

**GUARANTEEING REGULAR AND ADEQUATE  
WATER SUPPLY TO CUSTOMERS IN MUNALI  
CATCHMENT**

**By**

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requirements of the Master of Business  
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## **DEDICATION**

To my Mother, Siblings, Husband and Children for what they mean to me.

....Aveless M. Kafwabolula

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## **ABSTRACT**

Like in many countries, the provision of quality water has been a major concern of the Zambian government. To this effect, the government has issued a number of policies aimed at addressing water supply and management concerns. Positive outcomes from these policies have however been overshadowed by the ever increasing challenges of rapid population growth, urbanization, aging infrastructure as well as financial constraints to mention but few challenges. Funding from other governments and donor agencies with the aim of improving livelihoods has been sought and secured from time to time. However, the actual delivery of water services has generally not matched the concern, leaving gaps in effectiveness and consumer satisfaction. This research assessed guaranteeing of water supply to customers by Lusaka Water and Sewerage Company in Munali Catchment, of Lusaka District, following the 1994 Water Sector Reforms in Zambia. The study covered seven community locations of Munali Catchment namely Jesmondine, Chudleigh, PHI, Minestone, Chainama, Kaunda Square Stage I, and Kaunda Square Stage II. Purposive selection of household respondents and service providers and other institutions with a stake in water supply was used. Coverage and utilization of water supply was assessed by questionnaire based interviews and observation. Results obtained indicated that although there has been an increase in numbers of people in Townships of Munali Catchment, accessing clean water and the number of hours of supplying water to customers was still low at points of household connection. Low income communities had less access to such services because of little investments in water supply.

**Key words:** Access, Water supply, service and delivery.

## ACRONYMS

<b>CBMT</b>	Competence Based Modular Training
<b>CBO</b>	Community Based Organisation
<b>CCO</b>	Commercial and Customer Orientation
<b>CP</b>	Cooperating Partners
<b>CU</b>	Commercial Utility
<b>CSO</b>	Central Statistics Office
<b>DTF</b>	Devolution Trust Fund
<b>DWA</b>	Department of Water Affairs
<b>DWAF</b>	Department of Water Affairs and Forestry
<b>FNDP</b>	Fifth National Development Plan
<b>GRZ</b>	Government of the Republic of Zambia
<b>GTZ</b>	German Technical Cooperation
<b>IWRM</b>	Integrated Water Resources Management
<b>JICA</b>	Japan International Cooperation Agency
<b>LA</b>	Local Authority
<b>LCC</b>	Lusaka City Council
<b>LWSC</b>	Lusaka Water and Sewerage Company
<b>MEWD</b>	Ministry of Energy and Water Development
<b>MFNP</b>	Ministry of Finance and National Planning
<b>MLGH</b>	Ministry of Local Government and Housing
<b>NRWSSP</b>	National Rural Water Supply and Sanitation Programme
<b>NUWSSP</b>	National Urban Water Supply and Sanitation Programme
<b>NWASCO</b>	National Water and Sanitation Council
<b>NWP</b>	National Water Policy
<b>PEAP</b>	Poverty Eradication Action Plan
<b>PSP</b>	Private Sector Participation
<b>PSRP</b>	Public Service Reform Programme
<b>PPURSS</b>	Promoting Peri-Urban Sanitation Services
<b>RWSS</b>	Rural Water Supply and Sanitation



<b>SLA</b>	Service Level Agreement
<b>UN</b>	United Nations
<b>UNECE</b>	United Nations Economic Commission for Europe
<b>UNESCO</b>	United Nations Educational, Scientific and Cultural Organisation
<b>UWSS</b>	Urban Water Supply and Sanitation
<b>WASH</b>	Water Sanitation and Hygiene
<b>WDC</b>	Ward Development Committee
<b>WFD</b>	Water Framework Directive
<b>WHO</b>	World Health Organisation
<b>WRM</b>	Water Resources Management
<b>WSP</b>	Water Supply Programme
<b>WSS</b>	Water Supply and Sanitation
<b>ZMK</b>	Zambian Kwacha
<b>ZS</b>	Zambia Standards
<b>ZWS</b>	Zambia Water Standard

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## DEFINING THE KEY TERMS

<b>Water reticulation:</b>	Piped-water network as opposed to well water
<b>Water supply:</b>	The provision of water by public utilities commercial organisations, community endeavors or by individuals, usually via a system of pumps and pipes.
<b>Unaccounted for water:</b>	The proportion of water that is extracted from the supply system but not charged to customers
<b>Guaranteeing:</b>	A formal assurance, especially that certain conditions will be fulfilled relating to a product, service, or transaction.
<b>Customer:</b>	An individual or business that purchases the goods or services produced by a business. Attracting customers is the primary goal of most public facing businesses, because it is the customer who creates demand for goods and services.
<b>Model:</b>	A physical, or verbal representation or simplified version of a concept, phenomenon, relationship, structure, system, or an aspect of the real world.



## **CHAPTER ONE**

### **INTRODUCTION AND BACKGROUND**

#### **1.1 Introduction**

This chapter discusses the historical background to water supply in Zambia and Munali Catchment in particular. The chapter further discusses the problem situation, objectives of the study, research questions, scope and organization of the dissertation. An overview of the study area has also been included.

#### **1.2 Background**

Access to clean and safe water is a fundamental human right and is enshrined in the Bill of Rights Part III Section 39(1) d (The Laws of Zambia, 1997). Every person has the right to water in adequate quantities and of satisfactory quality. This has direct implications on an individual's wellbeing. The right to water indirectly facilitates for an individual to have good health and be free from disease. According to the World Health Organization (2013) an important share of the total burden of disease worldwide (around 10%) could be prevented by improvements related to drinking water, sanitation, and hygiene and water resource management. This means that safe water has a bearing on health. Ensuring that individuals have good health, requires that laws and regulations are put in place. These laws provide regulatory frameworks for nations, cities and towns to provide this necessary commodity to its citizens.

According to the NWASCO sector report for 2016, Zambia's water coverage levels are 67% for rural areas and 83.5% for urban areas. The country's primary sources of water are surface water and ground water. The Kafue River flows through most of the major towns, and as result it serves as a sink for industrial, mining and sewerage effluents emanating from these towns. The water quality in this basin is affected by wastes such as suspended solids, fertilizer, filter mud and oil from sugar factory (Ministry of Energy and Water Development, 1994).

Zambia also enjoys favourable ground water with an estimated storage capacity of

1,740,380 million cubic meters, with ground water recharge estimated to be 160,080 million cubic meters per annum (Mac Donald, 1990). Furthermore, studies of Zambia's ground water resources have indicated that an area like the Kafue drainage basin, covering an area of 155,000 square kilometers has an estimated ground water storage capacity of 252.06 million cubic meters.

The surface water source for Lusaka is the Kafue River. Lusaka Water and Sewerage Company's reported average daily water production for Lusaka province is 270 million litres per day. This is actually an aggregate amount of 116.1 million litres (or 43%) surface water and 153.9 million litres (or 57%) ground water. The ground water is accessed through 110 boreholes distributed around the city (LWSC, 2011). In Zambia there are several laws that provide frameworks for the provision of clean and safe water to the citizens. For instance, the Water Supply and Sanitation Act No. 28 of 1997 transferred the authority for water service provision from the central government to local authorities. Thus providing for the establishment of autonomous commercial water utility companies such as LWSC. This ACT further placed responsibility of regulating these water utilities on NWASCO. For instance, NWASCO works towards ensuring that water utilities produce sustainable supply of safe drinking water for a specified number of hours per day at a fair price.

The National Water Supply and Sanitation Council (NWASCO), which begun its operations in 2000. The regulator's critical role is to balance consumer interests by safeguarding them against exploitation whilst ensuring that commercial utilities are viable institutions (NWASCO, 2016). In order to ensure that the water and sanitation service providers such as Lusaka Water and Sewerage Company give a progressively better services to their customers, NWASCO has formulated Minimum Service Level (MSL) guidelines. MSLs are simply standards which define the acceptable minimum level of service which providers must achieve over a specified timeframe. As a license condition issued under the WSS Act No. 28 of 1997, all water and sanitation service providers are required to formulate and maintain SLGs and SLAs which NWASCO monitors (NWASCO, 2016). Among the many indicators under the service level guarantee that LWSC has signed with NWASCO are the following that relate to water supply:

- a) average daily water supply duration at connection:22hours
- b) average daily water supply duration at public distribution system:12 hours

Lusaka Water and Sewerage Company is a quasi-government institution formed out of the water and sewerage department of Lusaka City Council (LCC) but operating as a commercial water utility company providing water and sanitation services to Lusaka province. Although the company was established in 1988 under the Companies Act Chapter 388, it commenced operations in 1990. The company became a provincial utility in February 2008 as a private limited liability company with the councils of Lusaka city, Kafue, Chongwe and Luangwa being the shareholders (LWSC, 2018).

Lusaka City Council holds 60% shares, Kafue Municipal Council holds 20% shares, and Luangwa Municipal Council holds 10% shares while Chongwe Municipal Council holds 10%. Lusaka Water and Sewerage Company is the commercial utility that is charged with the responsibility of water provision to Lusaka province. Its operational area has a population of about 2.3 million people and about 70% of the population reside in Peri-urban areas the other 30% of the population reside in the urban parts of the city of Lusaka of which Munali is a part (LWSC, 2011). Munali as a Ward has a population of 45,933 according to the census of 2010 (CSO, 2010). Lusaka Water and Sewerage Company (2014) sells water and sanitation products and services in the form of:

- a) Piped water supply, through reticulation networks from the water source to consumers.
- b) Sewerage disposal from households to sewer ponds
- c) Bowser water deliver to consumers who may not have access to piped water.
- d) Water quality testing to ensure that water supplied meets stipulated standards.
- e) Leak detection and water use audit to minimize water loss from the reticulation system.
- f) Water and sanitation consultancy, which is essentially outsourcing expertise.
- g) Sewerage disposal, sewer maintenance and repairs, which contribute to environment protection.
- h) Organic fertilizer, which is an alternative to conventional fertilizers.

### **1.3 Statement of the problem**

While the above NWASCO norms apply, however, in areas, such as Munali the scenario is different. The patterns of water supply have not been sketched in a systematic by way of research, and access to water appears not to have been explicitly recognized as a fundamental human right of these people.

### **1.4 Research aim and objectives**

Given the statement of the problem, this study aimed at developing a model that could be used to solve the perennial water supply challenges in Munali Catchment.

#### **Specific objectives**

To describe the spatial deviations, temporal deviations and pattern of water reticulation to Munali Catchment customers.

1. To explain the spatial deviations, temporal deviations and pattern of water reticulation to Munali Catchment customers using the bottlenecks approach.
2. To describe how Lusaka Water and Sewerage Company can maintain the water reticulation norms.

### **1.5 Research questions**

Given the statement of the problem, this study is seeking answers to the following research questions:

1. What have been the spatial deviations, temporal deviations and pattern of water reticulation to Munali Catchment customers?
2. Why has there been the spatial deviations, temporal deviations and pattern of water reticulation to Munali Catchment customers?
3. How can Lusaka Water and Sewerage Company maintain the water reticulation norms?

## **1.6 Assumptions of the study**

1. The researcher assumed the assessment of service guarantee of water supply to customers by water service providers.
2. The working model assumed the possibility to improve water and sanitation provision to customers by water service providers.

## **1.7 Significance of the study**

This study is justified for a varied range of reasons. Firstly, access to clean and safe water has been recognized as a fundamental human right and its provision to the citizenry is a statutory obligation for the local municipalities in Zambia. The municipalities however face challenges in the provision of adequate clean and safe water. This is because residential areas and urban areas in particular are characterized by high population growth, especially in African cities. African cities and towns are undergoing quick urbanization which leads to a lot of other problems such as shortage of water. Shortage of water at the source is as a result of many factors among them are issues of climate change. Despite large freshwater resources, rainfall has declined in the last 30 years. With little water to drink or grow crops with, people's health and wellbeing are severely affected ([www.wateraid.org](http://www.wateraid.org)).

Currently there is a shortage of water in the capital as the southern African country heads into the hottest months of the year. Lusaka's demand is already twice as high as supplies that are constrained by a falling water table and power rationing according to Lusaka Water and Sewerage Company which provides water to the city of about 2.2 million people. Conditions are expected to get worse as temperatures head toward 35 degrees centigrade (95 degrees Fahrenheit) in October. The water shortage is mainly affecting customers in Lusaka's most elevated areas. The discomfort will spread as the 100-plus boreholes the city depends on for more than half of supplies dry up faster than last year because of the depleted water table ([www.bloomberg.com](http://www.bloomberg.com)).

This study therefore is significant in the sense that it will explore the challenges of water reticulation in Munali Catchment.

Secondly the study is significant in that it proposes a model that seeks to address challenges of water reticulation in Munali. Among the many objectives a working model has, is, to aid in decision making by simulating 'what if' scenarios, and to explain, control, and predict events on the basis of past observations ([www.businessdictionary.com](http://www.businessdictionary.com)). As such the study will provide a model or a tool that will aid in decision making by the policy makers. The study is limited to Munali but its findings can be used by decision makers to come up with solutions not only for Munali but the country as a whole. Currently in Zambia one in three people lacks access to clean water. These problems have a huge impact on health, over 1,000 children under five die every year from diarrhoeal diseases caused by poor water and sanitation in Zambia ([www.wateraid.org](http://www.wateraid.org)).

### **1.8 Theoretical frameworks guiding the study**

Since this is mixed methods study design, philosophically three theoretical frameworks are appropriate. The first one the Tanahashi model or bottleneck analysis will bring out constraints or phenomena. The second one is phenomenology and this will bring out the lived experiences of LWSC staff and service users. The third one is the theory of constraints. In essence theoretical triangulation is being applied in this study. The details of the model are presented in the reviewed literature.

### **1.9 Scope of the study**

This study focusses primarily on water service users in Munali Catchment and some workers from Lusaka Water and Sewerage Company who provide the water service. The study is focusing on these respondents to determine water reticulation patterns as well as water accessibility to households of Munali Catchment. Gaining an understanding of the patterns of water reticulation and the accessibility of water will be useful for the purpose of devising a model of water supply.

## **1.10 Organization of the Dissertation**

This chapter introduces the study by outlining the background of the study, the statement of the problem, research objectives, research questions, assumptions, ethics statement, justification of the study, scope of the study and overview of the study areas and the rest of this research paper is structured as follows:

Chapter Two – Literature Review: Reviews the theoretical and empirical literature behind guarantee water supply to customers in Munali Catchment, working model and theoretical framework;

Chapter Three – Methods: gives an outline of the adopted research philosophy, design and tools that were used to obtain data for analysis;

Chapter Four – Presentation and Analysis: presents the results in form of tables and figures (charts and graphs);

Chapter Five – Discussion of findings: Discussion of findings are also presented relating the results of the study to the reviewed literature;

Chapter Six – Conclusion and Recommendations: gives closure to the study by giving a summary of the research findings, some concluding remarks, makes recommendations to the various stakeholders and suggests areas of further research.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

This chapter will look at water reticulation in cities and suburbs of Asia, Europe, and Africa in general and Zambia in particular. Some of the key challenges associated with water reticulation will be highlighted.

#### **2.2 Water reticulation**

Water production may be defined to be the volume of treated water distributed into the network. Some of the water extracted from the source ends up being lost and does not generate revenue for the water utility companies. The water loss may be as result of leakages, illegal connections, poor management or uncharged connection wastage on un-metered customers' premises (Binnie et al, 2003).

Water service delivery refers to all services utilized to provide water for households, public institutions or any economic activity. This may be extended to relate to the whole series of activities from the abstraction of raw water at the source to the delivery of treated water to the customer and from the customer back to water sources.

Over the years, scholars have been interested in water service delivery, and factors that impact it. Their studies reveal both achievements and failings in water delivery to communities. On a positive note, a number of studies indicate progress in water service delivery. Access to water has been improving the world over. This is especially so following the impetus from the United Nations through its Millennium Development Goals, and now the Sustainable Development Goals. These have and still advocate for universal access to water by all. They have set benchmarks to be met by governments around the world (UN-Water, 2018).

Water reticulation system consists of a combination of components which include pipes made from such materials as asbestos cement, mild steel, ductile iron, cast iron,



polyethylene, and PVC, and fittings, pumps, reservoirs, valves, hydrants, meters and backflow preventers (Zyl, 2014). These components are needed in order to maintain the physical integrity of the delivery system. For instance, water quality can be affected by the material and age of pipelines.

### **2.2.1 Consequences of loss of physical integrity**

There are some number consequences that could arise when a water reticulation system losses its physical integrity. The system could be unable to function as intended possibility due to failure or wrong settings. Water loss could also result from compromised system integrity, and as Desalegn (2005) wrote, the major causes of water loss include leakage, water that is unaccounted for because of measurement errors, inaccurate meters, and illegal connections. Based on LWSC data (for October 2010) the non-revenue water (NRW) is calculated at 47.5% (billed consumption/water production), whilst the unaccounted for water (UfW) (losses/water production) is 47.2%.

### **2.2.2 Minimising water loss**

Zyl (2014), suggested the following measures that could help water utilities improve on water distribution to consumers:

- a) Active leakage control, which encompasses various methods to actively find and repair leaks in the system. An assortment of leak detection devices exist, some based on listening for the sound leaks make from outside the network, while others require placing a sensor inside the water pipe.
- b) Pressure management, which refers to the practice of maintaining pressures in the system as close as possible to the minimum required levels. Some of the advantages of pressure management include longer pipe service lives, lower water losses and wastage, and lower failure rates.
- c) Speed and quality of repairs to ensure that leaks are stopped as quickly as possible and do not reoccur.
- d) Pipeline renewal, which is the process of refurbishing or replacing pipes that present the greatest risk to disrupting service or increasing losses.

### **2.2.3 Water quality**

Water is very important for people's livelihoods, and hence for human development. It is very vital to any society that it is widely accepted to be a human right. However, there are many challenges that affect access to water for domestic purposes such as drinking and personal hygiene. Governments the world over have tasked local municipalities, water utility companies and such others with the responsibility of water production and service delivery to their respective communities.

In developing countries like Zambia, households are more dependent on the water distribution system for a safe supply of drinking water, since they are generally not able to afford alternative supplies of safe water for consumption, like bottled water. Furthermore, home treatment systems for purifying water are not readily available. As Zyl (2014) noted, the cost of procuring such technology may still be prohibitive for the majority of the consumers. Water quality is therefore deemed to be of greater importance to developing countries than to developed nations.

### **2.2.4 Physical accessibility**

Physical accessibility entails that sufficient and safe water, as well as the necessary water facilities and services must be within safe physical reach for every cohort of the population. According to UN (2008), accessibility should be within, or in the immediate vicinity of each household, educational institution and work place. Physical security should not be threatened during access to water facilities and services (Murinda, 2011).

A study on accessibility of water services in Kisumu municipality, Kenya found that the proportion of households with access to piped water supply within a distance of 200m is 77.1%, only 65.6% of the basic water requirements of the residents are met and that only 25% of the households access the minimum recommended 50 l/c/d (Wagah, Onyango and Kibwage: 2010). In this study only 25% of the households benefited from the water reticulation in the municipality. This is attributed to many factors. Another set of factors challenging the supply of water in urban settings have been highlighted in many more studies. In a study by Assefa (2006), on urban Water

Supply, in Assosa town, it was found that the root causes of the challenging problems are institutional, financial, human and material resource constraints.

#### **2.2.5 Effects of pricing on household water use practices**

The ability and willingness of a household to pay for water depends upon many factors such as household income and quality of service delivered by the service provider. In cases where the cost of accessing water delivered by the water utilities is expensive, people may resort to other unsafe sources such as streams for water. However, surface water is usually contaminated and unsafe to drink. Depending on the region, some lakes and rivers receive discharge from sewer facilities or defective septic tanks. Runoff water could carry mud, leaves, decayed vegetation, and human and animal refuse. Discharge from industry could increase volatile organic compounds (Water Treatment Certification Review, 2018). This then would expose consumers of such water to a wide range of chemical compounds which can be harmful to human health. They would also be subjected to water that may be deemed unacceptable on grounds of unpleasant taste, odour and colour.

In a study by Fitsum and Fikirte (2014) in rural Ethiopia, challenges of Potable Water Supply System were highlighted. Out of a total 292 sample respondents those who use hand dug well, developed spring and rope pump accounts 47.9%, 12% and 8.9% respectively. The remaining 31.2% of the respondents are still using either river or unprotected spring for their domestic consumption. The rural set up represents another set of unique challenges which show that the urban areas are far from having perfect water reticulation systems. Accessibility to water reticulation services is a challenge in urban settings due to the above mentioned factors and many others.

#### **2.2.6 Costs associated with water delivery**

Water utilities incur costs as part of the distribution process. According to the Department of Water and Forestry (2003), the following require funds:

- a) Construction of abstraction works, bulk treatment plant, bulk reservoirs, pump stations and pipelines required to abstract and purify the raw water and distribute the potable bulk water to the municipal reservoirs;
- b) Repayment of the loans (and interest) required to finance the construction;
- c) Operation works as well as chemicals, electricity and labour;
- d) Maintenance works.
- e) These costs are recovered by the water services authority or water services provider in the form of water tariffs.

### **2.2.7 Water bills collection efficiency**

Water bills collection efficiency is very important for the continued provision of water by utilities. This has a direct bearing on the sustainability of a water utility as well as the level of service satisfaction by consumers (Murinda, 2011). Namaliya (2017), suggests that one of the tools by utility companies is a prepayment meter.

Prepayment meters help companies to reduce credit risk. This is in contrast to postpaid meters that promote credit sales, which expose a company to credit risk.

Another strategy adopted by LWSC for example, is the use of mobile money services. This is aimed at making payments convenient for customers, and ultimately at enhancing the settlement of water bills. In this way, water utilities can increase revenue collection for the services they offer.

### **2.2.8 Water supply challenges**

Water supply which is inadequate due to a number of reasons including: the increasing number of unplanned new developments in the city; leakages and pipe bursts within the existing distribution system due to its age and insufficient maintenance; and illegal connections contributing to the high percentage of Non-Revenue Water (NRW) (Ingenieure, 2013). The other setback has to do with unregulated construction of houses around cities without any water supply or sewerage infrastructure. This makes water provision and wastewater management problematic in these areas (VanRooijen, 2011).

In Yemen the study carried out by (GTZ, 2009) cited that, there was an absence of an effective regulatory capacity and a system of tradable water rights for domestic water use resulting into overdrafts of groundwater and no conservation. At the same time, demand for domestic water use, particularly in towns, was increasing as a result of rapid population growth as well as rural-urban migration. Yet, the response of Urban Water Supply and Sanitation (UWSS) sector institutions in the country was inadequate in dealing with water shortages and increasing domestic demand. Meanwhile, the sector structure was evolving in a chaotic manner with two contradictory trends: namely, a wide dispersion of agencies being responsible for water on the one hand, and over centralization of UWSS on the other. Productivity and efficiency in urban service delivery were of secondary importance, while service coverage expansion was reaching the limits of institutional ineffectiveness. Moreover, the Yemen water sector was highly influenced by political interference (GTZ, 2009). Thus the transformation of water supply and sanitation sector was triggered by the breakdown of the critical equilibrium of available water resources and domestic water use which had existed for centuries.

Understanding of the breakdowns in critical equilibrium of the water sector in Yemen and dwindling supply systems for increased populations is important for this study because it illustrates the inadequacies in service provision in other countries that necessitated reformation of the water sector. Furthermore, just like in Yemen, the importance of planning for increases in population growth, when engaging in developmental projects including water supply and sanitation has been seen to be significant to the Zambian experience.

In a similar study, Kahariri (2014) conducted an assessment of the challenges of water reticulation and sanitation in uncontrolled residential developments of Huruma estate, Nairobi County. His investigations have revealed that increased urban population has a direct impact on water supply and sanitation in Huruma estate. It was actually found to be a major cause of this challenge with 55% of the respondents under study being in agreement to this. It was found that water reticulation in uncontrolled residential developments was negatively impacted by increased population. This implies that the more the population increases there should be a deliberate and well controlled

residential development structure that factors in water reticulation. However, increase in population is not the only factor that poses a challenge to water reticulation in residential areas.

A study in Masvingo municipality by Mapfumo and Madesha (2014) identified other factors alongside population growth that impact on water reticulation. The study identified population growth, poor infrastructure, economic challenges and climate change as the major challenges affecting efficient water delivery in Masvingo city. This study presupposes that population increase is not so much of a problem rather poor infrastructure, economic challenges and climate change compound the problem of water reticulation. If infrastructure is in a good state, population growth is not a problem. There are still many other factors apart from these alongside population growth.

A study by Desalegn (2012) assessed the causes and challenges of Urban Water Supply in Mekelle City. This study found that apart from the rapid population growth, the challenge of water reticulation resulted from; Shortage of water at the sources, operator's lack of technical skill, and quick urbanization. Population increase still is a key factor among the challenges in water reticulation in this study though shortage of water at the sources is another factor that is introduced including operators lack of technical skill and quick urbanization. It is one thing to have a water reticulation system and it is another to sustain the system. Having sustainable water supply seems to be a challenge, this is highlighted by a study that was done in Gondar town.

An assessment of the challenges of Sustainable Water Supply was conducted by Shemelash (2013) where it was found that the provision of potable water in Gondar town was inefficient. The situation was getting worse due to the population growth and spatial expansion of the town which outstripped its ability to supply sufficient water for its inhabitants. In this study another factor apart from the population factor was introduced and this is the spatial expansion of the town. There seems to be an inherent problem in the way urban areas are developed in Africa that poses problems in water reticulation. However, the problem is not just in urban areas but in rural areas

as well. Rural areas also grapple with an array of problems that make it a challenge to have an efficient supply of water.

### **2.2.9 Storage and distribution**

The cost of supplying water to the users of any water system includes the installation of storage and distribution facilities. Also, there are on-going maintenance costs associated with cleaning, repairing, and replacing these facilities. The distribution system must also protect water quality between the source and the customer's tap. Proper construction is important in maintaining system integrity. Care must be taken that no foreign material is introduced into the system during pipe laying operations. Pipe ends should be covered at the end of the work day or during interruptions of construction.

### **2.2.10 Population growth and urbanization**

Census data from 2010 estimates the population of Lusaka District to be about 1.7 million while that of Lusaka Province is estimated at 2.2 million. The growth of the city can be attributed to high immigration from other regions of the country and new births. Drivers for immigration are the prospect for higher economic opportunities, potential for higher education and higher wage employment the population is predominantly young, with up to 70% of the population estimated to be below the age of 30 (Ingenieure, 2013).

Recently, Central Statistical Office, CSO, released a report which highlighted among other things, the percentage of Zambian households which have access to improved sources of drinking water. For urban areas, the percentage of households increased from 84.7 percent in 2010 to 89.7 percent in 2015 (CSO, 2016).

Another study projects demand for domestic water increase in line with population growth. It has been projected that by the year 2020, the demand for water sourced from Kafue River Catchment, for domestic consumption to be 258 MCM per annum. A large proportion of this increase in demand will have to be satisfied by Lusaka Water and Sewerage Company. Currently the water utility company abstracts from

Kafue River at Lolanda Water Works about 40 MCM per annum. This implies that LWSC will have to increase to seven times the current abstraction (FCFA, 2015).

Challenges to water supply include increasing demand for water as result of rapid urbanization and population growth. As demand outstrips supply, water utilities may resort to rationing water supply. This then means that water treatment plants for municipal water supply are at times inadequate to meet the increasing demand (Mambwe, 2014).

### **2.2.11 Financing**

Financial constraints have inhibited the performance of water utility companies. As Lengwe (2017) pointed out, the financing of water has been through budget or project support, donor grants and internally generated revenues. Inadequate financing poses a challenge to water utilities in part because of the need to scale up services to meet increasing demand as well to expand the reach to households not previously connected to the supply network. According to NWASCO (2016), inadequate investment in infrastructure which is dilapidated and inadequate greatly contribute to Non-Revenue water at an estimated 52% of wasted water. In monetary terms commercial utilities in Zambia are losing K736 million per annum. Furthermore, the installation of reservoir tanks especially overhead tanks to counter effects of disruptions to piped water supply is hampered due to financial constraints.

To mitigate such challenges, water utilities have increasingly sought to form Public Private Partnerships (PPP). PPPs may take different forms, such as Full divestiture characterized by complete transfer of assets from public to private sector through asset sales, share sales or management buyouts. Concession is another form, where a government issues a long-term contract, usually over 25 years, to a private company. The company then assumes responsibility for all capital investment, operations and maintenance. PPPs may be in the form of leases, which are long-term ranging from 10 to 20 years. The private sector becomes responsible for operations and maintenance but assets still remain the public domain (Budds and McGranham, 2003). Tucker et al. (2010) suggests that in South Africa for example, PPPs led to improved quality and reliability of water services.



This study brings into the equation an array of new factors, which are institutional and financial. The aspect of institutional constraints is premised on the reality that water reticulation in most municipalities is managed by water utilities or companies as is the case for Lusaka District. The water companies like Lusaka Water and Sewerage Company are charged with the responsibility of water supply in Lusaka and all its communities such as Munali Catchment. To effectively manage the supply, the company is guided by government water policies as well as by NWASCO's service level guarantees.

### **2.3 Pattern of water reticulation, service guarantee theory**

A service level agreement (SLA) is defined as a contract between a service provider and a customer. It details the nature, quality, and scope of the service to be provided. It is also sometimes referred to as a 'service level contract' ([www.businessdictionary.com](http://www.businessdictionary.com)). In more detail, Hiles (2000) defines a SLA as 'an agreement between the support service and the user quantifying the minimum acceptable service to the user. Hiles also notes that SLAs are particularly useful 'in time-critical processing' and that they may be complex and lengthy or simple one page documents, but, are mainly seen 'as indispensable to providing good service and sound relationships between vendor and customer.

One type of SLA is static and used for all customers, like those dictated by service providers. One can be a customer or not; this is the extent of "customization" available. Metrics are recorded by the consumer and must be reported to and validated by the provider in order for the penalty clause of a 10% refund to take effect. The other type is individual and specific based on the needs of the consumer and capabilities of the provider, in which case they are negotiated and include organization-specific guarantees. Typically, these service providers have an SLA template which can be tailored to the needs of the customer. This tailoring can happen in a series of meetings prior to beginning the service experience; there are also methods for negotiating SLAs automatically at run-time.

This aspect of providing good services and sound relationships between a vendor and its customer, makes others to view the guarantee as a marketing tool, service firms have increasingly been using to reduce consumer risk perceptions, signal quality, differentiate a service offering, and to institutionalize and professionalize their internal management of customer complaint and service recovery (Dwayne, 2009).

Service guarantees provide the following powerful platforms for promoting and accomplish service quality, Hart (1988):

- a) By delivering service guarantees, firms are forced to focus on customers' want and expectation in every aspect of the service;
- b) Guarantees establish clear standards which create a common image of what the company stands for in both customers and employees' mind. Managers are motivated to seriously concern service guarantees, because they emphasize the financial expenditure of quality failures;
- c) With service guarantees, firms are required to build effective systems to generate meaningful customer feedback and develop corresponding courses of action;
- d) Guarantees require service organizations to understand reasons of failure and motivate them to identify and manage potential fail points;
- e) Guarantees help customers to reduce risk in making purchase decisions and to reinforce their long-term loyalty.

These platforms are key in ensuring that the water companies are held accountable in the service of water supply. Service organizations use the guarantees to manage potential fail points, on the other hand customers use the guarantees in making decisions and in this context the decisions that pertain to piped water supply.

In one study by Gelamo (2014) on urban domestic water supply in Gimbichu town in Soro Woreda, Hadiya zone, Ethiopia, major factors attributed to lower accessibility were shortage of water provision, high cost of piped water connection, poor coordination and participation of stakeholders, limited forecasting strategies of the

Ground water supply Survey (GWSS) rapid population growth, frequent interruption and lack of narrowing gap between communities. These factors hinge on issues that are primarily institutional in nature, this is so because only the institution can put in place measures that reduce the cost of piped water connection by engaging key stake holders, further on frequent interruptions in supply are things that the institution can correct.

Mweemba (2013), assessed in a quantitative and qualitative research the performance of the water supply and sanitation service provision in Lusaka district, from the year 2006 to the year 2011. This study brought out the following findings although there had been an increase in numbers of people in high and middle income communities with regard to accessing clean water and supply hours at points of connection, households in low income communities had less access to such services because of little investments in water supply and sanitation resources in low income communities.

The performance of water supply provision is closely regulated by the regulator through a variety of measures including service level guarantees. Lusaka water is among the many providers in the country. All the service providers or Commercial Utilities are regulated by NWASCO through ten-year renewable licenses. In these licenses, specific Commercial Utility's Service level guarantees and agreements are defined. These SLG&A define each Commercial Utility's services quality, continuity, coverage, reliability, cost efficiency, functionality and customer care targets (NWASCO, 2004). Since 2008, the best performing Commercial Utilities relative to this priori defined SLG&A are periodically rewarded through the Regulation by Incentive program (NWASCO 2010).

By 2010, CUs served 75 percent of the total urban population within licensed service areas in Zambia. This corresponded to about 4 million customers (NWASCO, 2010). Moreover, this is equivalent to about 3 and 25 percent increase in coverage compared to service coverage levels in 2006 and 2002, respectively. Over the same time, Commercial Utilities had reduced their water losses and improved their metering and collection efficiencies among other key efficiency indicators (Mbuvi, 2012). This

means that when it comes to water reticulation in Zambia, and in Lusaka city in particular, the regulatory framework is in place and the water companies are legally held accountable to ensure they offer a service that is acceptable to the residents. However, having a regulatory framework does not guarantee provision of a sustainable water supply.

### **2.3.1 Corrective measures of temporal deviations of water reticulation**

A review was conducted on the water supply and sanitation services sector in Nigeria, the review focused on the policy trend and practice constraints. The review observed that the Nigerian water and sanitation policy environment is characterized by: a) too many short-lived policies without corresponding action; b) excessive and opportunistic use of some international policy instruments; c) very many agencies with none effectively in charge; d) unrealistic assumptions of situations and; e) poor implementation practices (Akpabio, 2012). This review presents some starting points for carrying out corrective measures in as far as water reticulation is concerned. At the first level, the review presupposes action to back policies. Secondly, there is need for domestic policy instruments as opposed to international policies. Thirdly, there is need for clearly defined roles and responsibilities. However, these problems of water reticulation cannot be resolved that easily, for instance in a study on the water supply problems in Zimbabwe by Makwara and Tavuyanago (2012) found that the problem is multifaceted in nature, hence a whole range of measures need to be adopted if a long-term solution is to be provided. The Zimbabwe study presents an approach that requires a whole range of measures that must be adopted as long term solution.

### **2.3.2 Working model**

A model is a physical, or verbal representation or simplified version of a concept, phenomenon, relationship, structure, system, or an aspect of the real world. The objectives of a model include (1) to facilitate understanding by eliminating unnecessary components, (2) to aid in decision making by simulating 'what if' scenarios, (3) to explain, control, and predict events on the basis of past observations. Since most objects and phenomenon are very complicated (have numerous parts) and much too complex (parts have dense interconnections) to be comprehended in their

entirety, a model contains only those features that are of primary importance to the model maker's purpose ([www.businessdictionary.com](http://www.businessdictionary.com)).

Water reticulation requires that a working model be developed that could be used in addressing inadequacies in water reticulation to customers. Inadequacies in water reticulation take many forms. Take for instance in Ethiopia's Oromia region where an assessment of urban water supply and sanitation was conducted, it was found in this survey that the major factors attributed to lower accessibility were shortage of water supply, high cost of piped water connection, length of process during connection and frequent interruption (Fita, 2011) in such a case a model needs to be developed that addresses these factors. Further still, it is desirable that the model should be able to reflect with reasonable accuracy factors such as levels of water availability of scarcity in Communities. Mukuhlani & Nyamupingidza (2014) conducted a study that sought to come up with Coping Strategies and Mitigation Measures in Bulawayo, the study found that high density suburbs were the most affected by water scarcity. The model then must be such that it factors in the aspect of high density suburbs. Workable models are possible to develop from looking at areas that are sustainable in matters of water reticulation. For instance, in a study that indirectly looked at water supply.

The study was on Water Sanitation and Hygiene services and it was found that approximately 2.4 percent of Ethiopia's population is gaining access to some form of improved water every year (Selassie, 2011). This study highlights the possibilities of having a working model for water reticulation that addresses inadequacies in water reticulation, this is so because Water Sanitation and Hygiene services are heavily dependent on sustainable water supply. Sustainable water reticulation has a bearing also on the quality of water and can be used to equally come up with a model that addresses the challenges of water reticulation.

For instance, in an assessment of the quantity and microbiological quality of domestic water supply in Peri-urban areas of Lusaka district, Zambia, the findings indicated that most of the people (above 90%) in the study areas had access to piped water, mostly from boreholes and water kiosks (Mambwe, 2014) if there is a possibility of

having above 90% of people having access to piped water then it follows that a model of sustainable water reticulation is viable.

Further on, Kambole (2012) conducted a study in Kanyama Township that looked at the financial sustainability of Kiosk Water Supply. This study found that the majority of the end-users are happy with the water kiosk system, the opinion of the institutions Lusaka Water and Sewerage Company (LWSC), Devolution Trust Fund (DTF) and NWASCO was that of the end-users preferring individual household connection but they are just inhibited by the hooking up Costs. The kiosk system in this study presented a system or model that consumers were happy with. A model that presents a sustainable water reticulation system for the Peri-urban areas.

However, this is not the case in the other parts of Zambia, a study conducted in Chililabombwe found that accessibility to water household levels is still a challenge in the settlement as most of the point sources (shallow wells, the stream and the river) were found to be contaminated. In addition to this, it was found that there was no direct relationship between the economic performance of a household and the accessibility to water (Sachikumba and Mafuleka, 2015). This study brings out an aspect that requires in-depth analysis, that is, if the economic performance of the household has no direct relationship with accessibility to water, then it follows that there are other factors that have to be explored. One aspect that is key is household participation. In a study in Amhara region, Ethiopia, on the Determinants of household participation in water source management, it was found that households' demand for sustainable water services are positively affected by users' participation during the project design and implementation, advocacy provided by the project and greater household income (Aschalew, 2009). The aspect of users participating in the project design and implementation is key in the development of a working model for water reticulation.

One of the objectives of a model is to aid in decision making by simulating 'what if' scenarios. This means that the policy makers can come up with all sorts of situations that would depict any kind of situation. They can look at a worst case scenario for instance of a drought that affects the water reticulation by impacting on the sources

of water. Then having the scenario, they would come up with steps or actions that would be followed to address the situation. One of the scenarios that can be considered in developing a working model is the case of Barcelona. Barcelona metropolitan area is composed by the city of Barcelona itself plus several municipalities located in its outskirts. Its drinking water network supplies water to 3.1 million of citizens. The water supplied to Barcelona metropolitan area comes from two main origins: the Ter and the Llobregat rivers. Surface water constitutes around the 85% of the total water supplied in Barcelona metropolitan area, while the last 15% of the water supplied comes from groundwater resources. Due to the Mediterranean climate, the natural water resource availability can sometimes be lower than the water demand in the area. This situation leads to the need to find alternative resources in order to ensure the drinking water supply in the entire water network. And in looking at the alternative resources some reasonable possibilities of obtaining new water resources were contemplated. According to the type of the measure, they have been classified in three different blocks (Cetaqua and Fife; 2009: 16):

- **Palliative actions:** Temporary actions which would only be used in order to mitigate the effects caused by drought. Some of them would include shipments of drinking water and recovery of wells whose capacity would not permit their exploitation for longer periods than the duration of the drought season.
- **Structural actions:** Actions which would imply a permanent improvement of the supply system and could be used in further similar scenarios. It is important to make improvements to a reticulation system to reduce on inefficiencies.
- **Advanced structural actions:** Permanent actions whose implementation costs would be substantially higher than the other type of structural actions. Among them, the recovery of ground water resources, and enlargement of desalinization plants and interconnection of networks.

It is also important to bear in mind that water demand in a water reticulation system is highly variable and changes with the season, day of the week and hour of the day.

As one author noted, demand for water is affected by various factors like temperature, rainfall and public holidays. In contrast to the variability in water demand, components such as water treatment plants, pump stations and bulk pipelines are designed for a fixed flow rate for cost and operational reasons (Zyl, 2014). It is therefore paramount for water utilities to install reservoirs in the reticulation system. An important function of storage reservoirs is to provide balancing storage between constant inflow and variable outflow. This means that reservoir water levels drop during periods when there is high consumption, and increases again when consumption is low.

These three aspects can be domesticated and modified to develop a model that would address water reticulation challenges in the Munali Catchment in Lusaka District. The Researcher is very much agreeable with conclusions derived by Pargal (2003) concerning low cost recovery and service provision operating below the cost of maintenance and operation, despite substantial changes being made in the water supply and sanitation sector to improve performance. Communities in rural and periurban areas pay subsidized tariffs – basically billed on a social tariff which in most cases fail to meet the cost of production, operation and maintenance of the service provision. The challenge of improving service provision in such areas is seen not to be lucrative and the motivation to offer quality services is overshadowed by economic considerations. Consequently, service provision of water supply and sanitation has tended to lag behind in rural and peri-urban areas more so than in the urban proper where full tariffs are paid for the service offered. This condition is an illustration of the prevailing situation with regards to water reticulation in Zambia.

Furthermore, the measurement of efficiency in the water sector is complicated by the nature of the production process. Complications arise from the fact that water production is a function of many variables, many of which are exogenous to the water sector – for example household income, chemical products prices, cost of electricity and intra household decisions etc. Farrell (1957), drawing upon the work of Debreu (1951) and Koopmans (1951), introduced a measure of productive efficiency that avoids the problems associated with traditional average productivity measures (ratios). He proposed that efficiency relative to a best-performance frontier is



determined by a representative peer group. In the Farell framework, a firm's efficiency is measured relative to the efficiency of all other firms in the industry, subject to the restriction that all firms are on or below the frontier. A firm is regarded as technically efficient, if it is operating on the best-practice production frontier in the industry (Murillo-Zamorano, 2004).

While this is true, to some extent, it is technically a challenge to determine performance efficiency using the yardstick of other firms in the industry particularly that the serviced areas are diverse with different water needs, utilization habits and social orientation. In this respect, the researcher finds a gap in Farell's assertions because his measurement of performance efficiency is based on quantitative measures, while overlooking the qualitative aspect which includes user satisfaction and important social dynamics that guarantee water user satisfaction. Moreover, satisfaction of water users is one great indicator that a service provider has to score highly in its service provision to be considered efficient.

## **2.4 Service Provision**

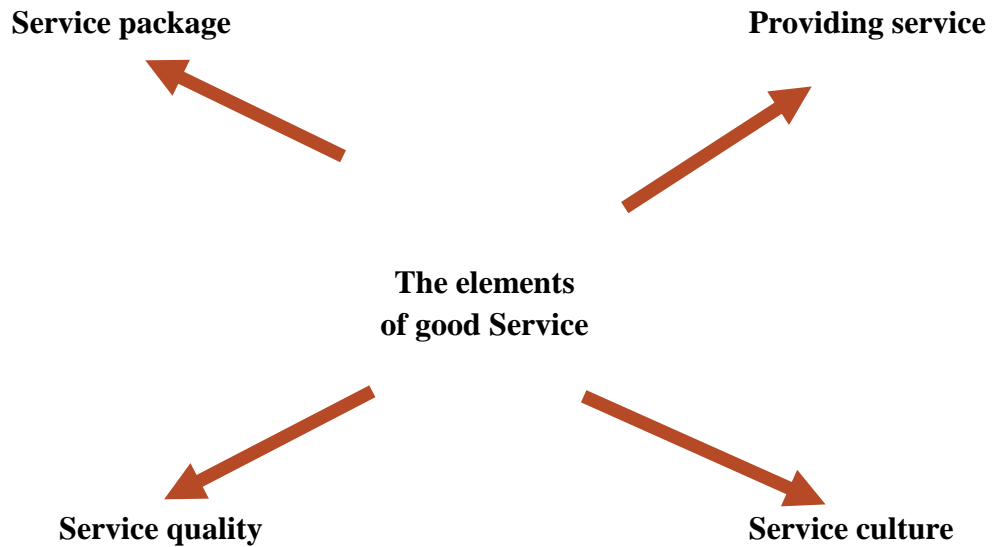
### **2.4.1 Defining services**

Kotler and Keller (2009, 789) define service as any act and performance that one party can offer to another that is essentially intangible and does not result in the ownership of anything'.

### **2.4.2 The elements of good service**

In customer oriented business customer plays an important role as they are the main parts who buy the services and if they like the service than become a repeat customer and also bring new customer.

Thus service should be provided in a way of service package, from the customers' point of view, of good quality. Figure-1 shows good service includes four elements, providing service, service package, service quality, and service culture. If any of these elements break the service system the total service will be incomplete (Isovita, *et al*, 1994:111).



**Source: field Research, 2018**

**Figure 1: Elements of good service system- a basis for good service.**

#### **2.4.3 Providing service**

When service is provided to the customer three main components contribute to the service production, 1. service environment, 2. contact personnel, and 3. other customers. Providing service is actually a series of activity of these three elements. In the service providing activity some customer participates actively by sharing suggestion or giving positive and negative feedback to the personnel; other remains passive like let the personnel do their own job. Thus each customer needs be served differently but should be served with equal respect. Contact personnel may be distinguished in two grouped, both continuous and direct contact with the customer or seldom and infrequently in contact with the customer (Isovita *et al*, 1994, 112).

#### **2.4.4 Service package**

Taking consideration into customers Service Company markets different service package that design to match different customer wants and needs. These service packages have the same core service but sometimes it is hard to define which the core service is. As for example, a customer cannot pay an invoice without paying the bank service charge. Thus additional service is built around core service to facilitate

customer. It makes the service and interesting and helps to generate more revenue because sometimes it is insignificant to earn revenue only from core services (Rao, 2007: 127).

#### **2.4.5 Service culture**

Water utilities need to incorporate mechanisms tailored to make interactions between consumers and service providers become part of service delivery. This makes access to information by both parties easier. Information accessibility in this case includes the right to seek, receive and impart information concerning water concerns. At this point, customer becomes very judgmental about the product quality (water) and they create an image quickly whether the service is good or bad. Thus if contact person does give the right information or become rude every effort goes negatively, and they do not get a second chance to make this positive. Customers' expectation and experience are to be conflicted here. On the other hand, after experiencing service with company personnel, environment, equipment etc. if everything goes positively, customer experience gets overwhelmed and they do not notice any fault. But if experiences do not meet the expectation then they see all the faults and reinforces (Isoviita and Lahtinen 1994.114-116).

Service culture is overall atmosphere of service process that gives customers an experience, feel and what they see in company or in organization. It reflects company's values and norms where it is an implied and tacit agreement about what is permitted and forbidden in the service organization (Fitzsimmons *et al*, 2006:108).

In dimensions of service quality, reliability represents the ability to perform the service both dependably and accurately. It also means service is carried out on time, in the same way and without any error every time. Responsiveness refers to the ability to respond to customer requirements and to provide prompt service. This ensures to the customer the best service and if any failure occurs, the ability to recover quickly that can create positive perceptions of quality. Assurance is the knowledge, courtesy, confidence and ability to convey trust of the employees. It includes features such as respect for the customer, politeness, effective communication with the customer. Empathy is the carrying and individual attention to customers including the features

of sensitivity, approachability and understanding customers' needs. Tangibles are the appearance of physical facilities, equipment, personnel. It has the impact upon perceived service quality for instance cleanliness of the service premises (Hunt, 2010). This dimension of service quality contains a large part of disconfirmation that drives the perception of service quality. However, the process is influenced by four externalities, word of mouth, personal needs, past experience and external communications that actually have an impact on the formation of expectations (Kasper *et al.* 2006, 190).

#### **2.4.6 Customer satisfaction definition**

Westbrook and Reilly (1983) define Customer satisfaction is as emotional response to the experience provided by, (or associated with) particular products or services purchased, retail outlets, or even molar patterns of behaviour, as well as the overall marketplace setup.

#### **2.4.7 Importance of customer satisfaction**

In modern business philosophy, business should be customer oriented and the implementation of the main principles of continuous improvement, justifies the importance of evaluating and analyzing customer satisfaction. In short, customer satisfaction is considered to be the basis of standardizing the excellence of performance for many businesses. It also helps to identify the potential market opportunities (Evangelos *et al*, 2010, 1-2). Mentioning the importance of customer satisfaction in business perspective Zairi (2000) said in one magazine, 'Customers are the purpose of what we do, and rather than them depending on us, we very much depend on them. The customer is not the source of a problem, we shouldn't perhaps make a wish that customers 'should go away' because our future and our security will be put in jeopardy.

However, the concept of customer satisfaction is not a new one. It hit the business sectors in the early 1980's where some researchers considered that customer satisfaction is the best window into loyalty. They also found that it has a direct relationship with company profitability or share of market. Satisfied customers think

twice or several times before switching to alternatives because they become attached emotionally and also skeptical about alternatives' quality (Oliver, 2007). Zairi (2000) mentions more about the importance of customer satisfaction; 'numerous studies that have looked at the impact of customer satisfaction, repeat purchases, loyalty and retention. They all bring the similar message. First, satisfied customers share their experience with average five or six people just like dissatisfied customers normally tell ten people about their unfortunate experience. Secondly, many customers do not complain about dissatisfaction to the service provider. Finally, people do not usually realize that dealing with customer satisfaction is not as costly as it is to recruit a new customer. Actually it is only twenty-five percent of the recruit a new customer.

#### **2.4.8 Measuring customer satisfaction**

It is a widely accepted practice by industry to measure customer satisfaction. In recent decades the importance of customer satisfaction has increased and thus many organizations have come to consider measuring customer satisfaction a requirement which should be set as a business performance parameter. 'It is also considered to be reliable feedback which provides effective, direct, meaningful and objective ways of determining the customers' preferences and expectations' (Gerson, 1993). Wild (1980) and Hill (1996) said, customer satisfaction measurement provides a sense of achievement and accomplishment for all employees involved in any stage of the customer service process and it motivates people to perform as well as the means allow. This leads to personnel achieving higher levels of productivity.

Evangelos and Yannis (2005) mentioned in their book that main advantages of measuring customer satisfaction, one- measuring customer satisfaction helps to evaluate business current position against its competition and accordingly design its future plans. Second- Satisfaction measurement is able to identify potential market opportunities. Third- it helps to understand customer behaviour and particularly to identify and analyze customer expectations, needs and desire. Fourth- It improves the communication the total clientele. Fifth- By this measurement it is also possible to examine whether new actions, efforts and programs have any impact on the organizations' clientele. Sixth- Organizations weakness and strength against

competition are determined, based on customers' perceptions and judgment. Seventh- Personnel is motivated to increase its productivity.

#### **2.4.9 Determinants of customer satisfaction**

Customer satisfaction is one of the most important issues concerning business organizations of all types. Business organizations try to give best service to the customer and also look for new approaches aimed at increasing the satisfaction level. According to Hokinson (1995, 13), these factors include friendly employees, knowledgeable employees, Helpful employees, accuracy of billing, billing timeliness, competitive pricing, service quality, good value, billing clarity and quick service.

#### **2.4.10 Consumer emotions**

Consumer emotions played a significant role with the product or services satisfaction. When a customer is in a happy moment of life or positive frame of mind, this has an influence on the service experience and feel good factor. Alternatively, when customers are passing through bad mood or negative feelings they might over react or respond negatively towards the service. It is normally seen that positive emotions had a stronger effect than negative ones. Specific emotions may also be influenced by the consumption experience itself, influencing consumes' satisfaction with the service (Zeithaml *et al.* 2006, 111).

#### **2.4.11 Attributions for service success or failure**

Attributions are a cause to influence perceptions of satisfaction. Even when customers do not take responsibility for the outcome, customer satisfaction may be influenced by other kinds of attributions. Sometime customers do not take any consideration of fault made by the personnel, if they found it rarely happens or it is beyond an agent's control (Zeithaml *et al.* 2006, 112).

#### **2.4.12 Perceptions of equity and fairness**

Perception of equity and fairness has a great impact on customer satisfaction. Customers usually think about whether they were treated fairly compared to other customers, was the price eligible for the service, do they get good service. These senses of fairness are central to customer satisfaction, particularly in service recovery situations. (Zeithaml *et al.* 2006, 112).

#### **2.4.13 Other consumers, family members and co-workers**

Customer satisfaction not only depends on the product or service features, one's own experience rather it is also influenced by other customer perceptions, experiences etc. As for example, family members' satisfaction or dissatisfaction influenced tremendously towards particular service – like water supply. (Zeithaml *et al.* 2006, 112).

#### **2.4.14 Customer loyalty and retention**

Customer loyalty means sticking with a supplier who treats him well and gives him good value in the long term even if the supplier does not offer the best price in a particular transaction (Wirtz *et al.*, 2007: 486). Lovelock and Wirtz (2007) also mention in their book that customer loyalty is much more than repeat purchases. They might not buy products frequently, but they drive business topline growth. Loyal customers' recommendation to their friends, family and colleagues indicate that business give the best economic value of the product or service. Moreover, loyal customers indirectly increase the number of new customers at no charge to the company which on the other hand, increases company's growth. Sivadas and Baker-Prewitt (2000) said, 'the ultimate objective of the customer satisfaction measurement should be customer loyalty. Actually satisfaction fosters loyalty to the extent that is prerequisite for maintaining a favourable relative attitude and for recommending and repurchasing from the supplier'.

Only customer satisfaction is not enough in today's business perspective rather there has to be extremely satisfied customer, because it leads to customer loyalty. Some

authors also mentioned that building customer loyalty is not a choice for business, but it is the only way of building sustainable competitive advantage. Though there is no definite rule to create customer loyalty, studies have shown that the following aspects might help to build that, firstly- focus on key customers, secondly- generating high level of customer satisfaction with every interaction proactively, thirdly- understand customer needs and demand, then respond to them before the competition does, fourthly- develop closer ties with customers and finally- create a value perception' (Bonsal et al, 2001).

#### **2.4.15 Price influence on customer satisfaction**

Price is a very popular tactic for consumer satisfaction. Customers will indicate higher levels of satisfaction when they get a better deal (pay less price) relative to a comparison other than they will when they pay more for relative worse deal. They thought they paid less than the published price for that item if the customer is satisfied. According to Zeithaml et al. (2006, 116-128) the customers' use of price as a signal to quality depends on several factors, they are accessibility of services cues to quality, brand names that offer evidence of a company's, level of advertising and the risks associated with the service purchase. Usually when the price is high, a customer expects higher quality and better services. On the other hand, when the price is too low, customer may doubt about the quality of services.

#### **2.5 Availability and Accessibility of Water Utilities**

In Zambia, numerous initiatives such as separation of Water Resources Management (WRM) from Water Supply and Sanitation (WSS) and devolution of authority from Central Government to Local Authorities (LAs), among others, had been introduced in water resources management to improve the performance of the water sector after the realization of poor performance in the sector. The Water and Sanitation Chapter of the Fifth National Development Plan reports that in the late 1980s and early 90s, government began a sector review and realized then that the issues constraining effective development and management of the water sector in Zambia were:

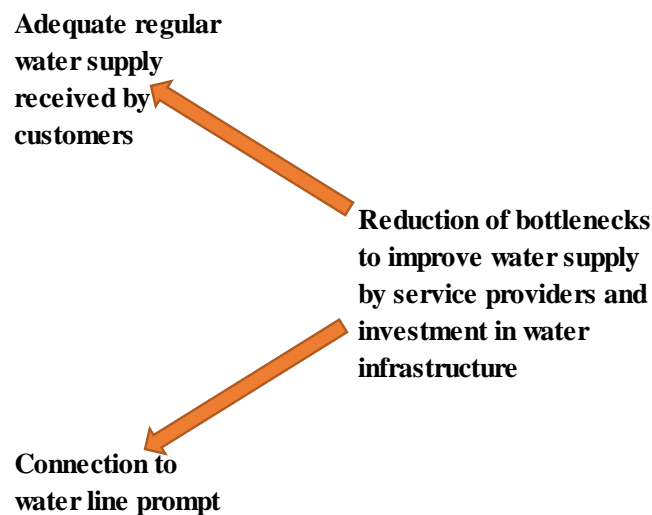


- a) Weak or inadequate legal and institutional framework for the Water Resources Development and Management and also for Rural Water Supply and Sanitation (RWSS);
- b) Inadequate data and information systems for water resources and RWSS;
- c) Inadequate human resource capacity;
- d) Inadequate stakeholder participation, particularly in WRM;
- e) Lack of Integrated Water Resources Management (IWRM);
- f) Inadequate and unpredictable sector funding, and relatively lower and declining share in budgetary allocation;
- g) Large population without water supply and sanitation services in urban poor communities and rural areas, and;
- h) Insufficient sustainability and self-financing (cost recovery) in the Urban Water Supply and Sanitation (UWSS) sub sector (MFNP, 2006).

The weaknesses identified in the water sector all pointed to too much centralization of activities by central government. There was no separation of authority to enhance efficiency. The government, therefore, needed to come up with policies that would improve coverage of service delivery while upholding efficiency at minimum costs. Private sector participation was also recognized as an important tool to bring in new capacity and resources to the water sector. Curtailing the weaknesses in water supply and sanitation services in the Zambian water sector saw a birth of a number of institutions and modification in roles and responsibility for others to streamline the sector. Through the Water Supply and Sanitation Act, enacted in 1997, the National Water Supply and Sanitation Council (NWASCO) was established and started operating in 2000 to regulate the Water Supply and Sanitation sub sector in Zambia; and Commercial Utilities (CU) under the custody of the Local Authorities were established to offer water supply and sanitation services in the urban and peri-urban areas in Zambia. Focus of the Water Supply and Sanitation Act of 1997 was on commercialisation, Private Sector Participation (PSP), regulation and delimiting of service area as well as the establishment of Devolution Trust Fund (DTF) (World Water Assessment Programme, 2009).

## 2.6 Theoretical Framework/Conceptual Framework

In this study, it is conceptualized that guaranteeing of water supply to customers, Service Level Agreements should be met by the water service provider. Although the phenomenon required a multi-stakeholder approach, the involvement of donors to finance water service providers could guarantee success to water supply to customers. The conceptual framework below has been developed to try and analyze several aspects that relate to satisfy water users by providing enough water storage and carry out regular maintenance of water pipes and sewer lines (OECD, 2008). The description above could be conceptualized as shown in Figure 2 below.



**Figure 2 Conceptual Framework for Guaranteeing Water Supply to Customers**

While there are service levels of agreements that ought to be met, the framework is rather weak for this study. Instead, Tanahashi model was selected to guide the study. Tanahashi model or bottleneck analysis has been selected to identify constraints or bottlenecks, which are fettering the service delivery system from achieving a desired level of coverage for water. The bottleneck analysis is a step-wise analytical approach that assesses six coverage determinants against an intervention. This analytical method identifies constraints hampering a system from achieving a desired level of coverage for an intervention or package of interventions. Based upon work by

Tanahashi (1978) and Piot (1967), the Tanahashi model defines six core coverage determinants as will be described below that help describe the capacity of a system to increase the utilization of effective interventions.

The model has been borrowed from its usual application when looking at health coverage. The main assumption of the model in service delivery is that services are a concept articulating communication between care or service and the potential users to whom it is intended. This communication is a course from resource apportionment to attainment of desired objective. The model defines service or care utilisation as connection between service capacity and service output. The communication is made possible through the following six domains or dimensions based upon work by Tanahashi (1978) and Piot (1967).

- 1) *Availability coverage*: Assesses the availability of critical system inputs by looking at the resources available for delivering an intervention and their sufficiency. These include structural, technological (equipment and so on). In other words, availability coverage measures the capacity of a system in relation to the size of the target population or ideally for the population in need.

Data for availability coverage is frequently drawn from employment databases and / or facility surveys.

- 2) *Accessibility coverage*: Access relates to how many people can use a service. It has different dimensions of which the important ones are: *financial accessibility (affordability)*, *psychological accessibility (acceptability)* and *geographical accessibility* (the time taken or distance to reach facilities providing services). The acceptability of services to the target population, which is often a function of culture, religion, gender, and distance. Estimates for accessibility are frequently drawn from surveys. Researchers tend to assess the physical access of health services to the clients, including the number of households or communities reached regularly served by services and the time taken or distance to reach a facilities providing services. Estimates for accessibility are frequently drawn from. Often an expert judgment is needed.

- 3) *Initial utilisation:* Assesses the first use of a services, which can also be influenced by the financial accessibility of the services as well as the knowledge on the service. Household surveys and service statistics reported at facilities are the main sources of information on initial utilization. Service records, when used, should be validated before use in the tool. Initial utilisation which can also be influenced by time (continuous utilisation) and the financial accessibility of the services as well as the knowledge on the service. Household surveys and service statistics reported at facilities are the main sources of information on initial utilization. Service records, when used, should be validated before use in the tool.
- 4) *Timely continuous utilization:* Assesses the utilization pattern compared to recommended contacts for services. This determinant measure continuity and compliance of multiple visits for a service, thus sometimes referred to as the continuity determinant or adequate coverage. Household surveys and service statistics reported at facilities are the main sources of information on initial utilization. Service records, when used, should be validated before use in the tool.
- 5) *Effective quality coverage:* This defines the proportion of a target population in need of an intervention or who have received all adequate components of an intervention in a timely and complete manner. The benefits from a service coverage implies the notion of an objective to be achieved and targets, which can be set of all adequate components of a service in a timely and complete manner. Effective quality coverage are defined as a minimum amount of inputs and processes that are expected to produce desired public welfare effect if used by individuals or applied to the population at large. In some cases, effective coverage is assessed as the proportion of timely continuous utilization delivery with quality inputs. In effect, it measures a service system performance and quality of service. Facility based, and household surveys and expert opinion are frequent sources of this data.
- 6) *Contact or utilization coverage:* Contact coverage measures the proportion of the population who have had contact with a service provider. It is similar to

‘use of services. For interventions that require a one-time action, contact coverage may be virtually equivalent to effective coverage. For other interventions, that require repeated use, effectiveness requires several contacts with service providers. We also need to consider ‘continuity’ of access and include some indicators for adherence to demands of the service. This should identify the factors associated with the abandonment of continued access or utilization.

The objective of the model is that it focusses on effective coverage and this is defined as the percentage of the people in need of an intervention that receives an effective intervention. This model was chosen because it is especially useful for an equity analysis, as it facilitates the identification of groups with unmet needs from a given service or services. Services may not be available, may be difficult to access, or be unacceptable groups, who will never contact the health system or do so infrequently. Since they are socially excluded from health services, these groups are “missing” or “hidden” from the system and are not included in routine statistics on utilization. These hidden groups also represent the inequity of the system.

The assumption being mooted is that water services may not be available in the cities under study, or may be difficult to access or may be unacceptable groups, who will never contact the system or do so infrequently. Since they are socially excluded from the services, these groups are “missing” or “hidden” from the system and are not included in routine statistics on utilization. These hidden groups also represent the inequity of the system.

### **2.6.1 Conclusion**

It could be concluded from this section that the adequacy and regularity of supply of water as a service could be constrained by numerous factors as outlined by the model.

## CHAPTER THREE

### RESEARCH SETTING AND METHODOLOGY

#### 3.1 Introduction

The main purpose of this chapter is to describe the research setting, discuss and describe the general methodology that was used in this study. It presents the research design, research design Matrix, sampling, data collection, data analysis, validity and reliability and ethical consideration of the study.

#### 3.2 Overview of the study area

Lusaka District is situated in Lusaka Province in the central part of Zambia and lies between latitudes 15° to 30° south of the Equator and longitudes 10° to 28° east of the Greenwich Meridian ((MFNP, 2005) in Mweemba, 2013). The district shares boundaries with four other districts namely Chongwe, Chibombo, Kafue and Mumbwa. Administratively, Lusaka District is subdivided into seven (7) constituencies and thirty-three (33) wards (Figure 3) and covers a total area of 360Km<sup>2</sup> (MFNP, 2005).

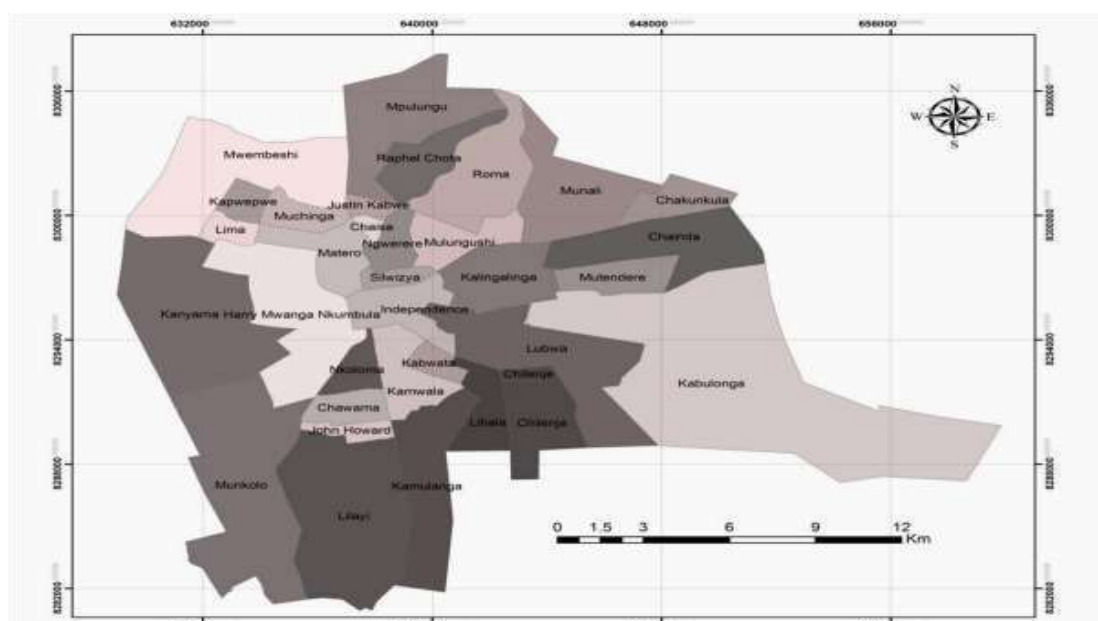


Figure 3: Map of Lusaka District showing District Wards of Lusaka, Zambia  
Source: Generated by Author using Arc-GIS Software

Population census report of 2000, reported that total population for Lusaka District was at 1,084,703 (CSO, 2003). The 2010 preliminary census report of Population and Housing reports that, total population in Lusaka District are at 1,742,979 (CSO, 2010). The annual growth rate for Lusaka District was at 4.9 percent in 2000 – 2010 inter censual period. Currently, population density stands at 4,841.6 persons per Square kilometer.

### **3.3 Main Characteristics of the study areas**

The study sites in Munali Catchment were Jesmondine, Chudleigh, Presidential Housing Initiative (PHI), Chainama, Minestone, Kaunda Square Stage I and Kaunda Square Stage II.

#### **3.3.1 Jesmondine and Chudleigh**

Jesmondine and Chudleigh are located along and/ or off Great East Road and are deemed to be among the high income areas. The two communities are characterized by good housing units with all basic services such as water supply, sewerage, storm water drainage and waste disposal in place. Road networks for the two communities are favourably good. Jesmondine and Chudleigh have low population densities. Chudleigh has extended housing units in the outskirts of the periphery with most houses built by private individuals. This has put a strain on water supply and sanitation service provision.

#### **3.3.2 PHI**

PHI is located along and/or off Great East Road and it is composed of: high, medium and low density areas. This community is characterized by good housing units with all basic services such as water supply, sewerage, storm water drainage and waste disposal in place. Road network for this community is favourably good.

### **3.3.3 Minestone and Chainama**

Chainama and Minestone areas are deemed medium density areas. The two communities are also deemed as middle income areas. They are characterized by favourably good housing units and improved road networks. Chainama and Minestone have access to basic services such as water and sanitation.

### **3.3.4 Kaunda Square Stage I and Kaunda Square Stage II**

Kaunda Square Stage I and Kaunda Square Stage II Compounds have largely unplanned and they are characterized by poor housing units and toilet facilities, high levels of unemployment, especially among the youth, and high levels of poverty. The two communities have high population densities and deemed as low income areas. Basic services such as water supply, sewerage, roads, storm water drainage and solid waste disposal are inadequate and/or completely lacking (MLGH, 2008).

## **3.4 Research design**

A research design was created by the researcher and in essence was moulded (rather than dictated) by the ontological as well as epistemological assumptions guiding the inquiry (Blaikie, 2010). From these two philosophical assumptions, the methods were selected which were responsive to the research questions, context and the participants. The question in this section was “Where to start?” What was the scope of this project and what was the nature of the data required? In order to answer these questions, we then linked up with Creswell. Creswell (2003) advises case study researchers to first develop a research design matrix to ground their studies. The design matrix showed how each research question was welded ontologically and epistemologically by describing how the researcher would approach the research question piecemeal and how the whole project was approached. A research design and research strategy followed from the development of research matrix. The matrix eventually points to the logic or research strategy and the selection of methods that were for sampling, data collection, and analysis in the research. Below (Table 1) was the research design matrix that points to how each research question had been designed and how it would



be answered and linking each one epistemologically to an appropriate sampling, data collection and analysis technique.

**Table 1: Research Design Matrix**

Research Questions	Objectives	Sampling and Data Collection	Data Collection Methods	Data Analysis
What have been the spatial deviations, temporal deviations and pattern of water reticulation to Munali Catchment customers in the last five years?	To describe the temporal deviations of water reticulation to customers weekly	Population of all categories of customers in Munali Catchment were enlisted by random sampling Relevant LWSC Documents were utilized for the purpose of analysis	Survey Questionnaires  Documentary review	Univariate and Bivariate Content analysis
Why has there been the spatial deviations, temporal deviations and pattern of water reticulation to Munali Catchment customers in the last five years?	To explain the pattern of water reticulation using Service Guarantee Theory	Population of all categories of employees in the company. These were enlisted by random sampling	Survey Questionnaires	Correlation Analysis Binary Logistic Regression Analysis
	To understand from the point of view of company employees the motives for the observed patterns of water reticulation	Company employees who were in decision making positions were enlisted based on availability and willingness	In-depth interviews with experts in the water distribution department	Thematic and Content Analysis
How can Lusaka Water and Sewerage Company maintain the water reticulation norms?	To devise a working model that could be used in addressing inadequacies in water reticulation to customers	Within the population employees were enlisted using maximum variation sampling.	Workshop based methods and on spot action	Thematic and Content Analysis

Looking at the research matrix, this was a case study approach guided by the pragmatic research strategies according to Norman Blaikie's assumptions of designing social research (Blaikie, 2000:78; 2010:79). A mixed methods type of research design therefore was appropriate to answer the overarching research question and the subsidiary sections. This mixed methods design were sequential and independent.

One-shot or cross-sectional embedded mixed study design (QUAN + QUAL model) had been chosen to answer these research questions. In this form of integration, one dataset (e.g., a quantitative survey), was analysed first and then using the information generated from the analysis, it was used to inform the subsequent data collection (e.g., interview questions, identification of participants to be interviewed). In this way the integration occurred by connecting the analysis of results from the initial phase with the data collection from the second phase of research (Bryman, 2006; Creswell and Plano Clark, 2011). Data was collected in an iterative process (Plano Clark, 2010; Creswell and Plano Clark, 2011:121).

### **3.5 Population and sampling**

The population in this research referred to the set of units where the data was used for inferences. These are the units for which the research results were generalized from and defined clearly giving the temporal and geographic characteristics and the units that were studied. The research targeted a population of 320 respondents of which comprised 300 customer service users and 20 LWSC officials. This study has drawn the following as units of analysis:

- 1) LWSC Documents containing customer information as well as water reticulation had been enlisted as part of this study analysis.
- 2) A sample of customers from the population in Munali of all categories of customers in Munali were enlisted by random sampling based on respondent availability and willingness to participate.

- 3) Eleven (11) of employees from the population of employees in the company. These had been enlisted by their availability and willingness during the data collection phase.
- 4) Within the population of company employees, one (1) who was in decision making position had been enlisted for an in-depth interview.
- 5) Within the population, employees were enlisted using maximum variation sampling.

Recognizing that this is a pragmatic inquiry, sampling was treated separately in terms of the qualitative and quantitative component. All units of analysis requiring random sampling, the sample size was determined using Yamane (1967:886) formula once the population or the sampling space was known. The formula below was applied

$$n = \frac{N_2}{1+N(e)}$$

Where n is the sample size, N is the population size, and e is the level of precision. A 95% confidence level and p = 0.5 are assumed for this equation. The population size of 1600 households was chosen by the researcher for this study. Therefore,

$$n = \frac{1600}{1+1600(0.05)^2}$$

$$n = 320.$$

The sample size is taken to be 320 respondents.

As for purposive sampling, qualitative analyses typically require a smaller sample size though others argue that qualitative sample sizes should be large enough to leave you with “nothing left to learn.” In other words, you might conduct interviews, and after the tenth one, realize that there are no new concepts emerging. That is, the concepts, themes, etc. begin to be redundant. Glaser and Strauss (1967) recommend the concept of

saturation for achieving an appropriate sample size in qualitative studies. Other guidelines had also been recommended. For an ethnography, Morse (1994) suggests approximately 30 - 50 participants. For grounded theory, Morse (1994) has suggested 30 - 50 interviews, while Creswell (1998) suggests only 20 - 30. And for phenomenological studies, Creswell (1998) recommends five to 25 and Morse (1994) suggests at least six. There are no specific rules when determining an appropriate sample size in qualitative research. Qualitative sample size may be determined by the time allotted, resources available, and study objectives (Patton, 2001). In this study, the sample size therefore was not stated a priori.

The researcher used sample size of 320 questionnaires to obtain data. Also an in-depth interview was done. The sample frame is presented diagrammatically as in Table 2.

**Table 2: Sampling frame**

<b>Sampling Unit</b>	<b>Targeted ample Size</b>	<b>Actual Sample Size</b>	<b>Data Collection Method</b>
Customer service receivers	300	296	Questionnaires
Water service providers	20	10	Questionnaires
<b>Total</b>	<b>320</b>	<b>306</b>	<b>Questionnaires</b>

**Source: Field Research, 2018**

### **3.6 Research instruments**

The researcher intended to answer the research questions raised in chapter one of the study;

### **3.6.1 The interview**

Interviews were done with water service providers who were purposively sampled. These were chosen because they were either in decision making position or directly linked with customer relations and direct provision of services.

### **3.6.2 The questionnaires**

Data due to its flexibility and ability to give respondents time and maintain anonymity. The researcher administered more questionnaires than prescribed by survey monkey ([www.surveymonkey.com](http://www.surveymonkey.com)) to ensure validity and balance in the subjectivity associated with the different respondents.

Before the final administration of the survey tool, pretesting of the questionnaire was done in the selected parts of Munali Townships. This was done to structure and modify the research instrument by clarifying grammar and language used so as to avoid bias and misinterpretations of the questions. The researcher had in-person pretests with some of the local residents of Jesmondine. To avoid sample contamination, the people who participated in the pretest did not participate when the survey questionnaires were administered for data collection.

## **3.7 Data collection**

In order to answer the stated research questions, data was collected from the sample of customers in Munali Catchment who were requested to answer a structured survey questionnaire which was self-administered or researcher administered. Employees were also expected to answer a survey questionnaire. The study planned that within the population of company employees, were to be invited to participate in an in-depth or key informant interview as well as a workshop to resolve the researchable problem. However, only the in- depth interview was done not the work shop.

Key informant interviews as well as documentary reviews were done. To be analyzed using Content analysis was the main data analysis technique. Interviews were conducted using the logic of abduction. Abduction corresponds to naturalism, which relates to the interpretive and constructive research paradigm. Abduction was based on the epistemology of idealism (in idealism, knowledge is viewed as a social construction) and encompasses research approaches, which had a central goal of seeking to interpret the social world (Higgs, 2001).

### **3.8 Data Analysis**

Qualitative data which was in textual form, was reduced, and analysed on the computer using Microsoft computer package. Qualitative content analysis was employed. Quantitative data was analysed using SPSS software to generate univariate and bivariate data.

In order to solve the problem, Contextual Action Research (Action Learning) sometimes referred to as Action Learning, was employed in this study (Young and Valach, 2016). This is an approach derived from Trist's work on relations between organizations. It was contextual, insofar as it entails reconstituting the structural relations among actors in a social environment; domain-based, in that it was used to involve all affected parties and stakeholders; holographic, as each participant understands the working of the whole; and it stressed that participants act as project designers and co-researchers. The concept of organizational ecology, and the use of search conferences came out of contextual action research, which was more of a liberal philosophy, with social transformation occurring by consensus and normative incrementalism (Max and Chisholm, 1993; ABL Group, 1997).

For this study, Chi-Square test and Correlation analysis were performed using SPSS software package. The Chi-Squared test was used to test for association between the

variables frequency of water supply and adequacy of water accessed by a household in Munali Catchment. Furthermore, the Chi-Squared test provides a criterion to test hypothesis based on a critical value. The null hypothesis that the frequency of water supply has an impact on the adequacy of water accessed by a household in Munali Catchment against was tested against the Alternative hypothesis that the frequency of water supply does not have an impact on the adequacy of water accessed by a household in Munali Catchment. The Correlation Analysis on the other hand was performed to the check for a linear relationship between the variables frequency of water supply and adequacy of water accessed by a household in Munali Catchment. The Correlation Analysis is ideal for such an analysis because it is able to determine the strength as well as the direction of a relationship between two variables.

### **3.9 Hypotheses**

Based on the research objectives and questions, the following hypotheses were formulated for testing:

H<sub>0</sub>: The regularity of water supply has an impact on the adequacy of water accessed by a household in Munali Catchment.

H<sub>1</sub>: The regularity of water supply does not have an impact on the adequacy of water accessed by a household in Munali Catchment.

### **3.10 Data interpretation**

Data obtained were presented and analysed using tables, simple percentages, mean score index, and coefficients. The variables were tested at 5% significance level, and it was interpreted as statistically significant if the calculated p-value was less than the significance level of 5%.



### **3.11 Ethical considerations**

Creswell, J. W. (2003) defined ethics as ‘a morality or a position of doing what is right both morally and legally.’ To start with, permission was sort from the University of Zambia to carry out this study as shown in appendix. It was important to protect participants who willingly presented themselves for the purpose of advancing understanding in research. Therefore, a strict set of guidelines and code of conduct was adopted and adhered to. Confidentiality was an important aspect in this study and hence, all the names of the respondents were not mentioned.

The researcher ensured that participants’ consent to participate in the research was voluntary, free of any coercion or promises of benefits as a result of participation. Since the study was on guaranteeing water supply to customers; a working model for selected Townships in Munali Catchment, the researcher ensured that the participants received a full disclosure of the nature of the study, expected benefits to the participants and society with an extended opportunity to ask questions, including the fact that they could choose to withdraw their participation even in the middle of the research.

### **3.12 Summary**

The chapter outlined the method used to gather data, instruments was used the justification of the instruments and the methods. Sampling method was used during the course of gathering were presented. The chapter also highlighted the targeted population and the sample size, justification for its representation and its significance to the study. The selected methodology served the important purpose of restricting the study to investigate only relevant matters and maintain coherence in the study. Chapter four dealt with data analysis and presentation. Findings, conclusion and recommendations of this study were presented in chapter five and six respectively.

## **CHAPTER FOUR**

### **DATA PRESENTATION AND ANALYSIS**

#### **4.1 Introduction**

This chapter provides the empirical findings gleaned from the collected data. It provides demographic information of the respondents and the statistical analysis of the information collected from them. This is followed by the interpretation and discussion of our findings.

It will focus on data analysis of the study in two different stakeholders namely service user and service providers. In collecting the data from the service user, 300 questionnaires were administered of which 296 questionnaires were collected, and the service provider was administered 20 structured questionnaires and 10 were collected. In addition to questionnaires with service providers, there was an in-depth interview that was also done. Hence the chapter, consists of responses given by service user and service providers about availability and accessibility of water service utility in selected parts of Munali Catchment in Lusaka District.

The data collected was analyzed using the Statistical Package for Social Sciences (SPSS). Thus the data collected were tabulated under the various themes and subheadings, and presented using tables, bar graphs, frequencies, percentiles and generalizations. Additionally, some of the open-ended responses and interviews were analyzed using the content analysis methodology. Defined content analysis as words, meanings, pictures, symbols, ideas, themes or any message that can be communicated. Open-ended questions were scanned to determine words or phrases that were frequently used by the respondents. The study adopted the same method as the one described above to analyze open-ended questions.

## 4.2. Assessment of Availability and Accessibility of Water Utilities by Service User

### 4.2.1 General Descriptive Analysis

Survey responses were obtained from 296 respondents (53% females and 47% males) from Munali Catchment (see Table 3).

**Table 3: Distribution of the respondents according to their age**

S.No	Age	Frequency	Percent
1	Below 15 years	3	1.0
2	16 to 25 years	98	33.1
3	26 to 35 years	80	27.0
4	36 to 45 years	55	18.6
5	46 to 55 years	22	7.4
6	56 to 65 years	24	8.1
7	66 years and above	14	4.7
<b>Total</b>		<b>296</b>	<b>100.0</b>

**Source: Field Research, 2018**

The Table 3 indicates distribution of respondents according to their age groups. The age group started from below 15years. The age group is divided into 7 categories with 10 years of class interval. It is easy to comprehend from the table that the youth age group or productive age group, combining two class intervals, i.e., 16 – 25 and 26 – 35 dominate the sample size and the number of respondents from above 66 and below 15 is marginal. It may be pointed out here that a majority (33.1%) of the respondents hailed from the age group 16 – 25 which is productive age group as per the concern of Munali Catchment in Lusaka District urban.

### 4.3 Other Demographic Factors

The study has revealed that there are generally more people who have attained Senior Secondary school education (39.9%) in the study site than those who attended Tertiary education (36.1%), Junior Secondary education (13.9%) and primary school education (5.1%). While those who never attended school accounted for the least 5.1%. On the other hand, the majority of the respondents were in formal employment (44.3%), followed by those who were unemployed (38.2%) and the rest who were in the informal sector (17.5%). The results also revealed that majority of the households (93.6%) were connected to LWSC water distribution network, whereas 6.4% of the households were not connected. Of all the consumer respondents surveyed in Munali Catchment, 53.4% were tenants, while 46.6% were property owners. See Table 4 below.

**Table 4: Other Demographic Factors for Respondents**

Category	Frequency	Percentage
<b>Education</b>		
None	15	5.1
Primary	15	5.1
Junior Secondary	41	13.9
Senior Secondary	118	39.9
Tertiary	107	36.1
<b>Occupation</b>		
Formal	131	44.3
Informal	52	17.5
Unemployed	113	38.2
<b>Relation to property</b>		
Owner	138	46.6
Tenant	158	53.4
<b>Property connection status</b>		
Connected	277	93.6
Not Connected	19	6.4

**Source: Field Research, 2018**

The distance from access point to homes of respondents are divided into five variables using one kilometer as interval. More than 36.5% of the respondents live in 3 to 5 kilometer radius from access point. Apart from this, there are 23.6% of the respondents living in 1 to 2KM radius from access point. It is evident that, majority of the people (60.1%) live away from access points. Hence the location of the access point is little outside from the people. See Table 5 below.

**Table 5: Distribution of respondents according to their proximity to service access point**

S.No	Nearest service point location	Frequency	Percent
1	0 - 1 km	17	5.7
2	1 – 2 km	70	23.6
3	3 – 4 km	92	31.1
4	4 – 5 km	108	36.5
5	Above 5 km	9	3.0
<b>Total</b>		<b>296</b>	<b>100.0</b>

**Source: Field Research, 2018**

Below is a depiction of two household taps connected to Lusaka Water and Sewerage Company's water distribution network. See Figure 4 below.



**Figure 4: Household tap in Jesmondine Kaunda Square Compound of residential area of Munali Catchment Lusaka District.**

**Source: Pictures by Author**

The distribution of respondents according to the household water storage capacity was divided into 6 categories. They are less than 50 liter, 51 to 100 liter, 101 to 250 liter, 251 to 500 liter, 501 to 1000 liter and above 1000 liter. The highest sample size 29.4% of the respondents belong to 101 to 250 liter, the second largest sections of the people belongs to 51 to 100 liter category, third group belongs to 251 to 500 liter consists of 19.6% and fourth category (10.5%) belongs to less than 50 liter. All these four category of people were fully dependent on running water from the water utility company because they don't have permanent water storage like overhead tanks in their households. Apart from this group, other category such as 501 to 1000 liter and above 1000 liter, they have storage facility in their houses. See Table 6 below.

**Table 6: Distribution of respondents according to their water storage capacity to manage intermittent supply of water**

S.No	Household water storage capacity	Frequency	Percent
1	Less than 50 liter	31	10.5
2	51 to 100 liter	71	24.0
3	101 to 250 liter	87	29.4
4	251 to 500 liter	58	19.6
5	501 to 1000 liter	28	9.5
6	Above 1000 liter	21	7.1
<b>Total</b>		<b>296</b>	<b>100.0</b>

**Source: Field Research, 2018**

It is very much evident that, the majority of the respondents were fully dependent on running water from water utility company and if any problem arises in the running water system that would affect the majority of the people who don't have adequate storage capacity. Figure 5 below shows containers on a wheelbarrow which were used for ferrying and storage of water.



**Figure 5: Water storage in Munali Catchment.**

**Source: Pictures by Author**

The cross tabulation analysis on access to running water based on gender shows that both male and female have just about the same levels of access to running water per day. Roughly speaking, 35% to 47% of either male or female have at most 12 hours of access to running water. A marginal number of household didn't receive water service due to issues with local service providers. The erratic water reticulation is evident to the interviewer with the service provider. See Table 7 below.

**Table 7: Cross tabulation of access to running water between male and female**

	Running water accessibility					Total
	Twenty four hour a day	6 to 12 hours a day	Less than 6 hours a day	Never	Non response	
Male	15.8%	34.6%	47.4%	1.5%	.8%	100.0%
Female	16.0%	35.9%	46.2%	1.9%	0.0%	100.0%
Pearson ChiSquare	1.800a	Asymp. Sig. (2-sided)	98.7%			

**Source: Field Research, 2018**

The distribution of respondents according to their monthly water payments starts from less than K250 to above K1000. The majority of the respondents (35.8%) belong to less than K250 category and the second largest group of respondents (28.7%) belong to K250 to K500 category. These two categories revealed that, majority of the users belong to this category and they depended on paid water for their day to day life. It is an interesting fact that, more than (10.8%) of the people pay more than K1000 for their water needs. It is evident that, this category of water user may use the connections for more than double



use. It needs to be verified and appropriate action to be taken by authorities for over use. Table 8 below.

**Table 8: Distribution of respondents according to their monthly water payments**

S.No	Water payment (ZMK)	Frequency	Percent
1	Less than 250	106	35.8
2	250 to 500	85	28.7
3	500 to 750	29	9.8
4	750 to 1000	44	14.9
5	Above 1001	32	10.8
Total		296	100

**Source: Field Research, 2018**

The distribution of respondents according to their response towards the realistic of price of domestic water fixed by water utility company were categorized into seven variables such as strongly agree, Agree, somewhat agree, Not sure, somewhat disagree, disagree and strongly disagree.

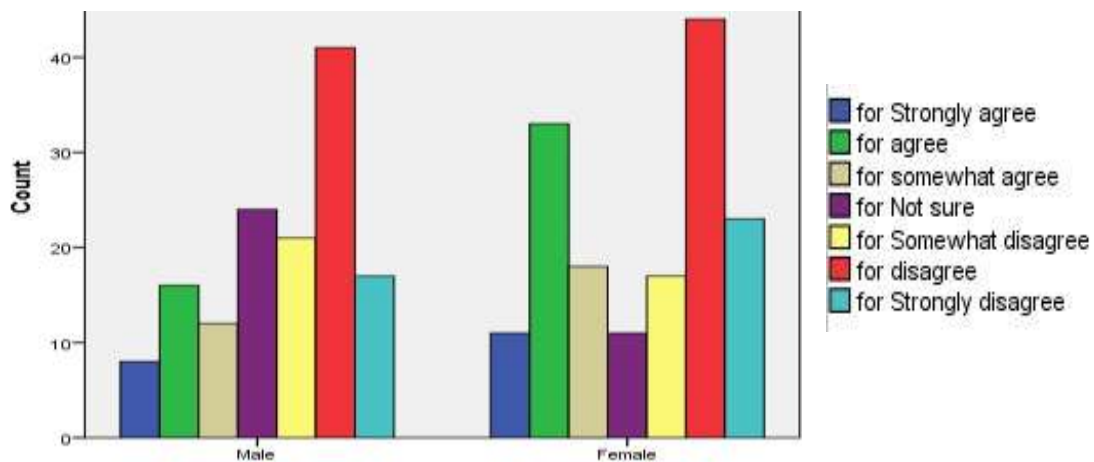
Majority of the respondents (28.7%) belong to disagree and strongly disagree the realistic of water prices. It indicates that, realistic of water prices is one of the issues perceived by water users. Hence the researcher, emphasized the water utility company must improve the realistic of the water prices in consultation with beneficiaries to be necessary. Out of 296 respondents, only 98 of them (33.1%) were agreed to the realistic of water price. Table 9 below.

**Table 9: Distribution of respondents according to their response towards the price of domestic water is realistic**

S.No	Response towards domestic water price	Frequency	Percent
1	For Strongly agree	19	6.4
2	For agree	49	16.6
3	For somewhat agree	30	10.1
4	For Not sure	35	11.8
5	For Somewhat disagree	38	12.8
6	For disagree	85	28.7
7	For Strongly disagree	40	13.5
<b>Total</b>		<b>296</b>	<b>100.0</b>

**Source: Field Research, 2018**

Among the people who were disagreed with the realistic of water price, females were dominating than males. It indicates that, a sizable out of 296 respondents, only 98 of them (33.1%) were agreed to the realistic of water price. Interesting factor noted here is, among the people who agreed to realistic water price, women were in higher number than men. It indicates that, any attempt to improve the water pricing needs to be targeted with women to bring positive result. See Figure 6.



**Figure 6: Distribution of respondents according to their gender and the response towards the price of domestic water is realistic.** **Source: Field Research, 2018**

The distribution of respondents according to their opinion on maintenance of the water lines – pipes is prompt once reported were categorized into seven variables such as strongly agree, Agree, Somewhat agree, Not sure, somewhat disagree, disagree and strongly disagree.

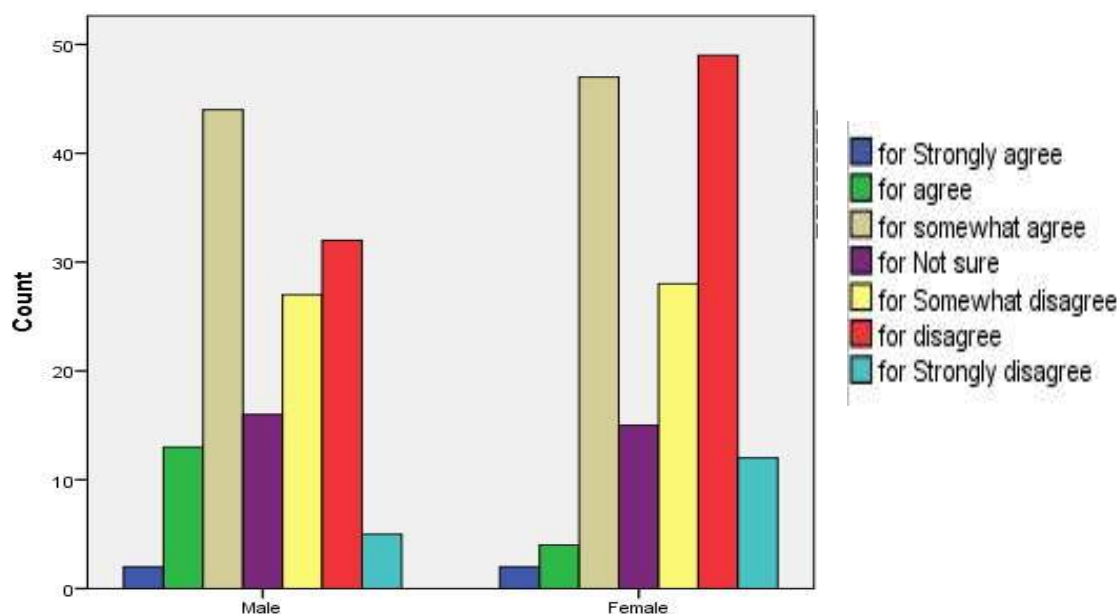
The majority of the respondents (30.7%) belong to somewhat agree on the maintenance of waterlines – pipes is prompt once reported. Just opposite to this case, there are 46.0% of the respondents are belong to strongly disagree and disagree category towards the maintenance was poor and the authorities did not properly respond to the complaints. This can be confirmed in the interview with the service provider. I must say that spare parts are a challenge to source especially in the rainy season and that repairs are done strictly where there is a problem. See Table 10 below.

**Table 10: Distribution of respondents according to their statement on maintenance of the water lines – pipes is prompt once reported**

S.No	Response	Frequency	Percent
1	For Strongly agree	4	1.4
2	For agree	17	5.7
3	For somewhat agree	91	30.7
4	For Not sure	31	10.5
5	For Somewhat disagree	55	18.6
6	For disagree	81	27.4
7	For Strongly disagree	17	5.7
<b>Total</b>		<b>296</b>	<b>100.0</b>

**Source: Field Research, 2018**

Among the people who are disagreeing with the maintenance issues, women are dominant group having disagreement when comparing to male. It indicates that, the disagreement rate is very high among women due to their approach towards the local service company and ineffectiveness of handling compliance. See Figure 7 below.



**Figure 7: Distribution of respondents according to their gender and the statement on maintenance of the water lines – pipes is prompt once reported**

**Source: Field Research, 2018**

The cross tabulation of acceptance of water service from the water utility company for their areas based on gender was performed. The responses of the respondents were categorized into seven variables such as strongly agree, Agree, Somewhat agree, Not sure, somewhat disagree, disagree and strongly disagree.

The majority of the respondents (24.0%) belong to somewhat agree category for acceptance of water service received from local authorities for their areas. There were (21.3%) of the respondents also disagreed with the statement. In addition to this, a sizable number of respondents (8.4%) also strongly disagree with the statement. Altogether (29.7%) of the respondents were disagreed with the statement.

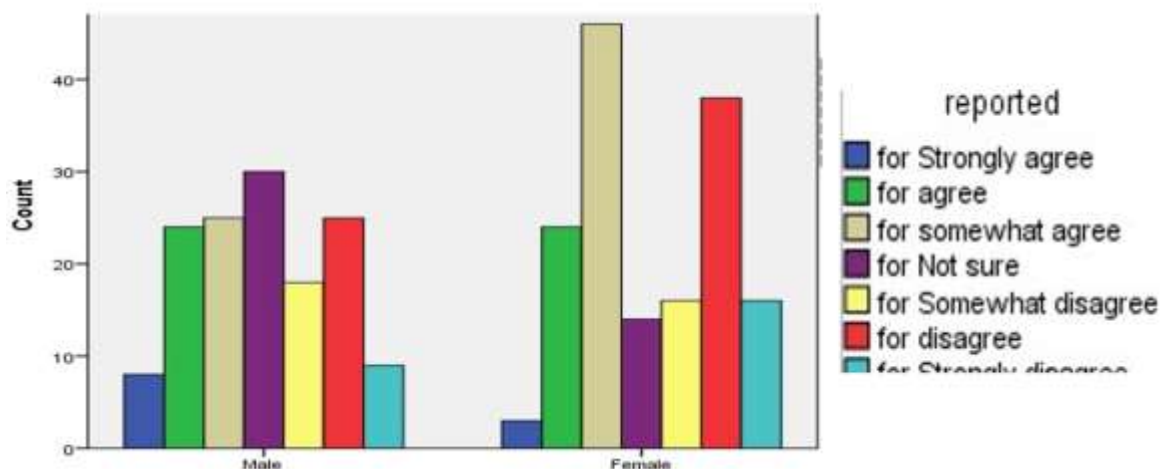
It indicates that both agreement and disagreement also commonly prevailed towards acceptance of water service received from local authorities. See Table 11 below.

**Table 11: Cross tabulation of acceptance of water service between male and female**

	I_have_accepted_water_service								Total
	Strongly agree	Agree	Somewhat agree	Not Sure	Somewhat disagree	Disagree	Strongly disagree	Non response	
Male	8	19	22	28	17	25	7	9	135
Female	2	23	48	12	16	33	15	10	159
Non response	0	0	1	0	0	1	0	0	2
Total	10	42	71	40	33	59	22	19	296
Pearson ChiSquare	24.992 a	Asym p- Sig. (2sided)	0.035						

**Source: Field Research, 2018**

Among the people who were in the disagree and somewhat agree categories for acceptance of water service received from the water utility company to their areas, women were dominant group in both counts. There were both positive and negative sentiments towards water service received from water utility company. These views prevailed among women and there is need to clarify this with the water utility company. See Figure 8 below.



**Figure 8: Distribution of respondents according to their gender and the statement on “I have accepted the water service provided by the local authority in this area”**  
**Source: Field Research, 2018**

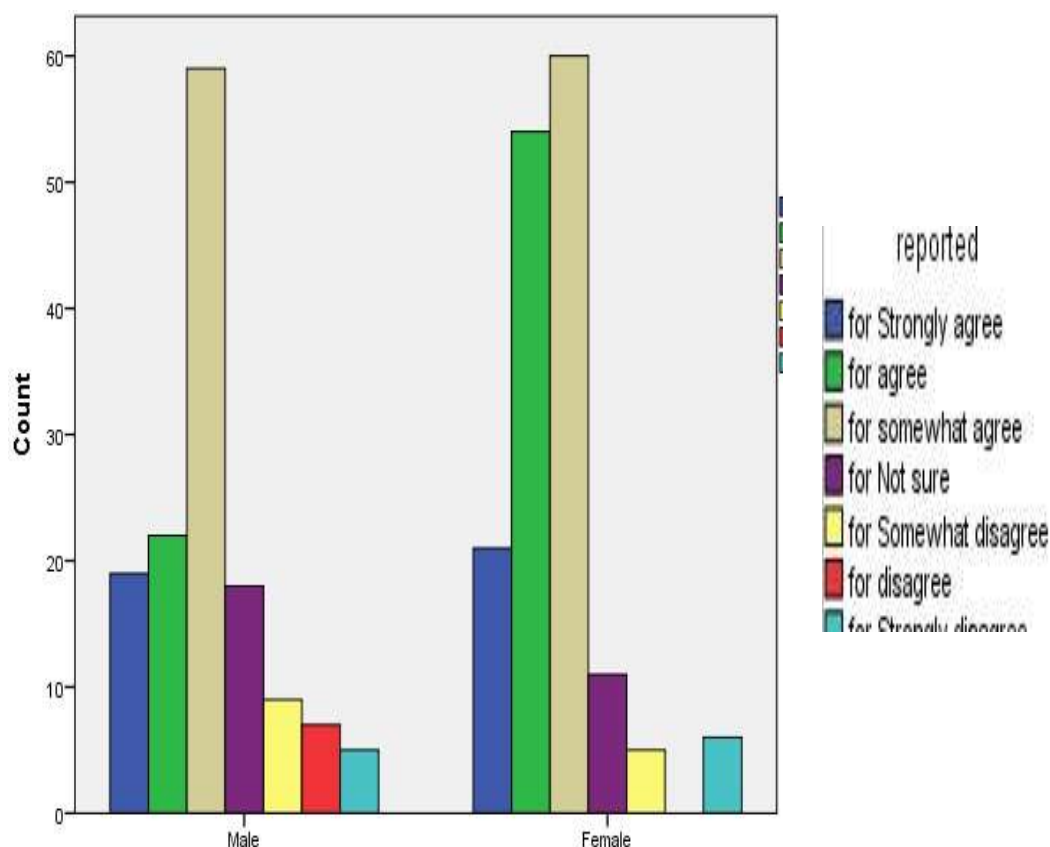
The distribution of respondents according to their willingness to find time and distance to travel and pay for the service or present a problem regarding a service was ideal, was categorized into seven variables such as strongly agree, Agree, Somewhat agree, Not sure, somewhat disagree, disagree and strongly disagree. Out of 296 respondents, 40.2% of them were somewhat agreed to the statement. In addition to this, 25.7% agreed and 13.5% strongly agree to the statement. Altogether, 79.4% of them were in agreement with the statement. The data mentioned above indicates that, the customers were willing to spend time and spare distance to express their grievances to authorities. It is the responsibility of the authority to come out with effective mechanism to address the grievances of the customers. See Table 12 below.

**Table 12: Distribution of respondents according to their statement on “I find the time and distance to travel and pay for the service or present a problem regarding a service is ideal”**

S.No	Response	Frequency	Percent
1	For Strongly agree	40	13.5
2	For agree	76	25.7
3	For somewhat agree	119	40.2
4	For Not sure	29	9.8
5	For Somewhat disagree	14	4.7
6	For disagree	7	2.4
7	For Strongly disagree	11	3.7
<b>Total</b>		<b>296</b>	<b>100.0</b>

**Source: Field Research, 2018**

Among the people who were somewhat agree category for their willingness to find time and distance to travel and pay for the service or present a problem regarding a service was ideal, both men and women were equally dominating. It reveals, there are higher number of acceptance prevailing among women towards showing willingness to find time and distance to travel and pay for the service or present a problem regarding a service was ideal. See Figure 9 below.



**Figure 9: Distribution of respondents according to their gender and the statement on “I find the time and distance to travel and pay for the service or present a problem regarding a service is ideal”**

**Source: Field Research, 2018**

The distribution of respondents according to their statement on “Initial utilization: connectivity to water lines had been prompt was categorized into seven variables such as strongly agree, Agree, Somewhat agree, Not sure, somewhat disagree, disagree and strongly disagree.

The majority of the respondents (24.3%) belonged to somewhat agree category towards the statement on “Initial utilization: Connectivity to water lines had been prompt (for those disconnected or seeking connection for the first time”. On the other hand, there were 22.0% of the respondents also somewhat disagreed the statement.



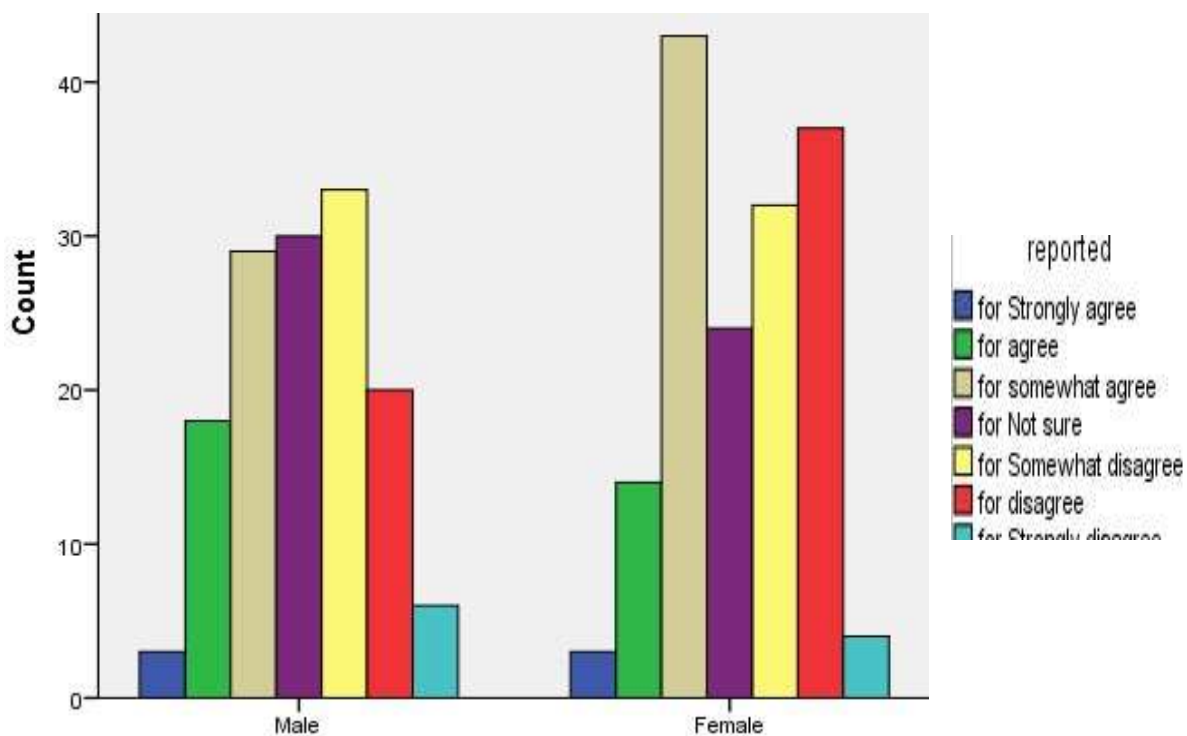
It indicates that both somewhat agree and somewhat disagree statement made by the initial customers were valid and it need to be given due importance to rectifying the errors. See Table 13 below.

**Table 13: Distribution of respondents according to their statement on “Initial utilization: Connectivity to water lines has been prompt**

S.No	Response	Frequency	Percent
1	For Strongly agree	6	2.0
2	For agree	32	10.8
3	For somewhat agree	72	24.3
4	For Not sure	54	18.2
5	For Somewhat disagree	65	22.0
6	For disagree	57	19.3
7	For Strongly disagree	10	3.4
<b>Total</b>		<b>296</b>	<b>100.0</b>

**Source: Field Research, 2018**

Among the people who were somewhat agree category for their statement on Initial utilization: Connectivity to water lines had been prompt (for those disconnected or seeking connection for the first time, women dominated than the male in more than 10%. It shows, there are higher number of acceptance prevailing among women towards “Initial utilization: Connectivity to water lines had been prompt (for those disconnected or seeking connection for the first time”. See Figure 10 below.



**Figure 10: Distribution of respondents according to their gender and the statement on “Initial utilization: Connectivity to water lines has been prompt (for those disconnected or seeking connection for the first time)”**

**Source: Field Research, 2018**

The distribution of respondents according to their statement on “I have accepted the cost it has taken me to have the water service initiated” was categorized into two categories. The two categories were “I have accepted the cost” and “I have not accepted the cost”. Out of 296 respondents, 33% have accepted the cost to have the water service initiated. The remaining 67% have not accepted the cost to have the water service initiated. See Table 14 below.

**Table 14: Distribution of respondents according to their statement on “I have accepted the cost it has taken me to have the water service initiated”**

<b>S.No</b>	<b>Response</b>	<b>Frequency</b>	<b>Percent</b>
1	I have accepted	98	33%
2	I have not accepted	198	67%
<b>Total</b>		<b>296</b>	<b>100%</b>

**Source: Field Research, 2018**

The distribution of respondents according to their statement on “I have accepted the cost it has taken me to have the water service maintained every month” was categorized into seven variables such as strongly agree, Agree, somewhat agree, Not sure, somewhat disagree, disagree and strongly disagree.

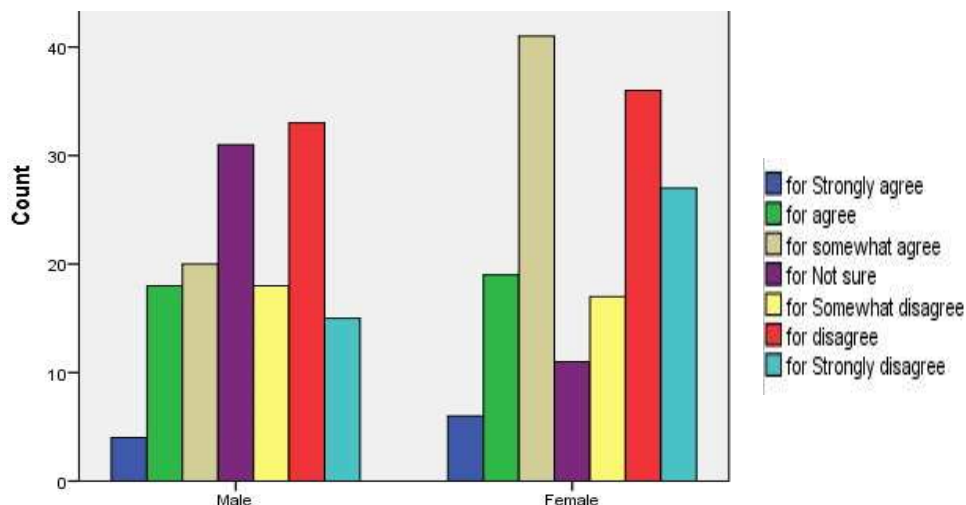
Out of 296 respondents, 23.3% of the respondents were disagreeing with the statement. The same statement somewhat was accepted by 20.6% of the respondents. Another interesting fact was, the statement was disagreed by a big margin with agreement. It was disagreed by 23.3% and agreed by 12.5%. This is evident that, the cost element of water service needs to convey the user in a proper way that would bring more positivity about the monthly service cost. See Table 15 below.

**Table 15: Distribution of respondents “I have accepted the cost it takes me to have the water service maintained every month”**

S.No	Response	Frequency	Percent
1	For Strongly agree	10	3.4
2	For agree	37	12.5
3	For somewhat agree	61	20.6
4	For Not sure	42	14.2
5	For Somewhat disagree	35	11.8
6	For disagree	69	23.3
7	For Strongly disagree	42	14.2
<b>Total</b>		<b>296</b>	<b>100.0</b>

**Source: Field Research, 2018**

Among the respondents, women were dominating than men to accept the maintenance cost of water service by authorities. More than 62% of the women accepted the statement when compared to 19% of the men who were in acceptance to the statement. See Figure 11 below.



**Figure 11: Distribution of respondents according to their age and the statement “I have accepted the cost it takes me to have the water service maintained every month”.**  
**Source: Field Research, 2018**

The distribution of respondents according to their statement on “Effective coverage: The frequency of domestic water supply is regular for hours, days and weeks” was categorized into seven variables such as strongly agree, Agree, somewhat agree, Not sure, somewhat disagree, disagree and strongly disagree.

Majority of the respondents (31.4%) were belongs disagree category towards the statement on “Effective coverage: The frequency of domestic water supply is regular for hours, days and weeks”. In the same manner, there was 22.6% of the respondents who also somewhat disagreed the statement and 11.1% of them were strongly disagreeing the statement.

It indicates that majority of them (67.1%) were disagreeing with the statement which means that the effective coverage including frequency of domestic water supply on regular for hours, days and weeks was not in place. See Table 16 below.

**Table 16: Distribution of respondents according to their statement on “Effective Coverage”**

S.No	Response	Frequency	Percent
1	For Strongly agree	5	1.7
2	For agree	34	11.5
3	For somewhat agree	56	18.9
4	For Not sure	8	2.7
5	For Somewhat disagree	67	22.6
6	For disagree	93	31.4
7	For Strongly disagree	33	11.1
<b>Total</b>		<b>296</b>	<b>100.0</b>

**Source: Field Research, 2018**

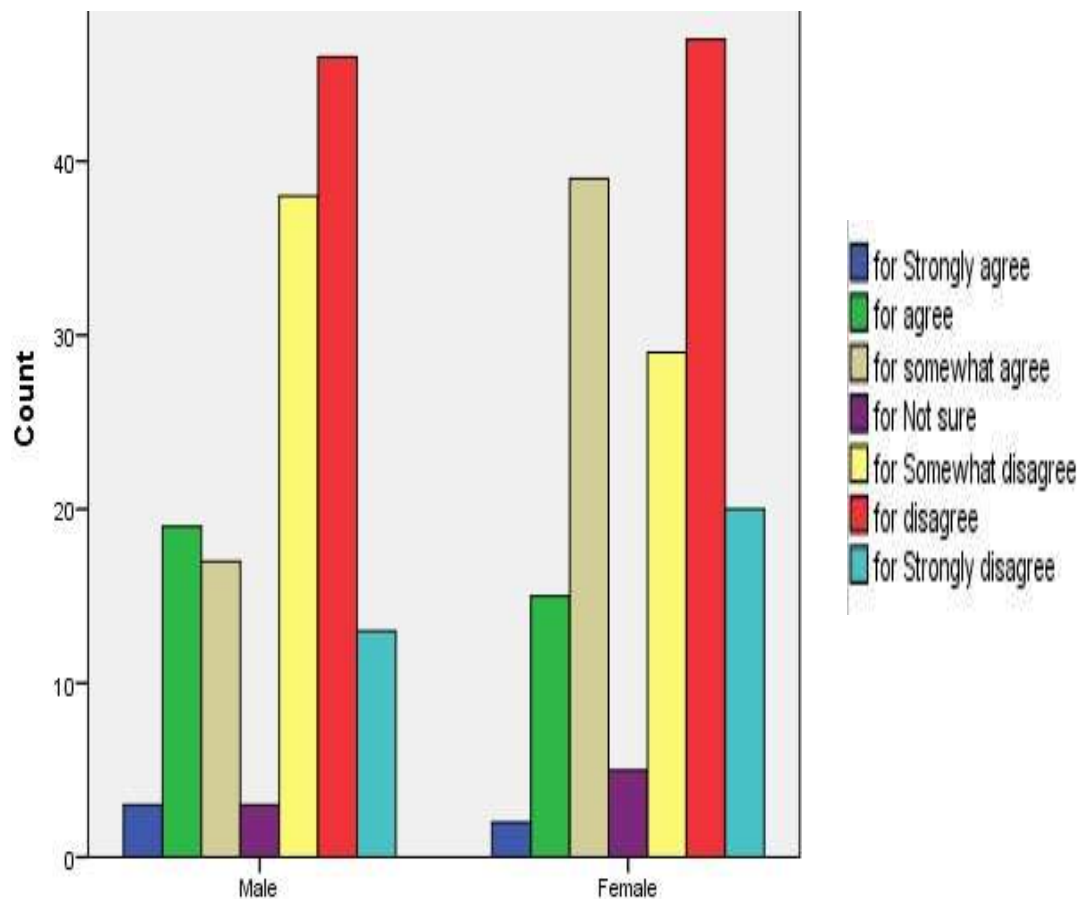
In this study the respondents from the service provider were asked to comment on the pattern of water reticulation per week. One theme emerged in relation to this question and this is) Pattern of water supply in residential areas. Below is an excerpt to affirm this.

*I must say that, residential areas have varied patterns of water supply. Residential areas such as PHI have timely continuous water supply. Jesmondine, Chudleigh, Chainama, Minestone. As for residential areas like Kaunda Square and M'tendere, water is rather scarce and residents are seen all over with drums and jelly cans ....It is not a good picture. Figure 12 below shows the challenges faced by residents of accessing water.*



**Figure 12: Kaunda Square residents accessing water from various places due to water interruption from the water service provider**  
**Source: Pictures by Author**

Among the respondents, both women and men equally dominated in disagreeing the statement on “Effective coverage: The frequency of domestic water supply is regular for hours, days and weeks”. It indicates that, the disagreement of the statement on effective coverage is a serious issue if the service is replicated in other places. Hence, this effective coverage issue must address effectively to satisfy the customers. See Figure 13 below.



**Figure 13: Effective coverage according to gender Source: Field Research, 2018**

The distribution of respondents according to their statement on “My household gets adequate water to meet the daily needs”, was categorized into seven variables such as strongly agree, Agree, Somewhat agree, Not sure, somewhat disagree, disagree and strongly disagree.

The majority of the respondents (31.4%) disagreed the statement on “My household gets adequate water to meet the daily needs”. In the same manner, 16.9% respondents somewhat disagreed and 13.9% of the respondents strongly disagreed the statement. It indicates that majority of them (61.2%) disagreed the statement which means that most of the household did not received adequate water to meet the daily needs. See Table 17 below.

**Table 17: Cross tabulation of adequate household water needs based on gender**

	My household gets adequate water to meet the daily needs							Total
	SA	A	SWA	SWD A	DA	SDA	NR	
Male	9	21	16	14	46	19	7	136
Female	11	14	33	32	44	19	5	158
Non responsive	0	0	1	0	1	0	0	2
Total	20	35	50	46	91	38	7	296
Pearson ChiSquare	19.569	Asymp. Sig. (2sided)	PR=0.14					

**Source: Field Research, 2018**

In this study, respondents from the service provider were asked to comment on the temporal deviations of water supply. Two themes emerged in relation to this question and these are) a) inadequate supply and (b) erratic water supply. Below are the excerpts to affirm this.

### **Inadequate Supply**

I must confess to you that we have challenges in this area. We do not have enough water to go round because the population has grown.

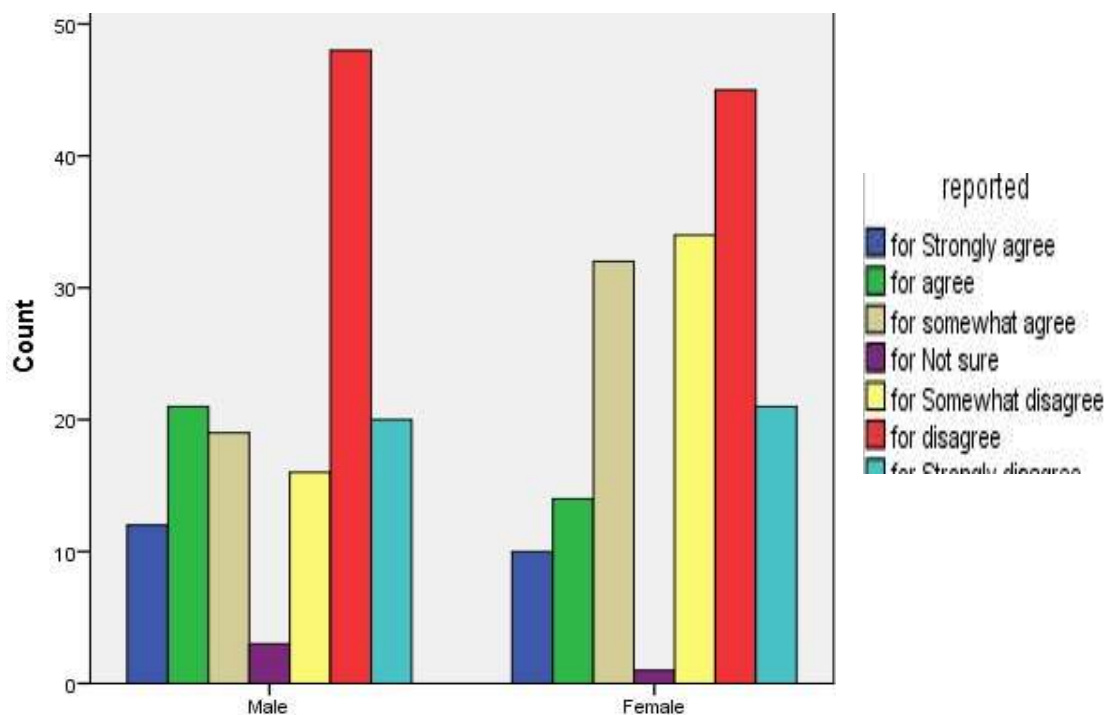


## Erratic water supply

There was a persistent erratic supply of water in most areas in Munali. One meter reader had this to say.

*I must say that water runs for a very short time of about 8 hours in a day from 16 hours up to midnight. In fact, water also runs 90 days inconsistency in 365 days.*

Among the respondents, both women and men equally dominated in disagreeing the statement with slight difference on “My household gets adequate water to meet the daily needs”. It indicates that, the disagreement of the statement on receiving adequate water to meet the daily needs as basic needs are not meet by the service. See Figure 14 below.



**Figure 14: Distribution of respondents according to their age and the statement “My household gets adequate water to meet the daily needs”**

**Source: Field Research, 2018**

The distribution of respondents according to their statement on “How satisfied have you been with the service?” was categorized into seven variables such as strongly agree, Agree, Somewhat agree, Not sure, somewhat disagree, disagree and strongly disagree. Majority of the respondents (29.7%) were disagree the statement on “How satisfied have you been with the service”. In the same manner, 27.4% were strongly disagreeing and 14.5% of the respondents somewhat disagree the statement.

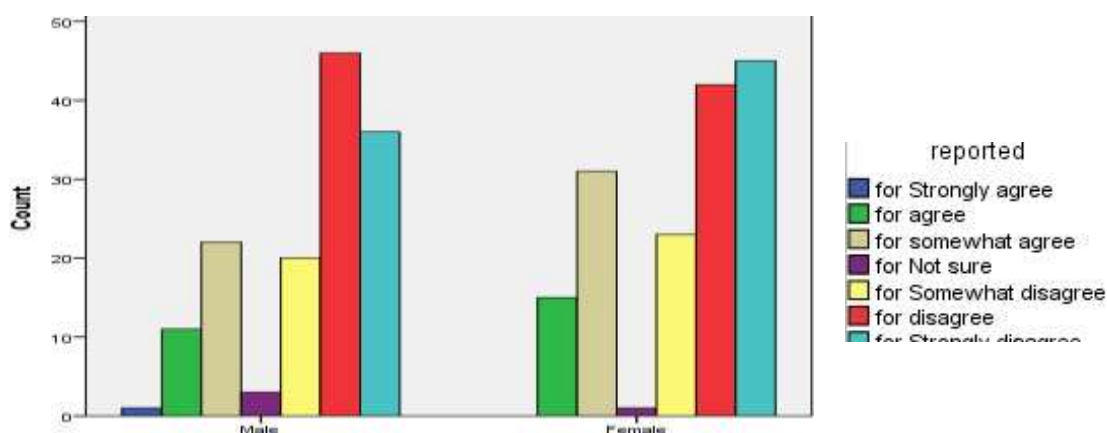
It indicates that majority of them (71.6%) disagreed the statement which means that most of the household were not satisfied with the service offered by water utility company. See Table 18 below.

**Table 18: Distribution of respondents according to their response towards “How satisfied have you been with the service”**

S.No	Response	Frequency	Percent
1	For Strongly agree	1	.3
2	For agree	26	8.8
3	For somewhat agree	53	17.9
4	For Not sure	4	1.4
5	For Somewhat disagree	43	14.5
6	For disagree	88	29.7
7	For Strongly disagree	81	27.4
<b>Total</b>		<b>296</b>	<b>100.0</b>

**Source: Field Research, 2018**

Among the respondents, men are slightly dominating women in disagreeing on satisfaction of service rendered by water utility company. See Figure 15 below.



**Figure 15: Distribution of respondents according to their age and the statement “How satisfied have you been with the service”**  
**Source: Field Research, 2018**

The Pearson Chi Square test was performed on acceptance of water service according to gender. Slightly more females than males accepted the service provided by water utility company. The majority of the respondents belong to the Somewhat agree category. In contrast the minority belong to the Strongly agree category. See Table 19 below.

**Table 19: Acceptance of water service by gender**

	I_have_accepted_water_service							Total
	Strongly agree	Agree	Somew hat agree	Somewhat disagree	Disa gree	Strongl y disagree e	Non resp ons ive	
Male	8	19	60	17	25	7	10	136
Female	2	23	60	16	33	15	9	158
Non responsi ve	0	0	1	0	1	0	0	2
Total	10	42	111	33	59	22	19	296
Pearson ChiSqu are	24.992a	Asymp. Sig. (2sided)	0.035					

#### 4.4. Assessment of Availability and Accessibility of Water Utilities by Service Provider

The respondents were distributed according to their township that they are in charge of water service. Out of 10 respondents, 6 of them were representing Individual Townships while 2 represent same townships namely Chelston and PHI. See Table 20 below.

**Table 20: Distribution of respondents according to their township that they are in charge with water service**

S.No	Township in charge for water service	Frequency	Percent
1	Chainama	1	10.0
2	Chelston	2	20.0
3	Chudleigh	1	10.0
4	Kaunda Square Stage1	1	10.0
5	Jesmondine	1	10.0
6	Kaunda Square Stage2	1	10.0
7	Mine Stone	1	10.0
8	PHI	2	20.0
<b>Total</b>		<b>10</b>	<b>100.0</b>

**Source: Field Research, 2018**

The respondents were distributed according to their terms of use of providing the water service (Position in the company). Out of 10 respondents, 30% of them represent fourth level position and 20% represented sixth level positions, 10% represented by third level position and 10% presented first level, second level and fifth levels. See Table 21 below.

**Table 21: Distribution of respondents according to their terms of use of providing the water service (Position in the company)**

Position in the Company			
S. NO		Frequency	Percent
1	Branch Manager	1	10
2	Customer Service Officer	1	10
3	Billing and Revenue Officer	2	10
4	Billing and Revenue Assistant	3	20
5	Superintendent	1	10
6	Plumber	2	40
<b>Total</b>		<b>10</b>	<b>100</b>

**Source: Field Research, 2018**

The respondents among the service providers were distributed according to their gender. The 90% of respondents were male and 10% of respondents were female. See Table 22 below.

**Table 22: Distribution of respondents according to their gender**

S.No	Gender	Frequency	Percent
1	Male	9	90
2	Female	1	10
<b>Total</b>		<b>10</b>	<b>100.0</b>

**Source: Field Research, 2018**

The respondents were distributed according to their age groups. The age group starts from 26. The age group is divided into 4 categories with 5 years of class interval. It is

easy to understand from the table that the majority of the employees belong to the age group of 31 to 35 years. See Table 23 below.

**Table 23: Distribution of respondents according to their age**

S.No	Age of the respondent	Frequency	Percent
1	26 to 30 Years	1	10.0
2	31 to 35 Years	6	60.0
3	36 to 40 Years	1	10.0
4	41 to 45 Years	2	20.0
<b>Total</b>		<b>10</b>	<b>100.0</b>

**Source: Field Research, 2018**

The respondents were distributed according to their length of service in charge for running water per day. Majority of the employees (80%) involved in less than 6 hours of water service work per day and the remaining 20% of the employees, doing their duty from 6 to 12 hours. See Table 24 below.

**Table 24: Distribution of respondents according to their length of service in charge for running water per day**

S.No	Length of water service	Frequency	Percent
1	6 to 12 hours	2	20.0
2	Less than 6 hours a day	8	80.0
<b>Total</b>		<b>10</b>	<b>100.0</b>

**Source: Field Research, 2018**

The respondents were distributed according to their response towards the price of domestic water is realistic. Majority of the employees (70%) agreed that price of domestic water is realistic. In general, all of them were agreed that the price of domestic water is realist and no one contradicted the view of the local authorities. See Table 25 below.

**Table 25: Distribution of respondents according to their response towards the price of domestic water is realistic**

S.No	Response towards price of domestic water	Frequency	Percent
1	For Strongly agree,	1	10.0
2	For agree	7	70.0
3	For somewhat agree	2	20.0
<b>Total</b>		<b>10</b>	<b>100.0</b>

**Source: Field Research, 2018**

The respondents were distributed according to their response towards maintenance of the water lines – pipes is prompt once reported. Majority of the employees (40%) strongly agreed that the response towards maintenance of the water lines is promoted except marginal (10%) number of respondent. See Table 26 below.

**Table 26: Distribution of respondents according to their response towards maintenance of the water lines – pipes is prompt once reported**

S.No	Response towards maintenance of water utilities	Frequency	Percent
1	For Strongly agree,	4	40.0
2	For agree	2	20.0
3	For somewhat agree	3	30.0
4	For Somewhat disagree	1	10.0
<b>Total</b>		<b>10</b>	<b>100.0</b>

**Source: Field Research, 2018**

The respondents were distributed according to their response towards most of the residents have found an alternative source of domestic water supply. Majority of the employees (90%) agreed that most of the residents have found an alternative source of domestic water supply except marginal (10%) number of respondent. See Table 27 below.

**Table 27: Distribution of respondents according to their response towards most of the residents have found an alternative source of domestic water supply**

S.No	Response towards need to found alternative source of domestic water supply	Frequency	Percent
1	for Strongly agree,	3	30.0
2	for agree	3	30.0
3	for somewhat agree	3	30.0
4	for disagree	1	10.0
<b>Total</b>		<b>10</b>	<b>100.0</b>

**Source: Field Research, 2018**



The respondents were distributed according to their response towards Contact or utilization coverage in the last three months, how many times have you been to the township to provide water using alternative means. Majority of the employees (50%) agreed that the beneficiaries contacted them from 6 to 10 times during last three months and 20% of them were contacted more than 11 times. There are 30% of the respondents were not contacted by the beneficiaries' not even a single time during the last three months. The 50% respondents and 20% respondents that were contacted can explain the inadequate amount of water supply and this could have been also a mitigating factor after the cholera breakout during the same period. See Table 28 below.

**Table 28: Number of times provided with water using alternative means**

S.No	Response towards utilization coverage	Frequency	Percent
1	Not used	3	30.0
2	6 to 10 times	5	50.0
3	Above 11 times	2	20.0
<b>Total</b>		<b>10</b>	<b>100.0</b>

**Source: Field Research, 2018**

The respondents were distributed according to their response towards how satisfied do you see your customers for the water service? Majority of the respondents (40%) dissatisfied towards customer satisfaction and also 20% are somewhat dissatisfied in customer satisfaction ground. Marginal number (10%) was attaining customer satisfaction. See Table 29 below.

**Table 29: Distribution of respondents according to their response towards how satisfied do you see your customers for the water service?**

<b>S.No</b>	<b>Response towards customer satisfaction</b>	<b>Frequency</b>	<b>Percent</b>
1	For Very satisfied	1	10.0
2	For satisfied	1	10.0
3	For Not sure	1	10.0
4	For Somewhat dissatisfied	2	20.0
5	For dissatisfied	4	40.0
6	For very dissatisfied	1	10.0
<b>Total</b>		<b>10</b>	<b>100.0</b>

**Source: Field Research, 2018**

In order to ensure maximum consumer benefit, service providers are required to guarantee a specific service standard which may differ among the various service providers and service areas for a water service provider due to geographical location and the differences in the state of the inherited infrastructure. A Service Level Guarantee is signed at the time of licensing and subsequently every three years. It stipulates the minimum expected service from the providers on which the ruling water tariffs are set. Water service providers are therefore mandated to make the service level guarantees public and inform both the consumers and the regulator should they fail to offer the guaranteed service.

From the findings revealed that over time, service providers were expected to progressively improve their guaranteed service towards the Required Service Standard. Service Level Agreements are therefore signed between customers and the service providers in which service providers commit themselves to meeting certain targets with stipulated means, within the specified period. Future tariff adjustments were influenced by the progress made by service providers in meeting their targets. Certainly, penalizing

non-achievement by denying price increases could compound the financial sustainability problems resulting from below-cost prices.  
(See Appendix I for the service level guarantee form.)

#### 4.5 Hypothesis Testing

A Correlation analysis was performed to determine how household water adequacy, the frequency of water supply, and the respondent's acceptance to pay for water supply are association.

		<b>My household gets adequate water supply 'to meet the daily needs</b>	<b>The frequency of water supply is regular for hours, days and weeks</b>	<b>I have accepted the cost it has taken me to have the water service maintained every month</b>
<b>My household gets adequate water to meet the daily needs</b>	Pearson Correlation	1	.934**	.501**
	Sig.(2-tailed)		0	0
	N	291	291	291
<b>The frequency of water supply is regular for hours, days and weeks</b>	Pearson Correlation	.934**	1	.550**
	Sig. (2-tailed)	0		0
	N	291	291	291
<b>I have accepted the cost it has taken me to have the water service maintained every month</b>	Pearson Correlation	.501**	.550**	1
	Sig. (2-tailed)	0	0	
	N	291	291	291

Variable(s) entered on step

## Monthly water bill, water supply adequacy

From the correlation analysis results table, it can be seen that the regularity in the frequency of water supply is the most significant factor impacting the adequacy of water that a household gets. To further determine whether there was any other significant factor that could be associated with a household getting adequate supply of water, a binary logistic regression was performed. However, the results indicate that none of the other factors were statistically significant (see Appendix II).

However, interviews revealed numerous challenges with service provision and particularly with regularity and adequacy of water supply. The state of the Lusaka Water and Sewage Company for Munali now is in a state of disrepair. Because of erratic water supply, a few residents are trying cope and doing all sorts of things to cope. They noted the constant breakdowns of the water supply system, low coverage of Water supply where some compounds were more hit than others. There were times when LWSC offered assistance in times of total deprivation and this was considered as assistance out of gratis.

Below are the excerpts to affirm this scenario.

### *Constant breakdowns of the water supply system*

Residents had numerous lamentations about constant breakdowns one had this to say.  
*It is not easy to be a resident of Munali because in some areas like M'tendere, the water barely reaches our homes. When you walk around, you will see leaking pipes allover and these guys (meaning staff from LWSC) are only specialized in water disconnection and reading consumption....*

Mr. Chanakila a retired teacher

Low coverage of drinking water was one area of great concern in service delivery that nearly all staff mentioned.

*We now have established that at present nearly every household has a complaint. We are actually supplying water erratically...water availability is quite low.*

One employee noted that the residents of Chudleigh and Jesmondine tend to face problems which are mostly beyond their ability to cope and as such, LWSC has put measures so that the residents are helped. The testimonies below will suffice.

*The community is able to come to the office when they have challenges. I remember, they had a problem with the main pipeline, and I remember they came to the office, at that time, I gave them the bowser and they got about 510 Litres per home...we had to deliver water to them...*

*Branch Manager*

We do not have adequate personnel to go around. Kaunda Square is very huge... We have tried to recruit staff and we lose them. They all seem to go to the mining firms. We cannot pay competitive salaries at all. This has been affecting our operations.... Main barriers to service delivery identified from causal analysis in the two regions.

*Superintendent*

In terms of chemicals to treat water, we never supply water that is not treated, that is guaranteed. Each time we supply water, we make sure that here in Chelston, this water you are seeing is treated.

*Branch Manager*

We do not run out of chemicals to treat water. However, there are limitations in terms of infrastructure. As we expand our service lines, we also need to upscale and also improve, starting from the intake, the reservoir tanks, all that has to be updated to suit the demand.

*Branch Manager*

### *Availability of spare parts*

In Kaunda Square I and II, informants confirmed the low availability of spare parts and materials like pipes, taps and valves to lay the system.

We have run out of end point water and sewer pipes tests, but we have those larger ones

*Plumber Kaunda Square I*

We have the materials but it is not enough, so we have to ask our customers to meet some of the costs... I mean they will have to buy some piping for about 60 meters...

*Customer Service Officer Chelston*

### *Infrastructure*

The challenge we have in Kaunda Square is the infrastructure itself. The amount of water that we need to supply to our customers, as I said earlier is huge and we do not have enough money. Water and sanitation require a lot of investments... The demand for water has more than tripled but the infrastructure has remained the same and because of that we are not able to supply all the areas with adequate quantities of water.

*Branch Manager*

The cost that is proving to be high is the maintenance of the machinery, they breakdown so often. We have tried to put protective gadgets but they fail us, we have lost so many pumps out of electrical faults.

*Plumber*

The demand for water in has more than tripled but the infrastructure has remained the same and because of that we are not able to supply all the areas with adequate quantities of water.

*Superintendent*

We are trying to reach out to our customers. However, there are limitations in terms of infrastructure. As we expand our service lines, we also need to upscale and also improve, starting from the intake, the reservoir tanks, all that has to be updated to suit the demand.

*Billing and Revenue Officer*

### *Observations*

In order to have a well-balanced approach to the study and triangulate the research findings, the researcher conducted field transect walks and made consultations as she met people in particular spots. Though few people were interviewed, during the transect walks, care was taken to ensure that the people who were interviewed were ideal to comment on the various project points in order to render the overall scenario of the state in terms of water availability, sanitation practices, socio-cultural and the economic environment.

These transect walks helped to map out the implementation and project closure omissions and what the scenario was like on the ground. This exercise generated treasured information, and insights into project capacities and the people's indigenous knowledge and skills sets.

From the interviews, it was evident that for Munali, there was a state of the art and science type of boreholes and water storage system. There was a good degree of technical capacity. This is what some of the respondents had to say about the erratic and inadequate water supply.

*Though we have water shortages, we just wonder what is happening... It was in 2003 that the Chelston water reticulation system was commissioned...It was a mega project...and now there is no water...we have to drive some long distance to fetch water or wait late in the night to draw water in our tanks. It is just pity that we now have less water in this new millennium.*

*Grace a Widow 55*

### *Weaknesses of the project management*

There were numerous complaints presented which are related to the need for capacity building towards sustainability of the water reticulation project in Munali. Most of the residents and staff pointed out the weaknesses and barriers to water supply in Munali. The following illustrates weaknesses of the project management towards building capacity to project sustainability.

*I did not like the selective induction of some staff who were to deal with our customer needs and service provision. Headquarters decided on its own who could be members of the water crisis committee or preventive maintenance team. There has been no community involvement in terms of presentation. This is why we are in this failing state.*

*Hankaanga 43 a water engineer*

One other engineer contradicted the need to have community representation in the decisions made when and where to supply water in the event that there was a crisis.

*You think our communities have technical skills imparted by the project. No not at all. What they show is just there local knowledge so that they could take up operation and maintenance of water supply and water based livelihood support systems.*

*Mrs. Kajoba a service user aged 29*

The fact that the water project in Munali could be said to have failed, it was stated that the institutional structure of LWSC did not have capacity to manage the service. Embrace the elements of sustainability. Some staff from LWSC pointed it out as one of the many drawbacks to water supply. The following were noted during the study as contributing factors to service provision weaknesses and challenges. Bureaucracy, ineffective preventive and monitoring activities and strategies as well as too much politicking. There was also mention of vandalism and untimely refusal to pay water levies. The testimonies below point to these bottlenecks.



## ***Bureaucracy***

*What we deduced from the stakeholder joint meetings was that the management of LWSC were driven entirely by top-down approaches...I mean you could see that a technical bureaucracy was created within the company and it had no scope for meeting the expectations of the community embraced in the strategic operations.*

*Mr. Chiboola a technician*

*We made suggestions as to what we could do...however, the decision making process in LWSC is rather cumbersome...To make a decision like “yes you can buy new pipes” tended to be highly centralized ....*

*Alick 27 a Technician*

## ***Technical Vandalism***

While the water project is in the hands of LWSC, it appears that LWSC is not in a position to ensure that technical vandals (companies that are involved in development projects) like installing telephone lines, internet cables as well expanding roads undertake repairs when they cut water lines. Below are excerpts of the state of vandalism and counter measures.

*While we may not appear to be in control of these development projects, we have tried to ensure that there is unity and adherence to good practices. We have given developers maps where our water lines pass....as well as estimates of repairs once our lines are cut. These include the do's and don'ts. However, nothing has been fruitful and we end up with water disruptions...*

*Lubobya 39 a meter reader*

## ***Refusal to pay even paltry levies***

Regarding the levy Ms. Chilala had this to say

*I can say that we all are willing to pay for this service. But how can you when you get a wrong bill when you have had no regular water?....*

## **4.6 Bottlenecks**

This section is related to the second research question which is “Why has there been the spatial deviations, temporal deviations and pattern of water reticulation to Munali Catchment customers in the last five years?” The question demanded outlining the bottlenecks from the point of view of water actors and users. The modified Tanahashi model was used to address this question. The model that was used in this study as described earlier was modified for its use to assess what barriers could be experienced in the water service delivery. One modification to the Tanahashi model still focuses on determinates of effective coverage which is defined as coverage of sufficient quality to reach a defined service impact and not merely geographic access. The barriers were all located on the supply side. Documentary reviews and interviews generated fifteen barriers /bottlenecks to water service delivery. Some of the barriers were crosscutting (appearing in some stages within the model) see Table 30 below.

**Table 30: Observed bottleneck barriers to service delivery**

<i>Domain of barrier</i>	<i>Descriptor</i>
<i>Availability of coverage.</i> Availability of system inputs, for example, chlorine and related commodities for water treatment	Limited proportion of service centers that provide water services like inquiring for services, application for services, payment for services and grievance handling
<i>Accessibility and utilization of service.</i> Coverage physical accessibility of service delivery points. And may also represent availability of staff at facilities that provide services.	General inadequate skilled technical and managerial personnel Mal distribution of staff, other requisites High cost of services Distance rather far (for repairs) Unavailability and stock out of essential inputs Power outages and shortages
<i>Timely continuous utilization.</i> The extent to which the full course of contact with the service system is required to be effective was achieved, for example, the proportion of households receiving water all the time and adequately or part of the time and inadequately	8) High cost of services particularly water affected by financing challenges 9) Lack of availability of resources (Inadequate skilled technical and managerial personnel, inadequate funds, equipment, sundries, and spare parts) and service. 10) Weak or no existing systems of data validation 11) Irregular supervision and monitoring 12) Poor data quality and usage
<i>Effective Coverage.</i> Represents the quality of the intervention which is defined as the minimum inputs and processes sufficient to achieve defined effects	13) Delay in supply of water as evidenced by lack of availability of resources and distance. 14) None reconnection due to lack of availability of resources and service 15) Inadequate chemicals and supply chain management challenges 16) Infrequent maintenance of outdated network of asbestos concrete pipes. The company has a high Non-Revenue Water of 48% compared to a desired level of 25%. This means that 48% of the water produced is lost through leakages in the network and commercial losses

## **CHAPTER FIVE**

### **DISCUSSION OF FINDINGS**

#### **5.1 Introduction**

This chapter presents the discussion of the findings presented in the previous chapter. It is organized based on the following subtitles arising from the research objectives: to develop a model that could be used to solve the perennial water supply challenges in Munali Catchment. Case study of selected Townships.

#### **5.2 Accessibility and Effective Coverage of Water Supply**

Water supply and sanitation service related complaints and their methods of resolution were used to measure performance of water supply and sanitation service providers. Water consumers at one time or another may experience dissatisfaction with the level of service and may wish to raise complaints with their service provider. Types of complaints range from erratic or no water supply, sewer blockages, leakages in pipes and at meter, perceived undue billing, late delivery of bills, and customer care, low pressure and unjustified disconnections among others.

#### **From the findings presented in this study to describe the temporal deviations of water reticulation to customers weekly**

During the survey, it was heard, in most communities sampled, that their service providers had not prescribed times of water availability and when supply would be interrupted at connection points. Rationing of water supply was also said to have no proper known timetable, hence making it a challenge for consumers to adapt to erratic water supply situations. This increased the frequency of ‘inadequate water supply’ being cited as the most complaint raised to service providers.

The findings revealed that water runs for 8 hours a day from 16 hours to midnight and 90 days inconsistency in 365 days for the past five years because the water service providers experienced some challenges in Munali Catchment because they did not have enough water to go round due to the overspill of the population that had over stretched on the same water resource.

In addition, the increase in housing units vis-à-vis population was not proportional to supply coverage by service providers. Whilst more housing units were being established, water reservoirs and reticulation systems remained constant. As a consequence, this put a strain on the use of available water from constant storage facilities making it a challenge to have sufficient water for all.

This is affirmed by a study by (Kaharir 2014) conducted an assessment of the challenges of water supply and sanitation in uncontrolled residential developments of Huruma estate, Nairobi County, and he found that increased urban population has a direct impact on water supply and sanitation in Huruma estate as it was found to be a major cause of this challenge with 55% in agreement to this. Water reticulation in uncontrolled residential developments is seen to be challenged by increased population, this implies that the more the population increases there should be a deliberate and well controlled residential development that factors in water reticulation. However, increase in population is not the only factor that poses a challenge to water reticulation in residential areas.

A similar study in Masvingo municipality studied by Mapfumo and Madesha (2014) identified other factors alongside population growth that impact on water reticulation. The study identified population growth, poor infrastructure, economic challenges and climate change as the major challenges affecting efficient water delivery in Masvingo city. This study presupposes that population increase is not so much of a problem rather poor infrastructure economic challenges and climate change compound the problem of water reticulation. If infrastructure is in a good state, population growth is not a problem.

However, this study introduces other factors such as climate change and economic challenges. There are still many other factors apart from these alongside population growth.

With regards to households in Munali Catchment, service providers failed to supply water in Munali Catchment at standpipes for a minimum of 6 hours on a daily basis. This was because of complications with man power and poor work culture by personnel manning the standpipes. Additionally, these communities were billed less on a social tariff rate for affordability hence service providers did not concentrate their efforts to supplying sufficient water to these areas. More supply hours were in high and middle income areas where it was believed that service providers did not operate at a loss. This was one way of ensuring service providers' sustainability. Water coverage is still low in low income communities. Residents affected by low water service coverage are forced to seek temporal alternative sources of water. See Figure 16 below.



**Figure 16: People accessing water from various places due to low water coverage in Munali Catchment.**  
**Source: Pictures by Author**

The other things that caused the temporal deviations of water reticulation to customers weekly in Munali Town ships were: Spare parts are somewhat of a challenge during the rainy season if they experience the damage to the pipes, lack of financial resources was seen as a constraint to improved service provision to customers. Service providers have a challenge of meeting operational costs from service bills because water supply and sanitation service bills in Zambia, particularly in Munali townships are subsidized to ensure that all consumers can afford to access the service. This has implications on operational costs incurred by service providers to enable them improve service delivery of water supply and sanitation in the study areas.

The result revealed that, most of the investments in water supply and sanitation have come from international finance and donor agencies which were by far below the funds required by the sector. The accompanied local funds from the government were also in short supply. The result was that huge gaps in terms of finance were created and service delivery was challenged in most cases.

It also revealed that the money which the Service providers got from the donor Agencies mainly were meant for repairs and not for replacement of various equipment that might require an entire area to be worked on. Field workers such as plumbers were few while Engineers who were planners were adequately. Chemicals such as gas chlorine, granular and liquid chlorine were adequately available.

Results of this study suggested that lack of financial resources was a major issue to water service provision, looking at the high percentage of service providers citing it as a challenge. The water supply and sanitation sub sector lacks necessary funds to finance the required investment on water supply facilities development and rehabilitation, particularly to underserved areas.

Like many suburbs area in Lusaka, the study areas in Munali Catchment had high demand for domestic water, causing the Local water suppliers to open up more water pumps and storage capacities of water in order to increase water supply (NWASCO, 2010).

It was very much evident that, majority of the respondents were fully dependent on running water from water utility company and if any problem arises in the running water system, that would affect the majority of the people who don't have adequate storage capacity. Furthermore, in the study areas, expansion of water supply and sanitation service provision to underserved areas had been minimal, as evidenced by the numerous individual initiatives to sink boreholes and use of on-site sanitation due to lack of finances for infrastructural development on the part of service providers. It was seemingly hard to get connected to the main reticulation system and hence some new housing units in Chudleigh extension, for instance, have adopted the use of boreholes and on-site for water access. This was among the many newly expanded community not serviced by LWSC in Lusaka District. In peri-urban areas, the challenge on sanitation coverage was on building space, while water supply was made available by either LWSC in particular areas.

### **5.3 Spatial deviations of water reticulation to customers weekly**

#### **Elevation points**

From the findings of this study it showed that most elevations points such as Chainama, Kaunda Square Stage I, Kaunda Square Stage II and Minestone have no additional pumping stations but they receive water because they are allocated along the gravity line. PHI has Access to water because it has an additional pump station with the capacity of 565000 litres of storage capacity of water. On the other hand the medium and highly density areas do experience erratic water reticulation.

The study however, also showed Jesmondine and Chudleigh experienced water reticulation challenges as a result of the elevation point i.e. they are situated above the Gravity Line. Thus, Jesmondine and Chudleigh are affected due to the Gravity Line



which is allocated on the lower part of these two townships and these Townships do not have additional pump station.

### **Initial utilization connectivity of water**

The findings on the initial utilization connectivity from the data presented in chapter four of the study revealed that the customers' initial utilization connectivity of water were prompt but the actual service of water is not guaranteed because they receive water for less than 6 hours. During the study, it was heard, in most communities sampled, that their service providers had not prescribed times of water availability and when supply would be interrupted at connection points. Rationing of water supply was also said to have no proper known timetable, hence making it a challenge for consumers to adapt to. This is contrary to the service level guarantee signed that relate to water supply:

- a. average daily water supply duration at connection:22hours
- b. average daily water supply duration at public distribution system:12 hours

Additionally, long queues were formed in the event that water supply was made available at connection points because many would have no water stored at home. The limited time given to access water meant that many households could only obtain little water for the day and other water needs remained unmet. Time spent accessing water was, therefore, much longer than necessary and less was spent on productive activities. As a result, poverty eradication, especially in low income communities, could still be a problem, particularly because people still concentrated on access to the most basic requirements of life's survival rather than putting their focus engaging in economic activities to earn income. Women and children, in most cases, were greatly affected by the lack or inadequate supply of water because they had been tasked "traditionally" with the responsibility to ensure that there was water available in homes.

The literature review, on the other hand, revealed that in order to improve sustainability of water resources and systems in the water sector, the government embarked on the

ambitious programme of letting community and Local Government to plan, implement, operate and manage water supply schemes. In addition, there has been a shift of State Government from the role of service provider to facilitator. Communities and local institutions are allowed a considerable degree of flexibility in choosing the appropriate institutional model for service delivery suited to their own specific local context. By introducing this Naidu (2002) argues that the programme has challenged the traditional top-down model of delivery of water supply services by State Government owned Engineering Departments and Agencies. Further, experience has shown that delivery by agencies that are far away from users leads sometimes to the creation of unsustainable schemes that are, more often than not, unsuited to meeting the requirements of those whom they are designed to serve and, therefore, unsustainable (Naidu 2002).

In an Annual report, DTF (2010) observation glorifies the ability of community and Local Authorities to plan and implement water supply locally. This assertion may not be conclusive, in that he does not clearly delineate the boundaries of Local Authorities and that of the State Government. State Government, as facilitator, is also responsible for funding the programme. It would, therefore, be a fallacy to assume that top-down model of delivery of services has been challenged completely because programme implementation relies on State Government funding. The State still has a bigger role to play in deciding how much should be channeled to the water supply programme, making the community and Local Authorities still highly reliant on State Government. Further, having to obtain funds from State Government requires that community and the Local Authority be accountable to the state. Therefore, there is not much autonomy as Naidu (2002) assumes, to exercise their authority because programme implementation would still be stipulated by State Government.

### **Water Bills**

Complaints of exaggerated and/or erroneous water bills also scored highly as the most raised complaints of water supply related problems in the study areas. This complaint stemmed from high bills people paid, yet meter reading was not done regularly, in the

case of metered households. It was heard during the survey that meter readers seldom carried out the meter reading exercise, yet bills were made available monthly. The difficulty was on understanding how the service bills were derived at. Recommendation was, therefore, made that when meter reading was being done, customers were supposed to be present to carry out their own assessment, and then compare readings at the end of the month to ensure that consumption of water quoted by the service providers corresponded with what the consumer had recorded. This was said to be a solution in reducing contested water bills. Water bills were also contested if they were high for most of the time yet, water supply continuously erratic (Nkuwa 2006).

Any improvements made in service provision requires multifaceted approaches which service providers and other stakeholders involved in water supply have tried to implement in the last 21 years of being in operation (for LWSC). Such approaches were premised on the view that efficient management of water supply service provision brings about financial sustainability, customer responsiveness and optimal use of resources. In addition, for enhancement in service provision to be realized, there should be systematic techniques put in place to effectively recover operations and maintenance costs from water users. There should also be an adequate tariff policy that promotes effective cost recovery of capital resources and preserves the social objectives of providing equity of access and free basic water supply for poorer consumer groups (Mukwena 2002).

Billing of water supply service should be favourable and affordable to the consumer and not to be seen as exploitative, if it has to qualify for good performance. Water is a finite and vulnerable resource, distributed unevenly in space and in time. As such, many have come to realize that it must be treated as an economic good. To price water is to discourage waste and corruption. However, in order to ensure that the poor do not suffer from the universal adoption of pricing, social and financial solidarity is essential. Pricing can be used as a mechanism to ensure that the poor will have access to water at a price they can afford (through focused subsidies, or cross-subsidies to the poor). Pricing can also be used as a tool to re-allocate water among users, including the environment

(provided that the market mechanisms include a means to ensure that someone has the means to pay for water thus allocated).

The study carried by Bhalla (1998) revealed that, a consequence of poor management is the low level of service and coverage of the water services. The International Drinking Water Supply and Sanitation Decade (1980-1989) has not solved Africa's water and waste water problems. An evaluation of the achievements at the end of the decade shows that the percentage of water supply coverage increased to 41%. In the urban sector, the coverage increased from 66% in 1980 to 77% in 1990. In the suburbs sector, however, the coverage increased from 22% to just 26%. The wealthiest countries in terms of per capita income have better developed water supply systems in the suburb areas. This implies that the urban supplies are also relatively better developed in such states, since decision makers who live in African cities normally take care of themselves first before helping the rural communities. On the whole, the water supply situation, instead of getting better, has actually got worse in a number of the countries in the region, as the rate of population growth continues to outpace the rates of increase in level and coverage of water services.

The implications of inadequate water supply are well known in both the congested urban areas and the neglected low income communities. Clearly, the water service levels are severely constrained by the level and coverage of water supply. For example, there can be no full flush sewer systems where there is no adequate connection of water through buildings. Considerable health improvement could be brought about by an improved water supply (Mbilima 2008).

#### **5.4 Reasons for Such Patterns of Water**

Findings from the point observed from water service providers about patterns of water were as follows;

**a) Amount of water supplied was less than demand**

The size of main water pipe from the source was inadequate as it was 24 inches and failed to supply water to an over stretched population. In as much as the size was far too small to meet the need of adequate water reticulation, the same pipe was outdated including the entire network that had not been changed from its inception.

**b) Non-availability of Booster pumps in strategic points**

Findings showed that due to donor dependence for funds, the service provider failed to source Booster pumps that could have been installed in strategic points to help with adequate water pressure and supply.

**c) No reservoirs in strategic points**

Funds for constructing reservoirs in strategic points was also an issue. Because service providers did not have enough fund for constructing reservoirs and they mainly depend on donors.

**d) Out-dated network of Asbestos Concrete**

These asbestos concrete pipes were posing a serious problem most especially in a rainy season because of high probability of getting damaged. This was so because they were installed for over four (4) decades ago and that they had never been replaced. This can be affirmed by the study by Pargal (2014) that stated that there are a number of challenges facing the water supply sector to the extent that the sector performance has been below expectation. These challenges can be categorized into financial, commercial, operational, institutional challenges and infrastructure economic challenges compound the problem of water reticulation.

**e) Power shortages**

For close to a decade, the service provider has had challenges of load shading. The nation at large has had this experience to date. Water reticulation is dependent on electricity or power supply. The country has only one (monopoly) company i.e. Zambia Electricity

Supply Corporation (ZESCO) that supplies electricity to the entire nation and also exports power to other neighboring countries.

Todaro (2014) defined that monopoly is a market structure characterized by a single seller, selling a unique product in the market. In a monopoly market, the seller faces no competition, as he/she is the sole seller of goods with no close substitute. In a monopoly market, factors like government license, ownership of resources, copyright and patent and high starting cost make an entity a single seller of goods. All these factors restrict the entry of other sellers in the market. Monopolies also possess some information that is not known to other sellers.

However, Lusaka Water Sewerage Company has been experiencing challenges in water production and distribution in the wake of the power deficit in the country. This has seen the level of water production for Lusaka city reduced from an average of 258,000 cubic metres per day in 2014, to a little over 190,000 cubic metres per day in 2016, representing over 25 per cent reduction in water production, mainly on account of power load shedding on the 125 ground water sources spread around the city. To fully meet the demand for Lusaka, the company needed to produce an estimated average of about 410,000 cubic metres per day (LWSC Report, 2011).

#### **f) Natural disaster like drought**

Droughts have negative effects on the quality of water flow. In the last five years, Zambia as a whole has experienced terrible drought in most parts of country which has led to deviation of water pattern. This significantly reduces water levels from the source and subsequently the water flow.

### **5.5 A Proposed model to solve water supply challenges**

This study has unearthed a tip of the iceberg from a descriptive point and not from an explanatory point that water supply is poor in Munali Catchment. The observed inter-

and intra- seasonal and township variability of water availability and use calls for assessing the temporal and spatial dimension of water scarcity further.

In order for LWSC to manage the challenges elicited, this section presents a system model which is a kind of a representation of how the bottlenecks could be managed. The researcher has opted to use a descriptive model. A descriptive model describes logical relationships, such as the system's whole-part relationship that defines its parts tree, the interconnection between its parts, the functions that its components perform. Typical descriptive models may include those that describe the functional or physical architecture of a system. The following areas have been identified as critical in addressing the bottlenecks described earlier and these will cover: Funding, regulation, service delivery, collaboration with other government institutions and Public Private Partnerships. The details appear below.

### **Funding**

LWSC should continue to mobilize financing from multilateral organisations, and donor countries. Donor financial support is useful for construction as well as rehabilitation of water reticulation infrastructure. For a developing country like Zambia, dependable funding from the public partner is key to promoting the expansion of access. Maintaining an affordable tariff and keeping overall risk levels acceptable for the private sector are equally necessary. Successful water PPPs are usually designed around a mix of funding sources. Therefore, the focus should be on building a partnership that layers a degree of public sector financing on top of private sector skills and expertise. This can improve the sustainability of systems, strengthen financial viability (UNECE, 2018).

### **Regulation**

NWASCO has the mandate to regulate water utilities in Zambia. In view of the increasing role played by the private sector in the water sector, in different parts of the world, it is essential to come up with regulation that addresses the need to maintain competition at

the same time ensuring proper and fair operation. LWSC will from time to time need to engage NWASCO on the issue of water tariff guidelines to create an economically enabling environment to encourage private sector participation in the water supply business.

### **Service delivery**

A World Bank review of the performance of PPPs indicates that there are significant improvements in terms of access to piped water, reliability of water service delivery, operational efficiency, affordability etcetera. In Niger for instance water has been available on a continuous basis in most urban centers since 2006. Ninety-eight percent of water samples now comply with bacteriological standards. NRW was reported to be at 17 percent, and the local water utility avoided massive layoffs, despite major gains in productivity (World Bank Group, 2014).

### **Collaboration with other government institutions**

Over the years the city of Lusaka has seen a proliferation of unplanned residential areas (LWSC, 2018). Inter-governmental agency collaboration is required to for example improve residential settlement planning and allocation by municipal authorities such as Lusaka City Council. This is necessary for the water utility to effectively plan and manage water network expansions sustainably.

### **Public Private Partnerships**

Well designed and executed PPPs, which are supported by sound institutional structures and the active engagement of both the public and private parties and their commitment to outcomes, can deliver very significant improvement and extension of services to water users. A selection of examples includes, the East Manila Concession where access to continuous portable water supply increased from 26% to 98% and the Senegal Affermage



where the access ratio went up from 58% to 76% and is now considered as a model of public-private partnerships in Sub-Saharan Africa (UNECE 2018).

An Affermage type of contract is a PPP structure under which the private operator is responsible for operating and maintaining the utility but not for financing. The project company does not receive a fixed fee in exchange for services but rather retains a percentage of receipts collected from consumers, a portion of the receipts going to the contracting agency as owner of the assets (PPP Knowledge Lab). In Niger for example, a similar type of PPP has led to improved operational efficiency where access to safe supply of piped water was inadequate, intermittent and of poor quality.

The private sector's financing of new connections and its contribution to repair and maintenance investments was key in decreasing the levels of unaccounted for water and improving revenue collection (World Bank Group, 2014).

LWSC could engage private organizations with the view of entering into Affermage contracts. The private operator's remuneration would consist of its affermage fee multiplied by the volume of water produced or sold. This would be retained out the revenues collected from users with the balance being transferred to the public entity to cover its investment commitments. While capital investments are publicly financed and the assets are publicly owned, the private entity undertakes financing of daily water supply operations and implementing maintenance, rehabilitation and new works.

## **CHAPTER SIX**

### **SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS**

#### **6.1 Conclusions**

The study set to assess the guarantee of water supply; a working model of the selected Townships in Munali Catchment. Among the aspects covered in the assessment were accessibility of water supply, effective coverage water supply, temporal deviation of water supply; Initial utilization of water supply which included connectivity of water lines prompt and connectivity to sewage lines prompt for and storage capacity of water supply and dis-connectivity of water lines prompt for those seeking for the first time, maintenance of water network lines was prompt by water service providers.

The study shows that water scarcity is a major constraint to socio-economic development and a threat to livelihood in Munali catchment and it has not attracted much political and public attention. Even though bore holes and reservoirs have been constructed, this progress on the quantification of water production has not equated with household availability and use. It is not possible to affirm the causes of the lack of a full-fledged supply of water. Water supply service related complaints were just slightly above average. Yet, there was a notable excellent knowledge base of where complaints could be raised, if consumers were dissatisfied with the service. Dissatisfaction was mainly noted in the communities with about 1/3 of the population interviewed expressing dissatisfaction with the service coming from water consumers in the communities.

Service related complaints in the study areas were mainly about initial utilization to water lines was prompt (that is, for those disconnected or seeking connection for the first time) effective coverage (frequency of domestic supply was being regular for hours, days and weeks). In addition, the rationing of water supply had no systematic time table so that people could easily adapt to it, hence the low supply in some areas was seen as a problem.

Sometimes, the service bills were too high and unjustifiable. The less the time meter readers were seen carrying out meter reading in the field, the more people contested their service bills because they were perceived to be erroneous and unjustifiable. Water bills were also contested if they were high for most of the time, since water supply was continuously erratic. It is important to note that households Munali Townships mostly perceived service bills to be on a higher side.

The absence of water storage capacity in Munali Townships connotes that service providers paid particular attention to the volume of water supply they offered to their customers. Sampled population accessed little water from service providers due to irregular to water supply.

Furthermore, service provision of water supply in the study areas, financial gaps of service bills were met by government and Cooperating Partners. However, most of the investments in water supply came from international finance and donor agencies but these were by far below the funds required by the sector for maintenance of old water lines network. The accompanied local funds from the government were also in short supply. The result was that huge gaps in terms of finance were created and service delivery was challenged in most cases. As evidenced by some individual initiatives to sink boreholes and use of on-site services and self-water storage in some communities in Munali Catchment because it was hard for them to get connected to the main reticulation system for newly developed areas due to irregular water flow, respectively.

## **6.2 Policy and Practice Implications of This study**

Given the results, there are notable policy practice implications. There is need for managements of LWSC to focus on performance improvement. While bottleneck analyses may include frameworks for identifying areas for operational improvement as argued by Zhang et al. (2007), the researcher is recommending that performance improvement in the local utility company would require evaluating and assessing performance by “quantifying the efficiency and effectiveness of action” and this has been

proposed in previous research where such bottlenecks have been identified (see Bayraktar et al., 2007) and management could also consider working on future goal setting (Raturi and Evans, 2005; Blecken et al., 2009). The data seems to suggest that the water sector in Munali is witnessing inequalities of human resource distribution and investment as well as distribution of water resources between rich and poor like urban localities, due to poor management, planning, prioritization, and poor to noninvestment of resources. Tentatively this study advances a hypothesis that could be tested in future research “the more a location grows bigger in size, the more bottlenecks it experiences and the poor the service it will render to the community”.

The implementation of the PPP model in urban and water service delivery in the City ought to address various problems at the levels of local government, society and intermediary agencies. Apart from contracting water services to local utility companies, the local government should clarify its specific duties based on its role in urban water supply. There is evidence to show that local governments have contributed to the poor quality of service delivery in that they have not assumed total responsibility for monitoring and promotion of the development of urban water supply and sewage treatment and for failing to bring urban management of these services under the remit of special local government quality monitoring. Local government have not studied and assessed the fit of the types of PPP models which would work best, as well as clarifying the main social welfare responsibilities in urban water and sewage service delivery, focusing on the point, performing a good service job, signing a deal with non-state bodies as “equal civil subjects” on the basis of the spirit of the contract, establishing a coordination mechanism with a clear division of responsibilities, and giving priority to the promotion of quality service with reasonable and transparent charges and stable profits.

Learning from South East Asia and Latin America, problems with the provision of drinking water services around the world having been increasingly been addressed by attempts at New public management in form of privatisation or PPPs, water has been treated as an essentially economic, rather than public, good. This approach has gained

popularity in Zambia particular and just as it was accepted in Latin America and Asia. However, it has not been short of limited success as shown in Munali. In order to address the full range of social, economic and environmental values necessary to sustain sewage service and water resources over time, public and governmental involvement has been promoted with the view to establish integrated water management by pursuing ‘soft path’ approaches, assuring stakeholder input as essential to the process of water management. Such approaches require the application of Dublin Principles (International Conference on Water and Environment, 1992). The principles express important considerations for the establishment of water management regimes which are participatory in nature. Generally, there is need to look into reticulation decision, storage and distribution. It requires concerted efforts of hydrologists, economists, social scientists, and environmental scientists to develop integrated approaches to capture the multi-faceted nature of water scarcity bottlenecks. Given the results, there are notable policy practice implications. There is need for managements of LWSC to focus on performance improvement. While bottleneck analyses may include frameworks for identifying areas for operational improvement as argued by Zhang et al. (2007). This study specifically recommends the following:

- a) There is need for efficiency and performance improvement by “quantifying the efficiency and effectiveness of action” To improve frequency domestic water supply hours, days and weeks in Munali Catchment, by the water service provider and as such, stringent measures put in place to ensure stipulated times of access are adequately followed. For instance, Lusaka Water and Sewerage Company should develop temporary actions which would be only used in order to mitigate the effect caused by drought. Some of them would be include shipments of drinking water and build more storage capacity would not permit their exploitation longer than the duration of the drought season. This will improve access opportunities for many including those in low income communities where access is still minimal.
- b) To mitigate short term water disruptions, water towers need to be set up.

- c) LWSC to invest in more ground storage reservoirs for prolonged emergencies.
- d) Permanent actions whose implementation costs would be substantially higher than the structural action must be undertaken by LWSC. Among them are; rehabilitation of water treatment works; drilling and equipping of boreholes; upgrading booster pumping station; repairing transmission line; strengthening of the core distribution network; extending secondary and tertiary networks.

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## APPENDICES APPENDIX I: SERVICE LEVEL GUARANTEE

Lusaka City



**Lusaka Water and Sewerage Company Limited**  
**Service Level Guarantee (2015 -2018)**

SERVICE INDICATOR	PRIMARY INDICATOR	SERVICE LEVEL
SI 1 COVERAGE OF SERVICE AREA	% of population served with drinking water	88%
SI 2 DRINKING WATER QUALITY	a. No. of tests carried out (bacteriological and residue chlorine	According to NWASCO water quality guideline
	b. % of results meeting the standard	95%
SI 3 SERVICE HOURS	a. average daily water supply duration at connection	22 hours
	b. average daily water supply duration at public distribution system	12 hours
	c. Office hours and pay point per week.	40 hours
SI 4 BILLING FOR SERVICES	a. frequency of billing customers	Once per month
	b. frequency of customer meter reading	Once per month
	c. payment period after bill delivered	2 weeks
	d. % metering	75%
SI 5 CLIENT CONTACT	a. Response time to written complaints	5 working days
	b. a.Response time for new connection	10 working days
	c. Response time for meter installation request	10 working days
	d. Response time for meter testing	10 working days
	e. Waiting time to pay bill or file complaint	15 minutes
	f. Telephone contact holding time	5 minutes
SI 6 INTERRUPTION OF WATER SUPPLY AND BLOCKAGE OF SEWER	<b>Water</b> - a. % connected property subjected to unannounced supply interruption for 20 – 36 hours	< 15%
	b. 36 – 48 hours	< 5%
	c. above 48	< 3%
	<b>Sewer</b> - c. % connected property subjected to sewer blockage 20 – 36 hours	< 10%
	d. 36 – 48 hours	< 8%
	f. more than 48 hours	< 3%
SI 7 PRESSURE IN THE NETWORK FOR WATER SUPPLY	Connection with flow rate of less than 7 litres / minute	< 5% of connections in particular service area
SI 8 UNJUSTIFIED DISCONNECTION	% of connections subjected to unjustified disconnection in a year	< 0.2%
SI 9 SEWER FLOODING	% of connections subjected to sewer flooding	< 0.3% of connections in particular service area
SI 10 QUALITY OF DISCHARGED SEWER	a. No of tests carried out (bacteriological and chemical)	According to ZEMA licence conditions
	b. % of results meeting ZEMA standard	40% for bacteriological and 60% for Chemical

*Water is life...Value it! Sanitation is health*

## **APPENDIX II: HOUSEHOLD QUESTIONNAIRE**

Questionnaire number.....

Household ID.....

You have been selected by chance with 300 other people to help us know what may relate to you regarding accessing water and sanitation services in this township. Please read /listen to each item carefully and decide to what things apply to you. Give each item a rating that applies to you by using a scale that is given for each question. Please remember to respond to all items. There is indeed no right or wrong answers. Your answers will be kept by me in the envelope that I have given you in the strictest confidence for only six months after which time I shall have examined all the 300 responses. Thereafter I shall destroy them. There will be no identification mark that relates to you on the questionnaire. I am sure that you will be open in responding to these statements.

1. What are you in terms of use of the service?
  - a) Property owner
  - b) Tennant
  
2. In the household, who are you relating to the service?
  - a) I am the head of the household.
  - b) I am a member of the household
  
3. Indicate your gender
  - a) Male
  - b) Female
  
4. Age -----

5. What is your occupation or what do you do for a living?

Doctors, engineers, lawyers, Accountants, lecturers are my categories	
Registered nurse, Technologists, Nutritionist, secondary school teacher are my categories	
Secretary, Accounts Clerk, Primary school teacher are my categories	
Enrolled nurse, electrician, plumber, receptionist are my categories	
Cleaner, Messenger are my categories	
I am into business	
I am a student	
I am a home maker	
I am not in employment.	

6. How far have you gone in school?

Level of Education	Never been to school	Primary	Lower Secondary	Upper secondary	College /University
<b>Tick</b>					

7. How far is your home from the nearest local water and service provider access point for service?.....km

8. Is your house connected to water and sanitation services by Local Utility Company which provide service in your town 1. Yes 2. No

9. How much storage capacity of water do you have if you do not have a regular flow of water?.....



10. If you have water, how often does your household have running water?

(a) Twenty-four hours	
(b) 6 to 12 hours	
(c) Less than 6 hours a day	
(d) Never	

11. How much do you pay for water on a monthly basis .....

12. Indicate your position regarding the services below. Out of 7 points, indicate the extent to which you experience each item follows: 1 for Strongly agree, 2 for agree, 3 for somewhat agree, 4 for Not sure, 5 for Somewhat disagree, 6 for disagree and 7 for Strongly disagree.

The price of domestic water is realistic	
The price of sewage and refuse disposal is realistic	
Maintenance of the water lines – pipes is prompt once reported	
Maintenance of the sewer lines – pipes is prompt once reported	
I have accepted the water service provided by the local authority in this area	
I have accepted the sewage and refuse service provided by the local authority in this area	
I find the time and distance to travel and pay for the service or present a problem regarding a service is ideal	

13. Initial utilization:

Connectivity to water lines has been prompt (for those disconnected or seeking connection for the first time).	
Connectivity to sewage lines has been prompt (for those disconnected or seeking connection for the first time).	
I have accepted the cost it has taken me to have the water service initiated	
I have accepted the cost it has taken me to have the sewage service initiated	
I have accepted the cost it has taken me to have the refuse disposal service initiated	
I have accepted the cost it takes me to have the water service maintained every month	

14. Effective coverage

The frequency of domestic water supply is regular for hours, days and weeks	
My household gets adequate water to meet the daily needs	

15. Contact or utilization coverage

In the last three months, how many times have you been to the local authority to access the services?

How satisfied have you been with the service? Indicate as follows: 1 for Very satisfied, 2 for satisfied, 3 for somewhat satisfied, 4 for Not sure, 5 for Somewhat dissatisfied, 6 for dissatisfied and 7 for very dissatisfied.

1	2	3	4	5	6	7
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### APPENDIX III: WATER SERVICE PROVIDER QUESTIONNAIRE

Questionnaire number.....

Household ID.....

#### SERVICE PROVIDER SURVEY QUESTIONNAIRE

1. You have been selected by chance with other people to help us know what may relate to you regarding the provision of water services in this township. Your answers will be kept by me in the envelope that I have given you in the strictest confidence for only six months after which time I shall have examined all the responses. There after I shall destroy them. There will be no identification mark that relates to you on the questionnaire. I am sure that you will be open in responding to these statements.
2. Township you are in charge with water service.....
3. What are you in terms of use of providing the water service? (Position in the company)  
.....
4. Indicate your gender
  - c) Male
  - d) Female
5. Age -----
6. How much storage capacity of water do you have.....
7. How long does the township where you are in charge have running water?

(a)Twenty-four hours	
(b) 6 to 12 hours	
(c) Less than 6 hours a day	
(d) Never	

8. Indicate your position regarding the services below. Out of 7 points, indicate the extent to which you experience each item follows: 1 for Strongly agree, 2 for agree, 3 for somewhat agree, 4 for Not sure, 5 for Somewhat disagree, 6 for disagree and 7 for Strongly disagree.

The price of domestic water is realistic	
Maintenance of the water lines – pipes is prompt once reported	

9. What would you say about the water service? Indicate 1 for Strongly agree, 2 for agree, 3 for somewhat agree, 4 for Not sure, 5 for Somewhat disagree, 6 for disagree and 7 for Strongly disagree.

Most of the residents have found an alternative source of domestic water supply	
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10. Contact or utilization coverage

In the last three months, how many times have you been to the township to provide water using alternative means.....

11. How satisfied do you see your customers the water service? Indicate as follows: 1 for Very satisfied, 2 for satisfied, 3 for somewhat satisfied, 4 for Not sure, 5 for Somewhat dissatisfied, 6 for dissatisfied and 7 for very dissatisfied.

1	2	3	4	5	6	7
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## **APPENDIX IV: IN-DEPTH INTERVIEW SCHEDULE**

### **In-depth Interview with Service Provider**

#### **Theme I: Coverage**

Please tell me about water service delivery.

#### **Water supply**

- a) Probe for availability of critical system inputs by looking at the resources available for providing water.
- b) Probe for delivery of adequate amounts of water to meet consumer consumption requirements and the needed flow requirements.
- c) Reliability of the water system; the required amount of water needs to be available 24 hours a day, 365 days a year in the last five years.
- d) Probe for Availability of chemicals, spare parts, human resources for the adequate functioning of the system.
- e) Probe for availability of different elevations points throughout Munali, additional pumping stations are provided to maintain adequate pressure in the water system during varying periods of consumer use or emergency water supply demand requirements.

#### **Theme II: Accessibility coverage:**

- 1) Please tell me how many residents access water and how many are yet to access water.
- 2) Tell me which areas in Munali have access and which ones have no access to water?

#### **Theme III: Initial utilization:**

- 1) For those who desire to use the service for the first time, Please tell me about the connection process and cost.
- 2) Probe for accessibility factors, response time, procedure and cost of initiating a service.

3) Ask for procedures or documentation of applicant.

Theme IV: Effective coverage:

Please tell me which residential areas have timely continuous access to water and which ones have irregular or no supply?

Theme V: Reasons

Why are there such temporal and spatial patterns of water reticulation for Munali?