene and sanitation at household level widening the poverty gap, gender inequalities and the prevalence of water-borne diseases (Cecilia, 2014).

In Sub-Saharan Africa various empirical studies have documented the inability of cities to provide satisfactory water as basic urban services to the rapidly growing populations (Abubakar and Doan, 2010). According to WHO, two out of every five persons in Sub-Saharan Africa do not have access to safe drinking water and seven out of ten are using unimproved means of sanitation (WHO, 2012). This trend is influenced by different factors. For instance, Garduno (2011), reports that 97% of the accessible freshwater in Sub-Saharan Africa countries is groundwater sources. Until now, the importance of coping strategies is recognised in many Sub-Saharan Africa countries. Normally people use drilled shallow wells, dug or deep wells as their coping strategies for tap water

scarcity to access groundwater resources. Literatures reveal that the diminishing water is enhanced by a number of factors including human population, urbanization and industrial development (Kashaigili, 2010; URT, 2012).

In Tanzania, the “access to water” by the definition of Sustainable Development Goal number 6; to ensure availability and sustainable management of water and sanitation for all by 2030 with the target of achieves universal and equitable access to safe and affordable drinking water for all by 2030 will aggregate this problem. Hence, access to safe drinking water and sanitation is a global concern. Therefore, to monitor progress with this goal, the UNICEF Joint Monitoring Programme (JMP) defines access to safe water as “proportion of population using an improved drinking water source” (UNICEF, 2012). Yet, failure of water services access in Tanzania is a longstanding reality. In fact, Tanzania faces difficulties privatizing urban water utilities (Nganyanyuka *et al*., 2014). For instance Pigeon (2012) found that the private management of city water supply in Dar es Salaam did not improve service delivery. Later, Smiley (2016) asserts that Tanzania water staging is unjust, inequitable, and uneven. However, the UN has recognized access to water and sanitation as human rights (WHO, 2012). Although, citizens use groundwater sources as their coping strategies that used for over 25% of water for domestic purpose, agriculture and sustaining ecosystem (Water Resource Group, 2014).

In Morogoro Municipality, MORUWASA was given autonomy in response to 1991 National Water Policy, were it had to ensure water supply. Later, to address the problem of water scarcity, the Tanzania government launched the National Water Policy in 2002. In Water Policy one of the basic issues addressed is improvement in delivery of water and sanitation services in low-income urban and peri-urban areas. Yet, the national water

policy (2002), water demand in urban areas is increasing at a rate, which is not proportional to the rate of expansion of water supply and sewerage services. According to Uisso (2013), fresh water available in Morogoro Municipality alleged to be diminishing because of the poor water supply system. In the other hand, MORUWASA had poor performance in supply water service whereby some areas face insufficient connection on tap water though, the scarcity of safe and clean water supply in Morogoro Municipality is due to limited capacity of MORUWASA (Ikula and Rwegasira, 2016).

1.2 Problem Statement

In Morogoro Municipality, Lukobe Ward is among the areas affected by inaccessibility to clean water where there is a wide gap between the demand for water and supply, and this is mainly due to inadequacy of tap water due to poor performance in supply water service and population increase (Santos *et al.*, 2017). Consequently, people use unsafe water, possibly exposed to water related health risks, hereby, Ikula and Rwegasira, (2016) assert that episodes of cholera in Morogoro Region occurred between 2015 and 2016 which affected 585 people of whom 88% were from Morogoro Municipality. A number of studies have been done to address the provision of water services in Morogoro Municipal and outside the area. For example, Kapinga (2015) did a study on accessibility of domestic water supply in Sangasanga, Lubungo and Mafuru villages in Mvomero District; Maro (2015) did a study on client perception on the level of water service delivery in Morogoro Urban; Rugemalila and Gibbs (2015) focused on urban water governance failure and local strategies for overcoming water shortages in Dar es Salaam, while Nthenge (2016) focused on challenges in delivery of water services and coping strategies in selected sites of Makueni County in Kenya.

However, literature lacks information on tap water scarcity problem for Morogoro Municipality, while such information is very useful when formulating strategies for addressing tap water scarcity problem. Due to the scarcity of tap water, Lukobe Ward households have been relying on various other water sources such as rain water and purchase from water vendors. However, it is not known empirically regarding the extent to which those alternative water sources suffice households' water needs. Yet, understanding the households' perception on performance to services related to water sources is necessary. In light of this, the study sought to answer the following questions (i) how do households of Lukobe Ward survive with unsatisfactory delivery of the tap water service? (ii) What is the extra water sources used in order to address the tap water scarcity problem at household level? (iii) to what extent is Lukobe, as a growing Ward, access alternative water sources? and (iv) what are the households' perception on the performance to services?

1.3 Justification of the Study

Tanzania, a typical developing country is struggling with huge problem of tap water connections to its people living in both urban as well as rural areas, although increasing access to safe water and sanitation is one of the Sustainable Development Goals (SDGs) that Tanzania along with nations worldwide adopted (UN, 2002; NBS and ICF, 2011). Since, the Tanzania Vision 2025 aims at achieving a high quality livelihood for its people and the specific target include "universal access to safe water". The study is in line with the implementation of various national and international policies, strategies, conventions and programmes such as the Tanzania's Development Vision 2025, which targets at increasing access to clean and safe water in rural areas to 90% and universal access in urban areas by 2025; Sustainable Development Goals number 6 which targets in access for Clean Water and Sanitation by 2015-2030 (URT, 2011).

In a nutshell, improvement in the urban water and sanitation services could contribute significantly toward achieving the Sustainable Development Goal number 6 by increasing the proportion of population with sustainable access to safe drinking water and attain a significant improvement in the lives of people. Moreover, doing this study is worth because it will lead to useful information based on alternative water sources on ascertain water sources that might support the success of SDG number 6. Therefore, this study will benefit both local communities and donors projects since the findings can be used to revise or create improved alternative water sources so as to reduce the extent of tap water scarcity problem at the household level.

1.4 Research Objectives

1.4.1 General objective

The general objective of this study was assessment of tap water scarcity and alternative household water sources in Lukobe Ward, Morogoro Municipality, Tanzania.

1.4.2 Specific objectives

i. To identify alternative water sources adopted and amount of water obtained by households in the study area;

ii. To explore accessibility on distance, cost and time to alternative water sources at the household level in the study area; and

iii. To determine households' perception on the performance of alternative water sources in the study area.

1.5 Research Questions

i. What are the alternative water sources adopted and amount of water obtained by households in the study area?

ii. How can households have access on distance, cost and time to alternative water sources at the household level in the study area?

iii. What are the households' perceptions on the performance of alternative water sources in the study area?

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Conceptusalisation of Key Concepts/Terms

2.1.1 Water supply

Water supply defined as provisional of water by public utilities, commercial organisations, community endeavours or by individuals, usually via system of pumps and pipes (WHO, 2004). The sources of water may include piped water within the dwellings, public tap, tube well, borehole, protected well and spring water (WHO, 2004; NBS and ICF, 2011). In terms of water supply there are basic needs which include access to safe supply of water for domestic use, meaning water for drinking, food preparation, bathing, laundry as well as cleaning. According to WHO domestic water supply is used for all domestic purposes which include drinking, cooking and bathing. Therefore, when determining adequacy of water in the household all such uses should be considered (Jalan *et al.,* 2009).

2.2 Water scarcity

Water scarcity refers to a lack of access to adequate quantities of water for human and environmental uses (Park and Seong, 2014). In terms of water scarcity there are insufficient available water resources to meet the demands of water within a certain area. And this is due to some factors hindering water supply services which include, the poor performance of the water sector include inappropriate water laws, lack of enough funds to invest in the sector of water supply, centralized system of water supply (Chang and Van Zyl, 2014).

According to Marandu (2009) lack of clean and safe water for domestic use can cause diseases like diarrhoea, typhoid, amoeba and cholera which consequently results into

several deaths and left some victims who cannot work to generate income. In a nutshell, water scarcity is still a challenging issue at the household level were the demand for water for human consumption is growing fast. Moreover, lack of access to water has greater impact on the poor affecting their livelihoods and health.

2.2.1 Causes of water scarcity in Africa

Some of the causes of water scarcity are described as follows

2.2.2 Climatic and environmental changes

Many countries in sub-Saharan Africa are under severe water stress. Climatic and environmental changes have considerably reduced freshwater quantity over the past 20 years (Jalan *et al.,* 2009). This exaggerates more the problem of water scarcity not only for domestic uses but also for agriculture as well as livestock production. Yet, there are some factors which may influence climatic and environmental change which are burning fossil fuel, deforestation, pollution etc.

2.2.3 Financial and technical factors

Water supply in Africa especially in Tanzania are in low coverage, poor service whereby some areas get supply once or twice a week whereas others do not get water for weeks. There are also frequent pipeline bursts because of the pipelines being old and leading to leakages which also affect the quality and quantity of the supplied water and no enough funds to repairs or change (Mihayo, 2000).

2.3 Urban water supply challenges in Tanzania

Urban areas in Tanzania are experience changes on space, population growth and economic development which in turn create high demand for reliable and adequate water

supply and sanitation services (Joseph, 2011). Yet, large part of urban population is living in unplanned areas with inadequate water supply and sanitation services. The population growth has negative impact on domestic water supply and sanitation if appropriate measures are not taken. Presently, only about 68% of the urban populations have access to reliable water supply services (Joseph, 2011). Moreover, water supply services in urban centres are beset with many problems, one of which is uncounted for water also known as non-revenue water. Unaccounted for Water is water that has been produced and is "lost" before it reaches the customer (URT, 2008). Apart from that, many areas of the dry central part of the country, water is so scarce that even water personal hygiene cannot easily be found (NWP, 2002). This coverage in the provision of safe water is undesirably low hence, the people, especially women and children, walk long distance to fetch water (Juma *et al.,* 2018).

2.3.1 Challenges in water supply services

There are several challenges facing the provision of water services in both urban and rural areas. The following are some challenges which common to both urban and rural areas as stated by Tibandebage and Maro (2009)

i. Inadequate supply of clean and safe water services, especially to poor households. Poor households in urban and rural areas continue to rely on water supplied by vendors and other unprotected water sources. This has broad implications on their well-being including being more vulnerable to water-borne diseases and even worse.
ii. Unreliable water sources. This is mainly due to seasonal fluctuations in the availability of water. Thus, water sources remain unreliable.
iii. Inadequate financing of the water sector. There are no enough funds to invest in sector of water supply. Therefore, adequate financing is needed for investments in water supply services.

2.3.2 Accessibility of domestic water supply at the Household level

Accessibility of domestic water supply influence hygiene and public health at the household level. Hence, poor accessibility of water supply is a factor of distance, time and cost used (Bartram, 2003). A domestic water supply can take different forms: a stream, spring, hand-dug well, borehole with hand pump, rainwater collection system, piped water supply with tap stand or house connection, or water vendors (Bartram, 2003). This domestic water supply the water used for indoor and outdoor household purposes (home activities) include drinking, preparing food, bathing, washing clothes and dishes, watering the yard and garden etc.

2.3.3 Sustainable water supply and Institutional framework

The Government of Tanzania further aligned its policy framework with the international processes through its National Water Policy (2002), the National Water Sector Development Strategy for 2006-2015, and the Water and Sanitation Act (2009). Those policy frameworks provided a starting point for water sector partners to work together with a common understanding of the sector needs and challenges as well as priority actions which were identified for achieving the MDGs (2015-2030) and which still relevant for the SDGs for Tanzania. Furthermore, in institutional arrangements for Water Sector Development Program (WSDP) has adopted a Sector Wide Approach program (SWAp) which incorporates all activities undertaken in the water sector in Tanzania.

To address the problem of water scarcity, the Tanzania government launched the National Water Policy in 2002. The overall objective of the National Water Policy is to improve health and alleviate poverty through sustainable improved access to adequate safe water and basic sanitation. In Water Policy one of the basic issues addressed is

improvement in delivery of water and sanitation services in low-income urban and peri-urban areas. Since 1961, the main objective of water policy in Tanzania is to improve water services to its people in order to achieve improved standard of living. In Tanzania, urban areas are experiencing rapid expansion whereby the population is growing at a rate of more than 6% per annum, which is exerting huge strain on the delivery of various services including water and sanitation services (NWP, 2002).

Moreover, the national water policy (2002), water demand in urban areas is increasing at a rate, which is not proportional to the rate of expansion of water supply and sewerage services; this is due to high rate of urbanization. Also, the impact of human activities on the environment has increased in recent years hereby water sources are constantly being polluted due to the disposal of untreated (NWP, 2002). Yet, the coverage in the provision of safe water is undesirably low. Therefore, the study aims to explore on the level of water service provision through alternative water sources adopted by the households and to what extent the water sources address the tap water scarcity problem at the household level.

2.5 Theoretical Framework

2.5.1 Game Theory (GT)

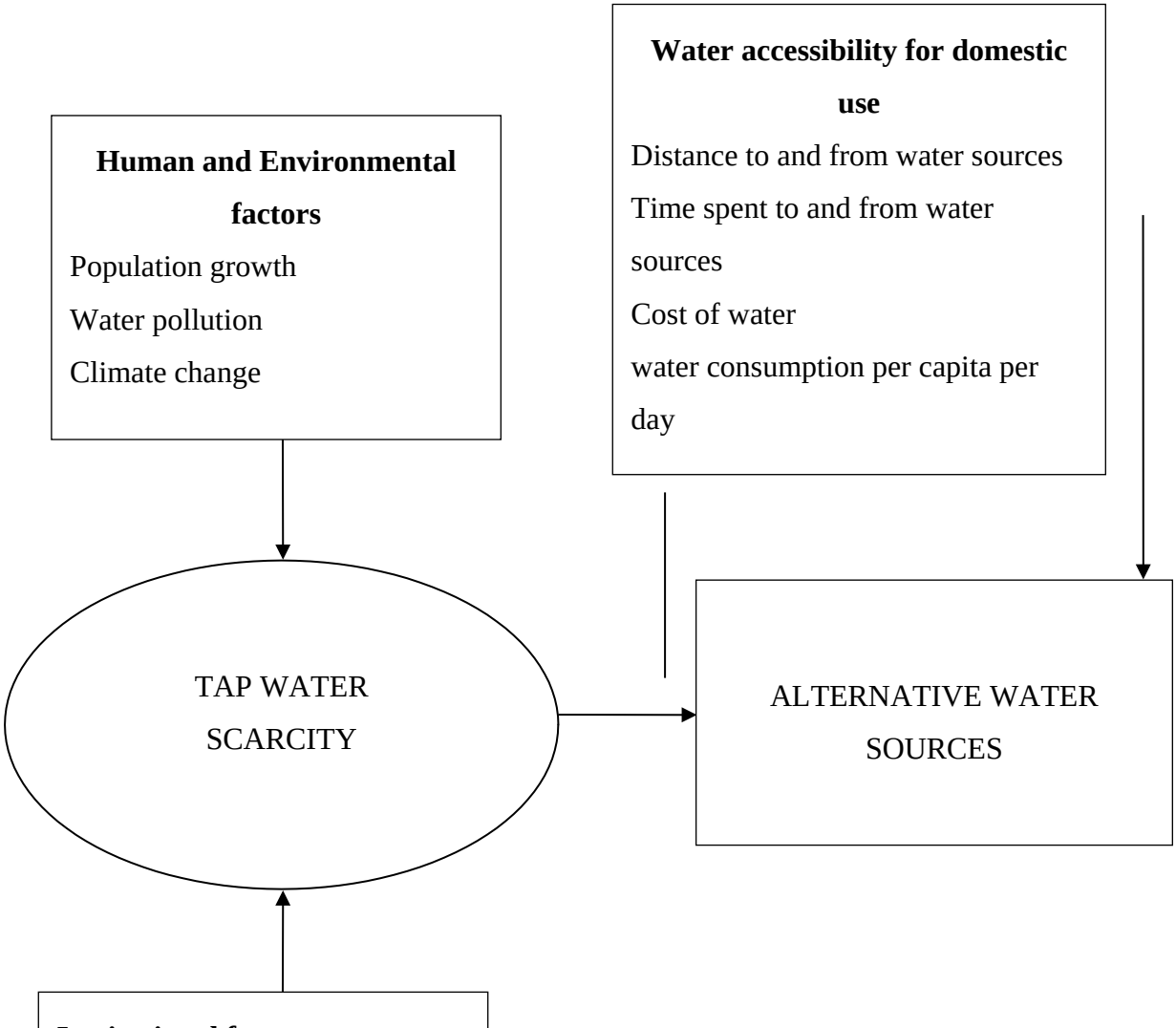
This study was guided by Game theory. Game theory gained popularity in 2011 and it is oriented on Water Scarcity and International Conflict in Africa. “Game theory is a mathematical framework for analysing the strategies of user a chance of winning and predicts possible outcomes of the game” (Madani *et al.*, 2011). Hereby, population growth accompanied by unsustainable human activities leads to overexploitation and pollution of freshwater resources (Steinbrueck, 2014). This is because growing population demand more water and sanitation for domestic uses. In Sub-Saharan Africa,

one of the most affected regions, it is estimated that 17 countries including Tanzania will have a water availability per capita less than 1000m³ per year in 2025, experiencing regular water scarcity (Madani *et al.*, 2011). Freshwater scarcity is increasing in all over the world and especially in Africa (Madani, 2010). However, all experts agree that water scarcity is raising and will have dramatic effects in the future. The theory applies on human factors can influence the rising of water scarcity hence; the alternative water sources can be recycled. The theory guided the study in analysed how households behave and make decision under water scarcity challenges and hence, households choose a certain source due to some factors like distance, cost and time.

2.6 Conceptual Framework

The framework shows a set of relationships between dependent and independent variables whereby alternative water sources are dependent variables and hence, severe challenges emanated from human and environmental factors along with institutional factors which cause tap water scarcity as independent variable.

Moreover, households have factors that influencing/declining accessibility to water for domestic use which are distances to and from water sources; time spent to and from water sources, cost of water as well as water consumption per capita per day hence influence the alternative water sources. Lastly, alternative water sources are directly related to level of access to water availability. The relationship between variables seeks to find the levels of access to water availability on relation to inadequate of tap water supply through alternative water sources.


Human and Environmental factors
Population growth
Water pollution
Climate change
Water accessibility for domestic use
Distance to and from water sources
Time spent to and from water sources
Cost of water
water consumption per capita per day
TAP WATER SCARCITY
ALTERNATIVE WATER SOURCES

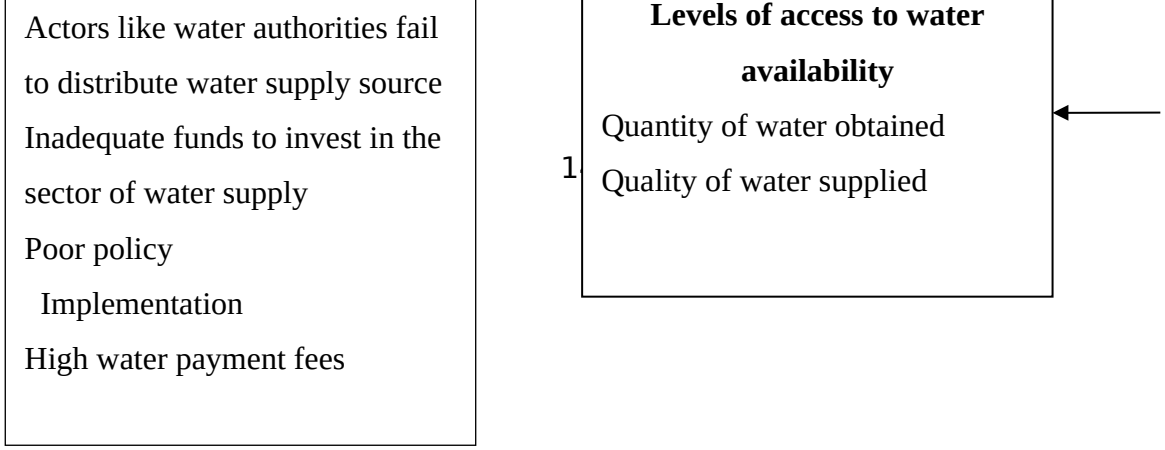


Figure 1: Conceptual Framework of the study

Source: Authors' construct, 2020

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Study Area

This study was conducted in Lukobe Ward, Morogoro Municipality. Lukobe Ward was chosen because of the insufficient connection and poor performance on public tap water supply system that widely perceived as the major cause of tap water scarcity. Morogoro Municipal lies between latitude $5^0$58" and 10^00" to the South of the Equator and longitude $35^0$25" and $35^0$30" to the East. The altitude lies on 495m above sea level, the climate is Tropical and temperature average 24.6^0C/76.3^0F (URT, 2004), moreover, the rainfall is around 935mm. Morogoro Municipal covers 260 square kilometres and it administratively divided into nineteen wards (URT, 2004). According to Tanzania's 2012 Population and Housing Census, Morogoro Municipality in 2012 had a total population of 315 866 people who included 151 700 male and 164 166 female (NBS, 2012). Additionally, according to Population and Housing Census report in 2012 the

population of Mgudeni ~~had 4~~had 4 430, Lukobe Kambi Tano had 1 621 and Lukobe Juu had 1 034 respectively.

3.2 Study Design

The study used cross-sectional research design, which allows data collection to be done at a single point in time (Pandis, 2014). Mixed method approach was employed involving quantitative and qualitative data. The first stage involved collection and analysis of qualitative data. Hence, key informant interviews (KIIs) and focus group discussions (FGDs) were used and guided by checklist and FGD guide respectively. The second stage involved collection of quantitative data through household survey using a structured questionnaire.

3.3 Study Population and Sampling Procedures

3.3.1 Study Population

The study's population targeted household heads (both male and female) in the study area. A household is defined as a person or group of persons related or unrelated who live together and share a common source of food (Coast *et al.,* 2010).

3.3.2 Sampling procedure and sample size

The study involved two sampling procedures which are probability and non-probability sampling. Probability sampling, simple random sampling was used involved household respondents based on various criteria including age of 18 years and above while for non-probability sampling, purposive sampling technique was used whereby it involved the selection of three streets which are highly affected by the tap water scarcity problem. The ward had poor performance in supply water service whereby some areas face insufficient connection on tap water (Ikula and Rwegasira, 2016). The streets were Lukobe Kambi

Tano, Lukobe Juu and Mgudeni. In each street, respondents were randomly selected at the household level making a sample size of 120 respondents. According to Bailey (1998) and Bartlett *et al.* (2001), a sample size of 30 respondents is said to be the minimum sample for data collection and proper because it allows statistical analysis for a reasonable conclusion.

3.4 Types of Data

The study collected primary data so as to adequately address the study's specific objectives.

3.4.1 Primary data

Primary data were collected on types of water sources adopted and used by households, amount of water obtained by household per day, households price paid for purchasing water, access to water in terms of distance, time spent to and from water sources and lastly, examined households' perception on the performance to alternative water sources in the selected streets.

3.5 Data Collection Method

3.5.1 Primary data collection

Primary data were collected by using household survey. Household survey guided by questionnaire, a questionnaire is an appropriate tool for collecting quantitative data in social science research (Kombo and Tromp, 2006). Generally, Household survey guided by questionnaire aimed to give information based on types of water sources used, amount of water obtained, households price paid for purchasing water, access to water in terms of distance, time spent to and from water sources and households' perception on the performance to alternative water sources.

Qualitative data were collected from each street. One FGD was conducted in each street making a total of three FGDs in order to get more in-depth information about water sources adopted and used by households and amount of water obtained by household per day. Each FGD comprised 8 participants. Women with the age range of 18-45 years were the criteria used to select FGD participants. In each FGD, women were more than 50%, the logic being the fact that, in the study area women are the most responsible to fetch water for domestic use. The information gathered during FGDs were mainly about sources, availability as well as quality of water used by households in the selected streets.

Three key informants were selected purposively from the three streets. The key informants were selected based on the fact that they were well informed and responsible for keeping all information related to alternative sources of water used and its access in the study area. In addition, The KIIs aimed to give information based on water sources available and quality of water used by households in the selected streets. Least of the data collected during the survey was attained using an index summated scale. The scale used to measure households' perception on the performance of the existing alternative water sources. Hence, the questionnaire was the major tool that was used to collect data that would answer the research on all the objectives.

3.6 Data Analysis

The study's quantitative data were analysed using IBM SPSS Statistics by computing descriptive statistics, an index summated scale to obtain frequencies and percentage distribution of the response and content analysis was used to analyse qualitative data.

3.6.1 Data analysis methods

3.6.1.1 Descriptive statistics and One-way ANOVA

Descriptive statistics were determined using IBM SPSS Statistics in order to explore the underlying features in the data. Descriptive statistics was used to analyse sources of water used, amount of water obtained by the households and time spent to and from water sources. One-way ANOVA was used to compare the amount of water obtained in litres between and among streets at households' level. In addition, descriptive statistics was used to describe the demographic variables of sample selected for the study.

3.6.1.2 One-way ANOVA

Access to alternative water sources was determined inferentially using one-way ANOVA to compare levels of access to water in terms of distance from home to water sources. This test is useful to compare mean difference on continuous variables for two different groups which are normally distributed (Pallant, 2007). In addition, the mean score and standard deviation of the responses was calculated. Furthermore, the mean score and standard deviation attained from the independent variables were aggregated so as to illustrate the general score of the distance used by households to find water.

3.6.1.3 Index summated scale

An index summated scale was used to determine the households' perception on the performance of the existing alternative water sources. Respondents were asked to indicate a degree of strongly disagree (1), disagree (2), neutral (3), agree (4), strongly agree (5) with each series of a statement.

3.6.1.4 Content analysis

Content analysis was used to analyse qualitative data by summarizing field data based on objective of the study. Qualitative information collected from KIIs and FGDs were summarized into themes, thus, information was categorized thematically. Subsequently, corroboration of the findings was used to link the study with latest relevant research studies. The reason for using this form of analysis, because the analysis makes replicable and valid inferences by interpreting and coding textual material.

CHAPTER FOUR

4.0 FINDINGS AND DISCUSSIONS

4.1 Respondents' Socio-economic and Demographic Characteristics

The findings presented in Table 1 show that 61.8% majority of respondents were female heads. The findings show that nearly half of respondents 48.4% were in the age range of 36-54 years. This implies that majority of the respondents were middle aged household heads. The findings show that more than half of respondents 68.7% were married. Out of married couples, 80.9% were from Mgudeni Street. This indicates that the married couples were many in number than singles and widowed. Furthermore, the findings show that 55% of the respondents were 4-6 family size households. This means that the mean number of persons per household was 4.4. This number is below 4.9 persons reported at the national level (URT, 2012). This implies that most respondents in their household lived in middle family size of less than seven family members. The findings show the respondents' education level, 58.1% of the respondents held primary education. This implies that majority of respondents had acquired basic education. Education is a major means of providing individuals with opportunity to achieve their full potential. This involves the ability of acquiring knowledge, skills, values and altitudes needed for various social and economic roles as well as for their all-around personal development (URT, 2000).

Furthermore, the findings show that 45.7% of the respondents depended on petty businesses as main source of income followed by 18.6% who depended on registered businesses. This implies that majority of the respondents were small scale business. Particularly, in line indicates that majority of the households in Tanzania depend in small scale business in supporting their livelihoods (URT, 2012). Moreover, the findings show that there variations in households income, the majority about 76.7% of the respondents

earned between 50 000-300 000 Tshs per month. The majority seems to earn lower income because has been engaged in non-agricultural activities like "*Mama lishe*" under women control because those activities were considered to be female activities.

Table 1: Respondents' Socio-economic and demographic characteristics (n=120)

Variables	Lukobe Kambi Tano	Lukobe Juu	Mgudeni	Total
Sex				
Male	14(35.0)	15(45.5)	16(34.0)	45(38.2)
Female	26(65.0)	18(54.5)	31(66.0)	75(61.8)
Total	**40(100)**	**33(100)**	**47(100)**	**120(100)**
Age (years)				
18 - 35	19(47.5)	12(36.4)	16(34.0)	47(39.3)
36 - 54	17(42.5)	17(51.5)	24(51.1)	58(48.4)
55+	4(10.0)	4(12.1)	7(14.9)	15(12.3)
Total	**40(100)**	**33(100)**	**47(100)**	**120(100)**
Marital status				
Single	9(22.5)	11(33.3)	5(10.6)	25(22.1)
Married	27(67.5)	19(57.6)	38(80.9)	84(68.7)
Widowed/widower	4(10.0)	3(9.1)	4(8.5)	11(9.2)
Total	**40(100)**	**33(100)**	**47(100)**	**120(100)**
Household size				
1-3	7(17.5)	10(30.3)	13(27.6)	30(25.2)
4-6	25(62.5)	17(51.5)	24(51.1)	66(55.0)
7-11	8(20.0)	6(18.2)	10(21.3)	24(19.8)
Total	**40(100)**	**33(100)**	**47(100)**	**120(100)**
Education level				
Informal	2(5.0)	2(6.1)	3(6.4)	7(5.8)
Primary	26(65.0)	15(45.4)	30(63.8)	71(58.1)
Secondary	8(20.0)	9(27.3)	12(25.5)	29(24.3)
Tertiary	4(10.0)	7(21.2)	2(4.3)	13(11.8)
Total	**40(100)**	**33(100)**	**47(100)**	**120(100)**
Hh/ head occupation	8(20.0)	2(6.1)	7(14.9)	17(13.7)
Agriculture	4(10.0)	8(24.2)	7(14.9)	19(16.4)
Employed	3(7.5)	11(33.3)	7(14.9)	21(18.6)
Registered business	22(55.0)	11(33.3)	23(48.9)	56(45.7)
Petty business	3(7.5)	1(3.0)	3(6.4)	7(5.6)
Homemaker	**40(100)**	**33(100)**	**47(100)**	**120(100)**
Total				
Hh/monthly income (Tshs)				
50 000-300 000	32(80.0)	29(87.9)	31(65.9)	92(76.7)
300 001-500 000	6(15.0)	3(9.1)	10(21.3)	19(15.8)
Above 500 000	2(5.0)	1(3.0)	6(12.8)	9(7.5)
Total	**40(100)**	**33(100)**	**47(100)**	**120(100)**

Note: Numbers in brackets are percentages; Hh=household

4.2 Water Sources used at Households' Level

The findings presented in Table 2 show that 100% of the respondents in all three streets purchase water from vendors and use of harvested rainwater. The study findings conform to those reported by Bourque (2010), the study found that, most of the households

receive water from vendors. Water vendors are informal household or individuals informally (sometimes illegally) reselling water from their utility water connections; also the study results conducted in Zimbabwe by Chaminuke and Nyatsanza (2013) of the Standard Newspaper reported that a number of households in Msasa Park and Dzivaresekwa have installed water harvesting. The households collect rainwater from their roof tops through the installation of tanks and other containers to collect the natural water. The benefits of rainwater harvesting include access to relatively safe, clean water at local points, and sustained water demands in times of precipitation failures.

The study findings also show that 63.1% of the respondents in all three streets buy water from private sources and others 61.1% of the respondents use shallow wells. The findings also show that mostly two streets used shallow wells which were Lukobe Juu (90.9%) and Lukobe Kambi Tano (77.5%). The study's finding is supported by the study conducted in Harare by Mangizvo and Kapungu (2010) who found that, residents have dug shallow wells from which they draw water for various uses. The study's finding is also consistent with the study by Starkey (2012) who reported that a solution being implemented in several parts of the world is digging wells to provide drinking water for a whole community. Wells are great resolution to the water crisis due to long-term benefits they provide to communities and not to individual people. The quotes below emphasize the above:

> "*…all the time we get water from our public wells. However, we get too few litres which do not suffice our household's needs while few others purchase water from vendors. Though*, the benefit of using *rain season lasts almost 6 months, from November to May so others save water in their tanks during rainy season…*" (Key informant from Lukobe Kambi Tano Street, 13th February 2020).

In the same vein, one informant from Mgudeni Street said:

> *"…we have no solution and we don't know when this problem will end. People tend to construct shallow wells around their houses for their daily domestic uses…"*

This implies that households consumed few litres that do not sufficed for their domestic use. Hence, there was no other alternative water sources for gained more water instead of public shallow wells. Yet this became as a challenge to the household members**.**

Table 2: Water sources used by households (n=120)

Water sources	Response	Lukobe Kambi Tano	Lukobe Juu	Mgudeni	Total
Water vendors	Yes	40(100)	33(100)	47(100)	120(100)
	No	0(0)	0(0)	0(0)	0(0)
Private sources	Yes	9(22.5)	22(66.7)	47(100)	78(63.1)
	No	31(77.5)	11(33.3)	0(0)	42(36.9)
Shallow wells	Yes	31(77.5)	30(90.9)	7(14.9)	68(61.1)
	No	9(22.5)	3(9.1)	40(85.1)	52(38.9)
Rainwater	Yes	40(100)	33(100)	47(100)	120(100)
	No	0(0)	0(0)	0(0)	0(0)

Note: Numbers in brackets are percentages

According to Coast *et al*. (2010), a household is defined as a person or group of people or those who share food, dwellings, other essential services and goods, and it is measured by the number of household members. In table 2, these findings deviate from the 2012 Population and Housing Census (PHC) report, which show that shallow wells were the main source of water in Tanzania (URT, 2012a). This relate to the study conducted by Starkey (2012) the study found that, currently, a solution being implemented in several parts of the world is digging wells to provide drinking water for the whole community. Hence, wells have been great resolution to the water crisis problem to most of the areas.

This indicates that apart from buying water from vendors and use of harvested rainwater, shallow wells were commonly used by the respondents as their private sources for various purposes. By definition, dug shallow wells are wells excavated and lined by human labour, usually by entering the well with a variety of hand tools. They may be as small as 80 cm diameter, and can range in depth from about five metres deep (Collins, 2010). However, Mvungi *et al.* (2009) quoted that "In Africa we have hundreds of millions of poor people in their area whom there is no alternative for other water sources".

In addition, coping with water scarcity means living in harmony with the environment conditions specific to and dictated by limited available water resources (Pereira *et al.,* 2009). However, uncertainties on shallow wells especially the public wells are not well protected even though the sources were observed as the main important sources for the households. The quote below emphasizes the above:

> "*Water from wells is not protected.* W*e get health problems due to unprotected groundwater sources. Our children are affected by typhoid but to others the risk is too low so we thank God for our health remains safe…"* (FGD participant, Lukobe Kambi Tano Street, 13th February, 2020).

Although Water Resource Management Act (WRMA) no 11 and 12 of 2009 directs that all groundwater sources have to be protected (URT, 2009). Generally, the public wells in terms of protection and hygiene were not well known by streets authorities. Thus, there is a possibility for users to get diseases such as typhoid and cholera.

4.3 Amount of Water Availability per Households per Day in Litres

Table 3 the findings show that majority of respondents 88.2% obtained 40-100 litres of water per households per day which were the equivalent of 3 buckets of water of 20 litres. However, this amount is low compared to the United Nations recommendations on the water poverty line suggesting that a sufficient amount of water is at least 50 to 100 litres per person per day (United Nation, 2012; Akoteyon, 2016). Thus, the amount of water used at the household level in the study area did not meet the requirements of the UN. This is similar to findings of the study conducted by Simon (2008) in Dar es Salaam, who observed that majority of the people in Buguruni use up to 100 litres of water per day. Hence, the findings show that few of them consume about 101-200 litres of water per households per day. This is obvious that the amount of water consumed per household is not adequate. The results are also supported by Nkonya (2010) who found that, delivery of household water continues to be a problem for mainland Tanzanians. The government was doing little effort in delivering water to households. According to FAO (2010), water scarcity is an imbalance between demand and availability. The quote below emphasizes the above:

> *"We are not satisfied with the availability of water services. Water situation seems to have not improved over the last couple of years in our area. Although, in some areas some of the households were satisfied with the availability of water services. This implies that, for some extent MORUWASA has poor water services delivery"*. (FGD participant, Lukobe Juu Street, 14th February, 2020).

Table 3: Amount of water obtained per households per day in litres (n=120)

Litres	Lukobe Kambi Tano	Lukobe Juu	Mgudeni	Total
40-100	36(90.0)	31(93.9)	38(80.8)	105(88.2)
101-200	3(7.5)	2(6.1)	7(14.9)	12(9.5)
201-240	1(2.5)	0(0)	2(4.3)	3(2.3)
Total	**40(100)**	**33(100)**	**47(100)**	**120(100)**

Note: Numbers in brackets are percentages

4.3.1 Differences in quantity of water obtained per household per day by streets

One-way ANOVA was used to compare the amounts of litres that were obtained per households per day in Lukobe Kambi Tano, Lukobe Juu and Mgudeni Streets. The findings presented in Table 4 show that there was no significant difference ($F = 2.335$, $P = 0.101$) in litres of water obtained per household per day. This implies that little was gained on the amount of water compared to the demand of people. The findings is also supported by Kapinga (2015) who found that, more than 50% of households consume less than 25 litres of water per day in Mvomero District contrary to the national water policy of 2002, that the consumption of water per person per day should not be less than 25 litres of water. This implies that the number of litres consumed per day was not enough for household use. Yet, this became a challenge to the household members.

Additionally, the findings presented in Table 4, show that the highest overall mean of the amount of water obtained per household per day was nearly 90 liters of water at Mgudeni Street. This is equivalent to 17 litres of water per person per day in the study area. This amount is also low compared to a minimum amount of 20 litres of water per person per day as suggested at the national level (URT, 2015). This finding is not consistent with the authority's mission of MORUWASA which were to provide enough, clean and safe water to the Morogoro Municipal area and to avail environmentally and hygienically acceptable high quality sewerage service in the municipality (MORUWASA Strategic plan 2010-2022). According to United Nation (2012), the minimum consumption of water per person per day should not be less than 25 litres and one domestic water point has to serve not more than 250 people. Furthermore, according to WHO (2015), the access to 50-100 litres of water per person per day ensures low impact on health. One of the key informants reported that:

"Water is not enough for our households' daily use. We usual get water once per week for very few hours and sometimes during night hours whereby it is not easy for us to stay all night fetching water. Yet, we use much time walking for fetching water in our public shallow wells. Hence, during dry season we sometimes get too few litres which do not serve our households needs".

(Key informant, Lukobe Juu Street, 14th February, 2020).

Table 4: Differences in amount of water obtained per household per day among streets (n=120)

Streets	N	Mean (litres)	Sum of squares between and within the group		Df	Mean square	F	Sig (p-value)
Lukobe Kambi Tano	40	80.0	Between groups	6607.8	2	3303.9	2.335	0.101
Lukobe Juu	33	71.5	Within groups	165522.115	117	1414.7		
Mgudeni	47	89.7						
Total	**120**	**81.5**		**172130.0**	**119**			

*The mean difference is significant at the 0.05 level

4.3.2 Comparison of streets by amount of water obtained per households per day

Using One-way ANOVA the findings of this study show that there was no significant difference (P= 0.101) on litres of water among streets. The findings presented in Table 5 show that Post hoc tests was used in looking for differences between groups testing each possible pair of Lukobe Kambi Tano and Lukobe Juu, Lukobe Kambi Tano and Mgudeni and Lukobe Juu and Mgudeni pairs of streets with p values of 0.339, 0.229 and 0.035 respectively as indicated in Table 5. There was significant difference in Lukobe Juu and Mgudeni streets P = 0.035. This means that people from Lukobe Juu collect water from two public shallow wells which were at Lukobe Kambi Tano Street. Hence, people from

Mgudeni Street depend more on buying water from vendors and there private sources. Key informant interview reported that:

> *"…households here in Mgudeni Street purchase water from vendors and also there are few houses which are connected with tap water pipes however, water is released once per week…"* (Key informant, Mgudeni Street, 15th February, 2020).

Table 5: Comparison of streets on amount of water obtained per households per day (n=120)

Compared street		Mean Difference	Std. Error	P-value	95% Confidence Interval	
					Lower Bound	Upper Bound
Lukobe Kambi Tano	Lukobe Juu	8.48485	8.84524	0.339	-9.0327	26.0024
	Mgudeni	-9.78723	8.09125	0.229	-25.8115	6.2371
Lukobe Juu	Lukobe Kambi Tano	-8.48485	8.84524	0.339	-26.0024	9.0327
	Mgudeni	-18.27208	8.54229	0.035	-35.1896	-1.3545
Mgudeni	Lukobe Kambi Tano	9.78723	8.09125	0.229	-6.2371	25.8115
	Lukobe Juu	18.27208	8.54229	0.035	1.3545	35.1896

*The mean difference is significant at the 0.05 level

4.4 Price Paid by Households for Purchasing Water

The findings of this study show that 53% of the respondents among streets in the study area purchase water which spent 400 Tshs per 20 litres of water per day from water vendors. The findings also show that 38.2% of the respondents from Lukobe Kambi

Tano and Lukobe Juu streets reported to get water from public shallow wells for free of charge. Moreover, research findings show that only 8.8% of the respondents bought one bucket of water at the price of 150 Tshs per 20 litres of water per day to their neighbours as private sources. By using the average price of 400 Tshs per bucket per day, the following calculations applied. The assumption made here was that there is a constant requirement of water in all 12 months in a year. The average proportion of respondents reported the need of up to 5 buckets (100 litres) of water per day which costs 2 000 Tshs per day (Table 6). This applied for the households with average of 5 members of the family meaning every person uses one bucket (20 litres) of water per day. Therefore, the households were expected to spend 60 000 Tshs per month implying that 720 000 Tshs was spent per year as costs of buying water. However, the water requirements and the associated costs mainly depended on the size of the households. This relate to the study conducted by Alaci *et al.* (2013) the study found that, assuring the water supply for the household has significant consequences both in terms of time and monetary costs. According to Tereza (2011), reported that household size is believed to determine the water uses and the demand in the households hence, household size will increase the demand for water. The quote below emphasizes the above:

> "*…we buy a bucket of 20 litres for the price of 400 Tsh from water vendors while in private sources there are few houses not more than six here at Mgudeni which are connected with tap pipes and water released once per week only on Wednesday, hence, we buy water at a price of 150 Tsh per bucket of 20 litres…"* (FGD participant, Mgudeni Street, 15th February, 2020).

Though, Morogoro Urban Water and Sewerage Authority (MORUWASA) plans to increase the percentage of the Municipal population with access to clean and safe water to 94% by the end of the year 2010 (MORUWASA strategic plan 2010-2022). Despite of

the strategies to expand water networks by MORUWASA and creation of new water service still the targets in water provision is not been fulfilled.

Table 6: Households' price for purchasing water (n=120)

Water sources	Price (Tshs)	Lukobe Kambi Tano	Lukobe Juu	Mgudeni	Total
Shallow wells	No payment	24(60.0)	18(54.5)	0(0)	42(38.2)
Water vendors	400	9(22.5)	12(36.4)	47(100)	68(53.0)
Private sources	150	7(17.5)	3(9.1)	0(0)	10(8.8)
Total		**40(100)**	**33(100)**	**47(100)**	**120(100)**

Note: Numbers in brackets are percentages

4.5 Differences in Distances from Home to Water Sources among Streets

Distances from home to water sources were determined using One-way ANOVA. It was used because the grouping variables had three groups (streets) while the test variables was one distance from home to water points. Using One-way ANOVA the findings of this study shows the distances of water sources were significantly different (F=19.965, P=0.000) among streets. This implies that some households were closest to water sources while other households were farthest. The findings in Table 7 show that the overall mean distance from a household to a water source was 633.45 metres with a standard deviation of 1015.77 metres. The findings are consistent with a study by Jansz (2011), who found that, the average distance from the household to the water collection point was about 700m in Niassa province, Mozambique. Hence, the National Water Policy (NAWAPO) of 2002 defines water as accessible when one water point serves 250 persons within a distance of 400 metres and users spend no more than 30 minutes for a round trip (URT, 2002; Mandara *et al.*, 2016). This indicates that some water sources in the study area were not accessible. Although, the national water policy of 2002, suggests access involves being able to physically walk-able distance to a water source. In addition, Tereza (2011) suggest that water use and allocation in the household should get a direct

link with accessibility of the water supply sources. The quotes below emphasize the above:

> "*We have few water points in our streets. Were only having two shallow wells here in Lukobe Kambi Tano Street while none in Lukobe Juu Street. Hence, people from Lukobe Juu share the water wells with Lukobe Kambi Tano's. This led people from Lukobe Juu to walk a long distance up to water points in Lukobe Kambi Tano Street in order to fetch water."* (Key informant from Lukobe Kambi Tano Street, 13th February, 2020).

This implies that water sources in the study area was not easy accessible. It is only two sources of water available and far walking distance from households. Yet, this indicates that availability of few water sources contributes little in supporting peoples' livelihoods. Hence, the water sources have an advantage of being nearly accessed from households.

Table 7: Differences in Distances from home to Water Sources among Streets (n=120)

Streets	N	Mean (metres)	Sum of squares between and within the group	Df	Mean square	F	Sig (p-value)
Lukobe Kambi Tano	40	989.25	Between groups	2	15620962.2	19.965	0.000
Lukobe Juu	33	1104.39	Within groups	117	782420.6		
Mgudeni	47	0.00					
Total	**120**	**633.45**	**122785139.7**	**119**			

*The mean difference is significant at the 0.05 level

4.5.1 Difference in distance from home to water source between streets

Using One-way ANOVA, the Post hoc tests was used in looking for differences between groups testing each possible pairs of Lukobe Kambi Tano and Lukobe Juu, Lukobe Kambi Tano and Mgudeni and Lukobe Juu and Mgudeni pairs of streets with p values of 0.581, 0.000 and 0.000 respectively as indicated in Table 8. The findings show that there was significant difference in terms of distance in metres from household to water sources between Lukobe Kambi Tano and Mgudeni and Lukobe Juu and Mgudeni Streets (P=0.000). This implies that most respondents in the household at Mgudeni Street have waited water from vendors; hence they do not require any distance. Although, literature shows that about 50% of households in arid areas obtain water service at distances of more than 3000 metres from their home (Mkonda, 2015). Consequently, the findings are contrary with the findings obtained from Joint Monitoring Report (2010) which indicates that about 14% of the people in developing countries did not have access to an improved water source and had to use unprotected wells or springs, canals, lakes or rivers for their water needs. The quote below emphasizes the above:

> *"Unimproved water sources decreased users satisfaction with both quality and quantity of the domestic water uses especially for drinking water. However, households' water satisfaction with the availability is lower than satisfaction with quantity…"* (FGD participant, Lukobe Kambi Tano Street, 14th February, 2020).

In the same vein, one of the participants from Lukobe Juu Street said:

> *"…we use much time to go and fetch water however, sometimes we miss it or we get too few litres which do not cater our households' needs for our daily use…"*

Additionally, there was no significant difference between Lukobe Kambi Tano and Lukobe Juu Streets (P= 0.581). This implies that households had largely associated to walk long distances from their home to water points.

Table 8: Difference in Distance from home to Water Source between Streets (n=120)

Compared street		Mean Difference	Std. Error	P-value	95% Confidence Interval	
					Lower Bound	Upper Bound
Lukobe Kambi Tano	Lukobe Juu	-115.143	208.014	0.581	-527.10	296.81
	Mgudeni	989.250	190.283	0.000	612.40	1366.09
Lukobe Juu	Lukobe Kambi Tano	115.143	208.014	0.581	-296.81	527.10
	Mgudeni	1104.393	200.890	0.000	706.54	1502.24
Mgudeni	Lukobe Kambi Tano	-989.250	190.283	0.000	-1366.09	-612.40
	Lukobe Juu	-1104.393	200.890	0.000	-1502.24	-706.54

*The mean difference is significant at the 0.05 level

4.6 Responses on Time used to and from Water Sources

The findings presented in Table 9 show the responses of male and female on the time spent for fetching water at water points. The findings show 60.0% of the male

respondents at Lukobe Juu Street spent less than 60 minutes for fetching water. This can be associated to various factors including using means of transport like bicycles as well as motor bike. Also, the findings show 43.8% of the male responses spent 60 to 90 minutes for fetching water while, others 12.5% of the male responses spent the average of more than 90 minutes for fetching water at Mgudeni Street. The findings are contrary the fact that was observed by Mdende (2009) who reveals that, women spend an average of 508 to 375 minutes while men spend about 150 to 25 minutes per day during dry season for fetching water. Thought, mostly women and girls spend a significant amount of time travelling some distance to collect water (Juma *et al.,* 2018).

The findings also show that 58.1% of the female respondents at Mgudeni Street spent less than hour for fetching water. This implies that most of female respondents live near the water sources use little time on fetching water. Also, the findings show that 46.2% of the female responses spent 60 to 90 minutes for fetching water at Lukobe Kambi Tano Street while, others 11.1% of the female responses spent more than 90 minutes for fetching water at Mgudeni Street. This can be associated by the farthest water points from their home. Yet, women and young girls are major actors in accessing and carrying water who spend walking miles for their daily water needs. According to Nkonya (2010) reported that in Tanzania, fetching water is the task of women and girls where they spend many hours fetching water for their families. Moreover, the findings show the remaining percentage of both responses male and female spent 00 minute, this means respondents were purchasing water from vendors so they remain at their house or nearby waiting for water. However, according to Nkonya (2010) in her study on realizing the human right to water in Tanzania stated that accessibility of water can be measured by the amount of time an individual must spend in round-trip travel to reach safe water. The quote below emphasizes the above:

> "*We spend much time on fetching water during dry season almost one hour and a half because our wells had low water level. Hence, many numbers of*

households waits for water jam which often occurs at morning as well as evening times which leads to a long queued time on fetching water…" (FGD participant, Lukobe Kambi Tano Street, 14th February, 2020).

Table 9: Responses on Time spent for Fetching Water by Households (n=120)

Group compared	Time on fetching Water (Minutes)	Lukobe Kambi Tano	Lukobe Juu	Mgudeni
Male	00	3(21.4)	1(6.7)	0(0)
	Less than 60	6(42.9)	9(60.0)	7(43.8)
	60 to 90	5(35.7)	4(26.7)	7(43.8)
	More than 90	0(0)	1(6.7)	2(12.5)
Female	00	3(11.5)	2(11.1)	0(0)
	Less than 60	10(38.5)	6(33.3)	18(58.1)
	60 to 90	12(46.2)	8(44.4)	13(41.9)
	More than 90	1(3.8)	2(11.1)	0(0)

Note: Numbers in brackets are percentages

According to Juma *et al.* (2018) accessibility, water supply and sanitation facilities must be accessible within, or in immediate vicinity of each household, educational institution, workplace and public place. Time necessary to fetch 20 litres of water should normally not exceed 30 minutes (including waiting times), and the distance should be less than one kilometer (both ways). Water is considered inaccessible if it requires travel of more than one kilometer or thirty minutes round-trip. The study by Tereza (2011) on water supply and sanitation in Ethiopia found that most of people always have to travel a distance of more than one kilometer to collect water from unprotected and unimproved sources. Distance and time to water source give a partial indication of the burden of domestic water management felt by women and children in Tanzania and is an indication of time that could be spent on more productive and social activities. Time and fetch water includes going to the water source, waiting, collecting water, and returning home.

4.7 Respondents' Perceptions on the Performance of Alternative Water Sources

The study findings presented in Table 10 study came up with different perceptions of respondents on the performance of alternative water sources at household level. The findings show that 55% and 67.8% of the respondents disagreed on two statements: good performance on water from shallow wells supply and buying water from vendors were sufficient to meet the domestic use. This implies that households were not sufficed by water from vendors and shallow wells for their daily use. The findings show that 54.2% of the respondents agreed on the statement; good performance on water from private sources (neighbour's) are sufficient to meet the domestic use. The findings show that 89.5% and 95.4% of the respondents agreed on two statements: poor water supply leads to poor households' sanitation and long distance to water points delays other economic activities. The findings are in line with the study by Saladi and Salehe (2017), who found that 66.7% and 83.3% of the respondents strongly agreed on two statements: poor water supply leads to poor sanitation and long distance to water points delays other economic activities.

In addition, the findings show that 95.3% of the respondents disagreed on the statement; good performance on management and protection of wells water sources. This implies that the majority of water wells users were not well informed on the Integrated Water Resource Management Intentions. Furthermore, the findings show that 76.8% of the respondents disagreed on the statement; there is no relationship between alternative water sources supply and households' size. The findings is related to the study by Tereza (2011), who found that household size is believed to determine the water uses and demand in the households, and therefore the increase in household size will increase the demand for water. The quote below emphasizes the above:

> *"We have two public shallow wells in our street. Those shallow wells are constructed by the households themselves for their own uses. So, it is their responsibility to ensure that wells are well protected. So far, i have been working here as a street leader since last year, but I have never found any document that stipulate how to manage and protect groundwater sources…"* (Key informant from Lukobe Kambi Tano Street, 13th February, 2020).

In the same vein, one of the participants from Lukobe Juu Street said:

> *"… We appreciate the people who provide water services for supply water from vendors in our street. Yet, our leadership have lack cooperative on the initiative about construction our public wells…"* (Key informant from Mgudeni Street, 15th February, 2020).

Table 10: Respondents' Perceptions on the Performance of Alternative Water Sources at Household Level (n=120)

Statements	Disagree	Neutral	Agree
Water from shallow wells supply is sufficient to meet the domestic uses	66(55)	0(0)	54(45)
Buying water from vendors is sufficient to meet the domestic uses	81(67.8)	0(0)	39(32.2)
Buying water from private sources (neighbour's) is sufficient to meet the domestic uses	55(45.8)	0(0)	65(54.2)
The community recognizes the importance of the management and protection of wells water sources	4(95.3)	2(1.3)	114(3.4)
Poor water supply leads to poor households sanitation	9(7.2)	4(3.3)	107(89.5)
Long distance to water points delays other economic activities	4(3.4)	1(1.2)	115(95.4)
There is no relationship between alternative water sources supply and households size	19(76.8)	9(7.2)	92(16.0)

Note: Numbers in brackets are percentages

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The objective of the study was to assess tap water scarcity and alternative household water sources in Lukobe Ward. Based on findings and discussion, the findings showed that the households were not satisfied with tap water supply services. Majority depend much on water from vendors, shallow wells and use of private sources from neighbours as their water sources for domestic use because they do not have other alternative. According to the field study, it shows that households pay for water service despite the hardships of life they experience. This study established that water was very costly and ruins a big share of household income beyond the 3% recommended by URT (2002). Variations in prices results from two main reasons which are the mode of water source ownership and the seasonal factor. Findings from this study showed that water was sold up to 400 Tshs per bucket of 20 litres of water (Table 6). This is a very high cost in relation to the household income status of residents in the study area. Hereafter, income spent on purchase water might raise poverty among community members. Most of alternative water sources which at least provide reasonable service were privately owned and purchased once per week, thus the water charges peak up to 150 Tshs per bucket (Table 6). Though, there was a high percentage of price spent by households monthly on purchase water from vendors on average of 60 000 Tshs per month (Table 6).

According to the existing prices of water most of the households do not afford to purchase enough water to satisfy for domestic uses. Yet, during dry season water supply became short conversely to the wet season whereby the availability of water was a relief to the households. Lastly, findings showed that the community in the study area is not

satisfied with water supply services due to inadequate tap water supply as well as unsatisfactory water quantity especially during off rain season and untreated water from shallow wells. With regard to the context in which water policy is implemented it is generally concluded that implementation of the national water policy 2002 for what have been contained in the document has not been fully achieved.

Based on the findings and discussions, the study concludes that the target of ensuring access to water within 400 metres to domestic water points by the majority of household is not yet to be achieved in Lukobe Ward. In Lukobe Ward, majority approximately distance from home to water source walked 633.45 metres and sometimes beyond to reach their alternative sources of water (Table 7). However, the majority average distance to fetch water for domestic use lies between 400 m and 1000 m which are contrary to the planned distance in water policy 2002 which requires the distance to be below 400 m. Thought, the National Water Policy (NAWAPO) of 2002 defines water as accessible when one water point serves 250 persons within a distance of 400 meters. Although, ensuring access to water within 400 metres to domestic water sources by the majority of household is not yet to be achieved in Lukobe Ward. So far, the policy statement is already in the mind of all community in Tanzania including the area of study. Yet, water points in the study area are not accessible in terms of distance from the households to the water sources.

According to the study findings, it can be concluded that there were no permanent water sources that can serve the households throughout the year despite the fact that Lukobe Ward are in peri-urban area in which MORUWASA had to provide water service supply. However, these sources were found to be located far distance from the households. Notably, there is a strong link between the location of sources of water and household

location that influence households' access to water services likewise longer distances travelled to fetch water. High number of female households spent much time (more than 60 minutes) for fetching water from sources (Table 9). Yet, water accessibility becomes more intense during the dry season as a result of falling in volumes for most alternative water sources. Particularly, both males and females had usual perceptions regarding water service is that the obtainability of alternative water sources do not satisfies households' domestic use.

5.2 Recommendations

From the findings and conclusions, the following recommendations are made.

i. The 2002 National Water Policy requires that buildings located within 30 metres from sewerage line should be connected to the sewerage system. Currently, the available sewerage network in Morogoro is not fully utilized and therefore, it is important for the MORUWASA to mobilize and have responsibility.

ii. The Urban Water Sanitation Authorities policy of serving only the urban areas should be revised to include the peri-urban areas. For the peri-urban area where the extension of the piped water supply from the Municipal will not be feasible, the water and sanitation utilities should consider the construction of deep and shallow wells fitted with hand pumps. In line with the 2002 National Water Policy, the beneficiaries in the peri-urban areas should be encouraged to manage and run the water schemes in partnership with the private sector for sustainable water service delivery in their area.

iii. To ensure adequate and sanitation supply of clean water for domestic use from various sources for households. The households should adopt an integrated water conservation programme to be implemented in the study area. The programme should promote water resource management, water sources conservation, protection

and sanitary water use practices by the local communities so as to raise their awareness on maintain quality of water; prevent and control of water-borne diseases.

iv. It is recommended that Morogoro Municipal under local government should empower donors and development partners to invest more resources into water supply projects; water storage tanks should be constructed and positioned strategically in an area to ensure people have unhindered access to portable water especially in Lukobe Ward.

5.3 Suggestion for Further Studies

i. The present study collected information on the alternative water sources used and the extent of water obtained by households. However, the study did not capture information on the reasons for low rate or no piped connection in households with the sewerage network. It is recommended that, more research be carried out to establish reasons for low rate of households' connection to the sewerage network in Morogoro Municipal.

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APPENDICES

Appendix 1: Questionnaire for a Household Survey

Date of interview……. District……..

Ward……. Street (s)……

SECTION A: Introduction and Context

My name is Frank Uhagile, pursuing MA Project Management and Evaluation at Sokoine University of Agriculture. I am conducting a research titled, Assessment of tap water scarcity and alternative water sources used at household level. Please allow me to ask you a number of questions concerning the topic mention above and the information you provide will be confidential and will only be used for the intended purpose i.e. MAPME dissertation research. The interview will take less than 30 minutes. I am kindly requesting for your cooperation.

SECTION B: Respondents' Demographic and Socio-economic Characteristics

General Instructions: Kindly respond by ticking or writing briefly where required

1. Name of household head ……..
2. Respondent's age …… years
3. Respondent's sex
   (i) Male [ ] (ii) female [ ]
4. Respondent's marital status
   (i) Single [ ] (ii) Married [ ]
   (iii) Widowed/widower [ ] (iv) Divorced [ ]
5. Household size ……
6. Respondent's education level
   (i) Primary education [ ] (ii) Secondary education [ ]
   (iii) Tertiary education [ ] (iv) Informal education [ ]
   (v) Others (specify)…….
7. Household head's main occupation
   (i) Agriculture [ ] (ii) Employed [ ]
   (iii) Registered business [ ] (iv) Petty business [ ]
   (v) Homemaker [ ] (iv) Others (specify)……
8. Household head's monthly income (Tshs)
   (i) Below 50 000 Tshs [ ] (ii) 50 000-300 000 Tshs [ ]
   (iii) 300 001-500 000 Tshs [ ] (iv) above 500 000 Tshs [ ]

SECTION C: Sources, Availability and Amount of water obtained for Households Domestic Use

9. What are the alternative water sources do you use in your household?

(a) Buying water from vendors	(i) Yes [ ]	(ii) No [ ]
(b) Buying water from private source	(i) Yes [ ]	(ii) No [ ]
(c) Shallow wells	(i) Yes [ ]	(ii) No [ ]
(d) Rain water harvesting	(i) Yes [ ]	(ii) No [ ]

(e) Others (specify)…….

10. Why do you use the above source mentioned?

(i)……..... (ii)……..

11. Is the source reliable throughout the year?

(i) Yes [ ] (ii) No [ ]

12. Are you satisfied with that source?

(i) Yes [ ] (ii) No [ ]

13. If no to question 12, what is the extra alternative source for tap water shortage?

(i) Buying water from vendors [ ] (ii) Buying water from private sources [ ]

(iii) Shallow wells [ ] (iv) Using harvested rain water [ ] (v) Others (specify)…….

14. How many households use the alternative water sources?

(i) Below 10 households [ ] (ii) 11-50 households [ ] (iii) 51-100 households [ ]

(iv) 101-150 households [ ] (v) above 150 households [ ]

15. Who is responsible for fetching water in your household?

(i) Women [ ] (ii) Men [ ] (iii) Children [ ] (iv) Women and Children [ ]

16. Which means of transport do you use to collect water?

(i) On foot [ ] (ii) Bicycle [ ] (iii) Motor bike [ ] (iv) Others (specify)…….

17. How many litres do you collect per day?

(i) Below 40 litres [ ] (ii) 40-100 litres [ ] (iii) 101-200 litres [ ]

(iv) 201-240 litres [ ] (v) Above 240 litres [ ]

18. Are your water source safe?

(i) Yes [ ] (ii) No [ ]

19. If no, have there been any health problems associated with using unsafe water for different domestic activities?

(i) Yes [ ] (ii) No [ ]

If yes, what are the problems ever experienced in your household or in the ward?

(i)…….. (ii)……. (iii)……..……

SECTION D: Households' Accessibility on distance, cost and time to Alternative Water Sources

20. How long does it take to go there, get water, and come back?

(i) Less than 60 minutes [ ] (ii) 60-90 minutes [ ] (iii) More than 90 minutes [ ]

21. How much do you contribute for the alternative water service?

(a) No payment (i) Yes [ ] (ii) No [ ]

(b) Tsh 400/= (i) Yes [ ] (ii) No [ ]

(c) Tsh 150/= (i) Yes [ ] (ii) No [ ]

22. What is the approximate distance from your house to main nearest water source? …… meters

23. What approximate distance of alternative water source if main source not applicable? ……. meters

SECTION E: Households' Perception on the Performance of Alternative Water Sources

24. What are your perceptions on the performance to service on using alternative water sources for reducing tap water scarcity problem in this area?

(Put a tick were appropriate)

s/n	**Statements**	**1**	**2**	**3**	**4**	**5**
1	Water from shallow wells supply is sufficient to meet the domestic uses					
2	Buying water from vendors is sufficient to meet the domestic uses					
3	Buying water from private sources (neighbour's) is sufficient to meet the domestic uses					
4	The community recognizes the importance of the management and protection of wells water sources					
5	Poor water supply leads to poor households sanitation					
6	Long distance to water points delays other economic activities					
7	There is no relationship between alternative water sources supply and households size					

***1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree**

THANK YOU FOR YOUR COOPERATION

Appendix 2: Checklist for Key Informants

1. How do you describe the area in terms of water availability and supply?
2. How many public and private water points are available in this area?
3. How many households connected to taped water?
4. What is the situation of safety water sources in your area?
5. Is there shortage of water in terms of quantity in this area?
   If yes, what contributed to this shortage?
6. What can you say about the accessibility of water over distance, price and time in this area?
7. What challenges do households face in Lukobe Ward due to tap water scarcity problem?
8. In your opinion, what should be done to address tap water scarcity in Lukobe Ward?

Appendix 3: Checklist for Focus Group Discussion

1. What is the situation of water sources in terms of availability and supply in the area?
2. What is the condition of water quality and quantity in your area?
3. Do you think the water service delivery from alternative water sources is satisfying?
   If yes, how did you know? If no, why?
4. Are there any institutions/organizations that tried to address tap water scarcity in your area?
   If yes, which institution/organization and how do they address?
5. Is there any health problems associated with using alternative water sources for household domestic use? If yes, what is the health problems experienced?
6. In your opinion, what should be done to address tap water scarcity problem in Lukobe Ward?

THANK YOU