PERCEPTIONS OF RESIDENTS ON THE PAYMENT FOR WATER SERVICES IN KITWE, ZAMBIA

BY

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A Dissertation submitted to the University of Zambia in Partial Fulfillment of the Requirements of the Degree of Master of Science in Environmental and Natural Resources Management

THE UNIVERSITY OF ZAMBIA

LUSAKA

2022

DECLARATION

I, Kelly Kabangu, hereby, declare that the dissertation whose title is *Perceptions of Residents on the Payment for Water Services in Kitwe, Zambia* has not been submitted to any other University than the University of Zambia for any type of academic degree.

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CERTIFICATE OF APPROVAL

This dissertation of Kelly Kabangu has been approved as a partial fulfillment of the requirements for the award of Master of Science in Environmental and Natural Resources Management by the University of Zambia.

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DEDICATION

This dissertation is dedicated to my late grandmother, my parents, my wife Racheal and my three children Suma, Tumelo and Kelly. May God richly bless you for your roles in my life.

ABSTRACT

Kitwe's water sector is quite peculiar since historically, part of the city's water was supplied by the mines almost for free and the other part was provided for by the local authority. Nkana Water and Sewerage Company (NWSC) is the commercial utility company that provides water in the city. It took over the water systems of the council and the mines. The company has been facing challenges in collecting revenue especially from the high density areas. These challenges may stem from the way residents of Kitwe perceive water. The objectives of this study were to investigate the history of water supply in Kitwe, determine the consumption rates and payment profile of water in different parts of Kitwe and determine the willingness to pay for water through a perception survey of residents in different parts of Kitwe. A mixed research design was used in this study. A sample of 300 household respondents and 16 key informants was used in this study. Stratified random sampling was used to ensure that both former Mine and Council townships were selected. Eight officials were selected from NWSC, two from KCC, two from ZCCM-Investment Holdings and four from ward development committees were selected. Data collection was done using a household questionnaire and interview guides for key informants. Thematic analysis was used to analyze qualitative data from interviews with Key Informants, some household respondent, secondary data and from observations. For quantitative data, descriptive statistics which include frequencies, tables, graphs and percentages where generated using SPSS IBM SPSS Statistics version 20 and Excel 2010. It was further used for inferential statistics in calculating for association, in this case, Pearson's Chi Square Test to test for association between customer satisfaction and willingness to pay at 0.05 level of significance. The findings show that the history of water supply in Kitwe has influence on some Kitwe resident's perception of water. Further, high consumption of water was more in low-density areas and less in the high-density areas of the city. In terms of township payment profiles, NWSC collected more revenue from the low density areas than the middle and high density ones. The study also established that low levels of water service satisfaction have contributed to low levels of willingness to pay among the residents. Furthermore, the study revealed that 77.7 percent of respondents perceived household supplied water as a commodity because of the operation costs involved Majority, (59 percent) of the respondents felt that they were paying more than the value of the water they received and were not willing to pay more for water services. There was an association between service satisfaction and willingness to pay for water (Chi-square=0.03 p <0.05). It was recommended that a lifeline water supply policy where a pre-set volume of 50-60 litres of water per person per day should be provided at minimal or no cost to the poor.

Key words: Kitwe, Urban water supply, Willingness to pay, Scarcity,

ACKNOWLEDGEMENTS

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LIST OF ACRONYMS

AHC   …………………………..   Assert Holdings Company

CBU   ………………………….   Copperbelt University

CSO   …………………………..   Central Statistics Office

CU   …………………………..   Commercial Utility

KCC   …………………………..   Kitwe City Council

MMD …………………………..   Movement for Multiparty Democracy

NWASCO ………………………   National Water and Sanitation Council

NWSC…………………………..   Nkana Water and Sewerage Company

UNIP ……………………………   United Independence Party

UNDP …………………………..   United Nations Development Program

UNZA …………………………..   University of Zambia

WDC   …………………………...   Ward Development Committee

WSS   ……………………………   Water Supply and Sanitation

WTP   ……………………………   Willingness To Pay

ZCCM …………………………....   Zambia Consolidated Copper Mine

ZCCM/IH ………………………   Zambia Consolidated Copper Mine/Investment Holding

CHAPTER ONE

INTRODUCTION

1.0 Background

Commercialisation of urban water in Zambia like in other countries was quite controversial (Garcia-Rubio, 2015). Commercialisation arose from the consideration of water as a merit good or the difficulty of introducing competition into an industry that is structured around local monopolies (Littlechild, 1988). The logic behind privatization as the World Bank (2003) argued was that "public sector providers waste water too much, typically losing 40 to 50 percent of their volumes through leaks and theft. As a result, this had accounted for a lack of expansion of services by the governments to urban slums, small towns and villages. The World Bank further argues that effective water resource management requires that water be treated as an economic good. In addition, private participation in water and wastewater utilities has generally resulted in sharp efficiency gains, improved service and faster investment in expanding services (World Bank, 2003).

In Zambia, initiatives for the reforms in the water sector were considered as early as 1976 and went on up to the 1980s. Dagdeviren (2008) reports that pilot scheme on commercialization and privatization of water supply and sanitation started in Lusaka in 1989 and Eastern province in 1992. The scheme was rolled out to the rest of the provinces after 2000 and by November 2006, ten commercial water utilities were established in the major urban centres of the country (Dagdeviren, 2008). Municipal authorities were in-charge of the operations, water delivery and sanitation in the urban areas before the 1990s. However, on the Copperbelt province, the Zambia Consolidated Copper Mines (ZCCM) owned and operated water networks and supplied water to the mine townships.

The water sector on the Copperbelt province is peculiar because historically, part of the region's water was provided by the mines whereas the other part was provided for by the local authority. This background is important because it plays a very big role in Kitwe residents' perception of water. Nkana Water and Sewerage Company (NWSC), established in 2006, is the commercial utility company that provides water in the city. The report states that the company provides piped water to 95% of the city's urban households (NWASCO, 2017). The utility company has been

facing challenges in collecting revenue, especially from the high population density areas. This challenge may stem from the way residents of Kitwe perceive water. These perceptions may include regarding water as a public or private resource. Whichever way individuals perceive water, it has implications on the use, conservation and management of water resources.

1.1 Statement of the Problem

The commercialisation of the water sector implied that residents of Kitwe had to adjust their way of living. Some had to start paying water bills while others had to increase the amount of money they spent on water. The water utility company is facing challenges in collecting revenue from its clients. This has led to inadequate revenue for operation costs, maintenance and lack of water network expansion which result in poor water quality and lack of water supply in some areas. Further, in some townships, residents are reluctant to connect to the grid of water services because they use shallow wells and do not pay for the service which they feel must be provided for free. Besides, the population is on the increase and demand for water is equally increasing. This study sought to understand the attitudes of residents of Kitwe in relation to payment for water services.

1.2 Aim

The aim of this study was to determine whether residents of Kitwe perceived household water supply as a commodity or as a free good.

1.3 Specific Objectives

The specific objectives were to

i.   Investigate the history of water supply in Kitwe.
ii.   Determine the consumption rate of water in the low, medium and high income areas of Kitwe.
iii. Determine the payment profile of water in the low, medium and high income areas of Kitwe.
iv.   Investigate Kitwe residents' perception of household water supply as a commodity or a free good.
v.   Investigate Kitwe residents' willingness to pay for water.

1.4 Research Questions

i.   What differences are there in the different regimes of water supply in Kitwe?

ii.   How does water consumption differ in different parts of Kitwe?

iii.   How frequently do people in the study area pay for their water?

iv.   What differences are there in the perception of water among Kitwe residents?

v.   How does the history of the provision of water in Kitwe influence residents of Kitwe's attitude towards water and their willingness to pay?

1.5 Research Hypothesis

Service satisfaction has a significant influence on willingness to pay for water services.

1.6 Significance of the Study

Provision of water in Kitwe after the privatization of the mines has not been without problems. Problems ranging from poor quality of water to lack of access to water supplied by NWSC in Kitwe urban have been an order of the day especially among the poor. This study has provided reasons why some residents have been facing challenges in accessing water NWSC and why some are reluctant to connect to the water services. The study has also tried to unravel the reasons why the water utility company is facing challenges in collecting revenue. The study has provided information that would be used by NWSC to improve their revenue collection and also help the utility company improve service satisfaction to the residents of Kitwe. The study has also contributed to literature particularly in political ecology of water as it reaffirms the argument that access to portable water in urban areas is politically influenced. It has also contributed to the literature of water management in urban areas as it reaffirms that water managers in urban areas usually neglect the plight of the poor and concentrate more on the affluent.

1.6 Organization of the Dissertation

This dissertation has six chapters. The introduction, statement of the problem, the aim of the study, objectives, research questions, research hypothesis and the significance of the study are in chapter one. Chapter two contains the literature review while chapter three deals with the description of the study area. Chapter four provides the research methodology including the research design, sampling procedure, data collection, data analysis and the limitations of the study. The results and the discussion are presented in chapter five while chapter six deals with the conclusion and the recommendations of the study.

2.0 Introduction

This chapter discusses the literature that was reviewed for this study. The first section presents the historical perspective of water supply before discussing environmental perceptions in general. The second section, examines the urban water supply using theories from political ecology. A general discussion on water perception and management from different parts of the world makes up the third section. The last part discusses The National Water Supply and Sanitation Council (NWASCO) before reviewing literature on water perceptions and management in Zambia.

2.1 Historical Perspective of Water Supply

The development of water and sanitation systems' history in the high income countries of the north shows a common pattern. The first modern city to introduce public water supply in the 13th century was Dublin (Hall and Lobina, 2008). During this time, water was supplied by street carriers in other European cities. London's first major attempt to provide water supply was in 1582 (Prasad, 2007). European urban water systems started developing in 17th or 18th centuries as a service limited to affluent customers and as a public assistance for fire control, lack of or poor quality of water, environmental and public health concerns, industrial use, or a combination of those factors (Prasad, 2007). As cities were growing in the 19th centuries, water demand for consumption grew and the public health issues became more acute. Whereas the initial systems were usually started by private companies, during the 19th century the utilities were fairly soon taken over by municipalities in nearly all European countries, including the UK (Hall and Lobina, 2008).

The water sector reforms aimed primarily at privatizing water utilities and commercializing water resources were initiated by World Bank. The water privatization policy of the World Bank articulated in a 1992 paper entitled "Improving Water Resources Management" proceeds from the belief that water availability at low or no cost is uneconomical and inefficient. It was argued that even the poor should pay (World Bank, 1993). Like it was pointed out in the "World Development Report 1992", the poor need a wider range of options so they can choose the level

of water services for which they are willing to pay, thereby giving suppliers a financial stake in meeting their needs (Garcia-Rubio, 2015).

One challenge which World (2003) brought out was the high amount of Unaccounted for Water (UFWS), being the difference between the amount of water produced and the amount of water sold. Accompanying this is the UFW, which is mainly due to leakage from pipes, unauthorized use (illegal connections, unbilled consumers), authorized but unmetered connections, inaccurate master meters for industrial, 15 commercial and domestic purposes. This UFW is also referred to as non-revenue water (NRW). These challenges directly translate to the amount of money lost by WSPs, by extension in the entire water sector (WASREB 2009).

2.2 Perceptions and Natural Resource Management

Public participation is widely recognized as being very vital to sustainable development although it is hardly practiced in developing countries (Omole & Ndambuki, 2014). Among the most effective tools for collecting public opinion for making decisions and resource allocation prioritization is perception studies (Huntler et al, 2007). Perception based studies have been used in strategic planning, resource management, primary data acquisition and feedback system (Bi et al., 2010). A perception study carried out in China shows that charting of global environmental policies is not a preserve which is exclusive to developed countries and the fact that people in developing countries, Zambia included, have attitudes which are pro-environmental (Bi *et al* 2010).

2.3. Urban Water Supply

Many scholars have written on the problems regarding the distribution and supply of water in urban areas. Some question the Malthusian theory on ecoscarcity or capital consumption patterns that contends that increase in population will result in scarce natural resources in urban areas. In terms of water, scarcity refers to a state of immediate crisis due to inadequate supply of water to meet various demands of human and the environment (Bakker, 2003). However, it has been argued that the Malthusian argument is faulty because research has shown that the affluent consume more resources per capita compared to the poor. Johnston (2008: 74) contends that "water scarcity not only reflects the relative aspects of supply (the conditions and actions that affect quantity and quality) and demand (intended and projected use), but the relative aspects of

how water is valued (the cultural meanings as well as economic values), relative levels of access and patterns of use, and the relative degrees of control over water resource management and distribution. Thus, scarcity might reflect the economic ability to pay for water, or, the customs, social conditions, and relationships that privilege access to some while withholding access to others."

Bakker (2003) argues that water supply is relatively abundant for the urban elite and relatively cheap. On the other hand, scarcity of potable water is a daily hardship for the urban poor. She gives examples of a South African case where a wealthy white person uses on average 600 litres per person per day of potable water delivered through taps inside their homes. For the poor and largely black South Africans, they average 10 litres per person per day often walking several kilometres to fetch water (Bakker, 2003). The 2006 Human Development Report which was largely influenced by political ecologists of water reported that scarcity is manufactured through political processes and institutions that disadvantage the poor. It further stated that the pattern regarding clean water in many countries is that the poor get less, pay more and bear the brunt of the human development costs associated with scarcity (UNDP, 2006).

Other scholars disagree with the view that environmental degradation should only be blamed on the marginal people. Before arriving at such a conclusion, the larger context of the situation that takes into account the political and economic context such as technological choices, affluence and greed should be used (Robbins, 2012). Furthermore, conservation and control is usually considered as benign. This is because the efforts at environmental conservation are shown to have pernicious effects and sometimes fail as a result. Using political lenses, conservation approaches or initiatives are extremely thickly loaded with political and economic imperatives of the implementing bodies like the state.

One other view relates to the environmental conflict and exclusion. Environmental conflict is viewed as part of the larger gender, class and race struggles and vice versa (Truelove, 2011). Proponents of Political ecology argue that political identities and social struggles are linked to basic issues of livelihood and environmental activities. Further, political and economic systems are shown to be underpinned and affected by the human actors with which they are intertwined.

Some scholars (Johnston, 2008 and Bakker, 2003) endeavoured to find answers to the question why water crisis is taking place and affecting people at different levels. This crisis, as Johnston (2008) argues, arises from the crush between agendas and actions that value water as a fundamental human right and agendas that value water as a private commodity. Bakker (2003) is of the view that under commercialisation, water ceases to be a service supplied to citizens at a subsidised rate as a right. Rather, it is increasingly perceived as a commodity, sold to consumers on profit making basis of willingness to pay instead of the consumer's ability to pay.

Urban political ecology of water, a branch of political ecology, concentrates on portable water and its distribution (including the placing of urban infrastructure) in urban areas (Swyngedouw, 1997; Loftus, 2009). The field unravels the fundamental relationship between water and social power that shape urban areas. One revelation from literature (Bakker, 2003; Loftus, 2009; Crifasi, 2009; Truelove, 2011) is that water plays an important role in shaping relations of power. Water and social power are shown to be mutually constitutive, an assertion which is against the environmental deterministic argument. Simply put, uneven distributed water infrastructure produces uneven distributed waterscapes.

Another argument concerns the choreographies of power that influence the amount of water flowing through urban infrastructure and where it flows. Rusca et al (2017) argues that the decisions of allocation, distribution and construction of water infrastructure are thickly loaded with economic and political decisions made by the state in association with private companies and other stakeholders involved in the power game. Bakker (2003) is of the view that in most developing countries, access to water is highly income correlated. She says that for the urban poor with access to networked service, water may not be potable and may flow intermittently – a few hours per day, or only a few hours per week. Access may be reduced further by low pressure. The daily decisions on water distribution that prioritise planned areas of the city worsens conditions of access to water in low income areas, resulting in worse quality of the water that the urban poor drink than that of the rest of the population in spite of it coming from the same source (Rusca et al, 2017).

2.4 Water perceptions and Management

Before the 1980s and the 1990s, it had been a common trend, in countries such as Germany and USA that urban water supply had been provided by state owned monolithic water organizations (Hall and Lobina, 2008). Then there was a paradigm change spearheaded by the World Bank that allowed private sector involvement with a hope that they would resolve performance problems of utility companies and mobilize scarce financing to sustain and expand (Baietti et al, 2006). But despite an increase of the private sector participation in water supply, financing to the sector had by 2005 accounted for less than 5% of the total investment world over. In fact, the performance of the utility companies had actually worsened the situation in low income communities due to their reluctance to provide the service (Baietti et al, 2006). Bakker (2008) reports that in many countries, fierce anti-water privatization campaign and protests have taken place due to poor performance and high tariffs charged. The worsened situation may have an effect on the people's perception of water.

Perception studies that have been conducted on water ownership and management are not as many compared to perception studies on the quality of water that is supplied to communities (Noga & Wolberng, 2013). In an online questionnaire survey undertaken in Canada, Noga & Wolberng (2013) revealed that the majority of the respondents believed that clean water is a private resource and that government is responsible over the control of water. This is because of lack of interpersonal trust that may lead to the tragedy of the commons. This perception could have been influenced by the quality of water provision from the private sector in their country.

Doria (2010) argues that it is not entirely understood how different factors interact to influence perceptions. She acknowledges that a better understanding of the processes that influence public perception can contribute to improvements in water management and consumer services among other areas. Yu et al (2013) who studied the villagers' perception of water crises in northwest China demonstrated that perceptions of different aspects of water crises including water access, control and affordability are affected by diverse factors in very different ways. They argue further that personal experiences together with physical, social-political and economic factors have more significant influence on water perception than ordinary demographic attributes. In discussing water scarcity in south Asia, Hanasz (2014) showed that perceptions are significant in

that perception of a looming water crisis creates urgency for tackling an envisioned problem. In Pakistan, the general perception on water is that decision makers and those in power are not directly affected by water insecurities and have little incentive to change the system or make water management reforms a priority. Further, the workers in the water sector generally have engineering backgrounds and tend to focus on the supply side, disregarding the changing dynamics of water demand, society and the environment (Mustafa et al, 2013).

When conceptualizing water inequality in Delhi, India, Truelove (2011) examined and analysed different views and concluded that differences in access to water contribute to social differentiation and stratification. It was found that women and girls shoulder most of the water responsibilities and the consequences and dangers associated with them. She reported that women in her study, depicted their social position and access to rights as being tied to the ramifications they face in compensating for unreliable water supply. In Moldova, WHO (2019) reported that women allocate much more time than men to the household activities perceived as "female" (cooking, baking, canning food, dish washing, cleaning up the house, laundry, physical care of children), activities that require the use of water resources. Therefore, there is a considerable gender disparity in these activities, which are performed mainly by women. These gender disparities show that women are more affected than men by the lack of access to water resources and sanitation.

Bakker (2008) argues that in Cochabamba, Bolivia, private water utilities companies remained unresponsive to the needs of the poor, in a pattern unchanged from that of the pre-water war era. She argues further that the challenges faced by the private sector in water supply are not unique to them alone but can affect public and community as well. What is important is not ownership but institutions (rules, norms and laws) and governance (decision making). Furthermore, education and awareness of customers can also help improve the performance and management of the utility companies (Baietti et al, 2006; Noga & Wolberng, 2013).

In terms of willingness to pay, Liesel et al. (2013) are of the view that owing to the fact that water is an essential commodity in economic terms, its value is infinite in terms of willingness to pay for a basic survival amount. The value of water external to willingness to pay may refer to among others aesthetic and health related values (Noga & Wolberng, 2013). Water prices by the

utility companies do not reflect the "true" value of the resource to society because they are typically related to capital required to supply water. Far reaching and essential benefits of water are provided through drinking water, maintaining biodiversity and supporting industrial development. A number of ecosystem services are underpinned by water and these include food production, climate regulation, soil fertility, carbon storage and nutrient recycling. Some of the ecosystem services important to water include protection of water quality and quantity through the water cycle and hydrological process (Liesel et al., 2013).

In Sub-Saharan Africa, using the 2008 data, 328 million people lacked access to safe drinking water. However, the rate of access to improved water had increased from 49 percent in1990 to 60 percent in 2008 (Stampin et al, 2011). They report that access to piped water remains generally low and improved negligibly from 15 percent in 1990 to 16 percent in 2008. In Zambia, by 2015, 67.7 percent had access to safe sources of drinking water (Central Statistics Office, 2016). This means that more than 30 percent of Zambians still lack access to safe and clean water, a situation which is not desirable, especially when some countries in the sub-region are making progress. For instance, in 2008, 80 percent of the people in Malawi had access to safe and clean drinking water (Stampin et al, 2011).

In terms of perception studies, nothing much has been done on people's perception of water and management specifically. However, there have been studies related to the topic (Omole & Okunowo, 2016, Hunter et al., 2007; Kelly, 2016).

Omole & Okunowo (2016) assessed people's perceptions of domestic water supply in Nigeria and argued that public perception impacts directly on environmental issues. They indicated that Majority of the respondents in their study area believed that water should be provided free of charge and that government should bear the responsibility of supplying it. Using in-depth interviews with respondents, Abubbakar (2018) investigated strategies for copying with inadequate domestic water supply in Abuja, Nigeria. The study revealed that water storage, using drums, buckets and canes, was used by the majority of the respondents. While storage helped in improving water quality by allowing solid particles to settle out, during collection and storage,

disease causing microbes could contaminate water. This could happen in open and unhygienic containers, including dust and heat when water is stored for larger periods.

Kelly (2016) discussed water commodification in Tanzania and shows that the African population in Mikindani community was not only unwilling, but also unable to pay fees for a service that was inconsistent and peculiar in its demand for monetary exchange when open wells were accessible. He indicates that residents perceived water from wells to be more reliable compared to piped water that relied heavily on technology and are costly.

Using a desk-top method, Hunter et al. (2007) explored how individuals in Southern Africa perceive environmental issues. They concluded that people who are affected by an environmental problem are the ones who will perceive it as a problem. In general, they suggested that poor environmental conditions tend to be related to perceiving environmental problems, highlighting material of the environmental concerns.

In South Africa, water supply services in urban areas favour the urban elite. Supply of water to the urban elite is usually relatively abundant and cheap than the urban poor. Affluent, mostly white South Africans access piped water cheaply at the comfort of their homes (Bakker, 2003). In Durban, the differences in placement of taps where blacks were only using outside taps and the whites having taps in their homes during the apartheid regimes still contributes to the poor South Africans accessing less water.

In Lilongwe, Malawi, choreographies of power were at play in influencing how much water was flowing through urban infrastructure as well as where it was flowing to. Uneven distribution of water across Lilongwe city was inherent to the structure of the network, designed to divert and store larger quantities of water in higher-income areas (Rusca, *et al.* 2017) they further argued that water was distributed through different infrastructure and materials that unequally protected water from contamination.

2.5 Nkana Water & Sewerage Company (NWSC)

During the transition from the United National Independence Party (UNIP) from 1991, to the Movement for Multiparty Democracy (MMD) government and a multiparty system, and as a result of further Structural Adjustment Programmes, the mines were gradually privatised. Even though this took long to materialise, by 2000 most of the mines had been sold off to private companies. In tandem with the happenings, the provision of water and electricity services had been commercialised and the mines no longer took the responsibility of providing such services to their own employees (Pesa, 2016). This resulted in the birth of NWSC.

As a company, NWSC was incorporated in 1998 to provide water and sewerage services in the urban and peri urban areas of Kitwe, Kalulushi and Chambishi. It is jointly owned by Kitwe City Council (70 percent) and Kalulushi Municipal Council (30 percent). The Company was set up under the Water Supply and Sanitation Act No. 28 of 1997. The company started its operations in July 2000 (NWASCO & DTF, 2005). The company has undertaken a number of projects to restore the water facilities to their original design capacity (NWASCO, 2004). The core functions of the company in the area of operations are to abstract water from various sources (such as Kafue River and underground through the mines) and to treat the water to meet Zambia Bureau of standards specification for drinking water. Furthermore, to deliver the treated water to customers, collect and treat collected waste water by stabilizing all pollutant to Zambia Environmental Management Agency (ZEMA) standards and to return treated waste water to aquatic environment.

2.6 Water perceptions and Management in Zambia

As this section will show, there is not much literature written specifically on the people's perception of water ownership and management in Zambia. Much of it dwells on water and sanitation, and water supply and commercialization of water utilities (Nkowani, 2013, Banda, 2003, Dagdeviren, 2008, Mwale, 2006; Nyirenda et al., 2016).

Using a questionnaire survey, Nkowani (2013) studied the water and sanitation situation in some selected townships of Kitwe. His study revealed that 40 percent of the people in the city of Kitwe

used shallow wells. Shallow wells are those usually dug by the use of a back hoe. Because they are shallow, they are more vulnerable to contamination and to drying up during drought periods. The use of these shallow wells was not only due to affordability and lack of service availability, but also reluctance by households to connect to the existing water grids. This reluctance was mainly attributed to the dissatisfactory water supply services as many received poor water quality. The dissatisfaction is also reported by Pesa (2016). He asserts that in the mining township of Wusakile, the peak of water problems was reached in October 2014, when availability of water to the residents lasted only 30 minutes per day. This resulted into vocal protests in the media and local riots against Nkana water and Sewerage Company. In their case study, Nyirenda et al. (2016) argue that majority of people in Mulenga informal settlement depend on water from shallow wells for drinking and other domestic uses. Regarding sanitation, nearly all households use traditional pit latrines which exacerbate the problem of groundwater pollution. However, the three studies did not inquire on how people perceive water in their residential areas.

In a household survey conducted in Lusaka, Chege and Agha (1999) found that one of the major sources of water contamination was the process of water collection and storage. The survey revealed that majority of the households, especially in high density areas of the city, stored water in containers that may have been sources of contamination. They further reported that majority of the respondents perceived piped water to be of good quality compared to other sources. In a Zambian case study, Chibuye (2010) interrogated urban poverty lines that included access to clean water. She also reported that water accessed through public taps could get contaminated during transportation and storage. Furthermore, in her findings, it was perceived that residents in high density areas that accessed water through communal taps spent more on water and could not buy enough. They were forced to supplement what they bought with unsafe water from shallow wells.

In a survey on water supply and sanitation in Lusaka, Mwemba (2013) assessed the performance of water supply and sanitation service provision and revealed that service hours were satisfactory for high and medium income communities. However, services were unsatisfactory in low income areas than the general recommendation proposed by National Water and Sanitation Council

(NWASCO). This situation in the low income areas may have an impact on the perceptions of the people the study area.

Mwale (2006) used a desk top analysis in analyzing the performance of CUs in Zambia. He reported that in some places of Kitwe such as Ndeke, Chimwemwe and Buchi townships, users refused to pay for water and sanitation services that providers tried to introduce because they were used to free access during the Zambia Consolidated Copper Mines (ZCCM) days. Phiri (1999) is of the view that in Zambia, there is a widespread perception that access to safe water and appropriate sanitation are basic human rights. He further says that in Zambia and Africa in general, there is also a perception that water is from God and should therefore be provided free of charge. These perceptions could have influenced the residents' attitudes towards paying water bills.

In his survey on the impact of consumer awareness of water sector issues in Kitwe and Lusaka, Ntengwe (2004) points out that awareness changes perceptions of people on water. He reports that willingness to pay alone does not influence the recovery of costs. However, the ability to pay, awareness, availability of water, affordability and the quality of water are some of the issues affecting willingness to pay. The unavailability of water or irregularity of supply leads to conflicts between the service providers and the consumer thereby leading to unwillingness to pay or loss of revenue. Ntengwe (2004)'s study however does not evaluate the people's perceptions of the value of water external to willingness to pay.

Reviewing water service reforms in Zambia, Chitonge (2011) highlights the fact that much progress has been made in areas related to management and operation performance. But he also points out that little success has been scored in core areas which include network expansion, service coverage, hours of service, and reduction of affordability burden especially among low income households. Commercial Utilities (CUs) are reluctant to expand in low income areas with the argument that the profit prospects are low (Dagdeviren, 2008) and that the risk of vandalism and defaults are high while consumption volumes are too low.

Dagdeviren (2008) further argues that indications brought about by reforms in the water sector are that there are improvements on some fronts such as bill collection and cost recovery. But it is also clear that most utility companies were not near to achieving their operational and maintenance costs despite the fact that water tariffs have increased significantly in real terms. This is due to the inability to collect bills in full, a situation that may have to lack of mentainance of the water network and poor water quality of water supplied to the residents

2.7 Chapter Summary

Commercialisation of water supply in urban areas was initiated by the World Bank in an effort to improve efficiency in the sector. The literature has shown that perception studies are helpful in trying to solve water supply problems. Further, political ecology theories demonstrated that scarcity of water supply may be created by the imbalance that exists between the urban poor and the rich. A number of studies conducted in Zambia and Kitwe in particular have shown that even after commercialisation, water supply problems which range from lack of supply to poor water quality still exist. However, the literature does not show whether the inability of the water utility company to adequately collect revenue from the residents may be due to residents' perceptions of water as a commodity or a free good. Further, the literature does not sow the differences in payments for water supplied and consumption among the high, medium and low income areas of Kitwe.

CHAPTER THREE

DESCRIPTON OF STUDY AREA

3.0. Introduction

This chapter gives the description of Kitwe City as the study area for this study. The first part deals with the historical background of the city before describing the location and climate of the area. These will be followed by descriptions on the population and townships of the city.

3.1. History of the Study Area

The city of Kitwe's origin is associated with the discovery of copper deposits in the area and the subsequent mining operations by Bwana Mkubwa Mining Corporation in the 1920s (Pesa, 2016). After successfully sinking and commissioning of the Mindolo North shaft and production of copper begun, Kitwe was constituted as a management board town in 1931 (Mutale, 1978). It hosts one of the largest copper smelting plants, the Nkana Mine, and copper mining has remained as the main stay of the City. Kitwe is also regarded as the hub "Commercial Capital" of the Copperbelt Province due to its central location, as the focal route to other towns in the country. Nkana Mine Township was the first township to be established in Kitwe. This was followed by Wusakile and Mindolo in the 1940s, created as housing units for the African miners. More units (Chachacha, Chamboli and Miseshi) were built as mine suburbs after the opening of a shaft at Mindolo South in 1956. On the other hand, the local authority through the Kitwe Municipal Council had also built housing units (Chimwemwe, Buchi, Bulangililo, Kwacha, Race Course and Ndeke) to complement the efforts of the mines by offsetting the shortage of housing that resulted from the migration of people from rural areas to look for employment in the mines and other industries (Mutale, 1978). Both the housing units for the mines and council were sold to sitting tenants during privatisation. Some sold their houses while others rented them to tenants and others poorly maintained their houses and facilities which led to their deterioration (Pesa, 2016). Whereas housing and service provision in the former mining and council areas has deteriorated, some newly established site and service areas like Ndeke presidential and Chamboli Extension are experiencing an unprecedented boom.

Informal settlements in Kitwe have no comprehensive written history on their development. The development of these informal settlements is a post-independence phenomenon which was propelled by limited housing units and the removal of colonial restrictions on the movement of people from the rural to urban areas (Kanyense, 2006). Among the settlements in this category are Itimpi, Kamatipa, Kapoto, Chipata, Mulenga, Zamtan and Zambia compound and these were established after independence between 1966 and 1975 (Nkowani, 2013).

3.2. Location and Climate

Located in the central part of the Copperbelt Province, Kitwe is the second largest city from Lusaka. The district lies between latitude 12^0 and 13^0 South and longitude 28^0 and 29^0 East. It sits on a plateau with an altitude of over 1,295m above sea level and covers an area of $777km^2$. Although Kitwe district lies in the tropics, its climatic conditions are determined by a relatively high altitude. The drainage system in Kitwe is controlled by the Kafue River, which runs first southeast and then south following the Kafue anticline and dividing the area into two parts. The drainage system also includes two tributaries of the Kafue River in the form of Mwambashi and Chambishi Rivers. In terms of geology, the district is composed mainly of recent rock formations such as the Katanga system, Kundelungu and Muva quartzite. The central part of the district is occupied by the Basement Suppergroup (KCC, 2010).

3.3. Population Size

During the 2010 National Census, the district recorded the highest population and population density. The population recorded for the city was 517, 543 and whereas the population density was 666.1 persons per square km. the population was further projected to be 714, 407 by 2017(CSO, 2011).

3.4. Townships

Kitwe townships are of different social and economic structuring. Further, the history of the township leads to their classification as either former mine or council townships. They can also be classified as high, medium or low density areas. Mulenga, Luangwa and Mwaiseni are some of the high density areas with majority of low income families. Chimwemwe and Ndeke form part of the former council townships with generally medium income generating families.

Chimwemwe is interesting because, at the time of the study, it had two water lines, one which was laid by the council and the other by NWSC. Chamboli and Wusakile are former mine townships with high density in terms of population. Nkana East and West represents high income families but they are also former mine townships. These townships are as shown in figure 3.1.
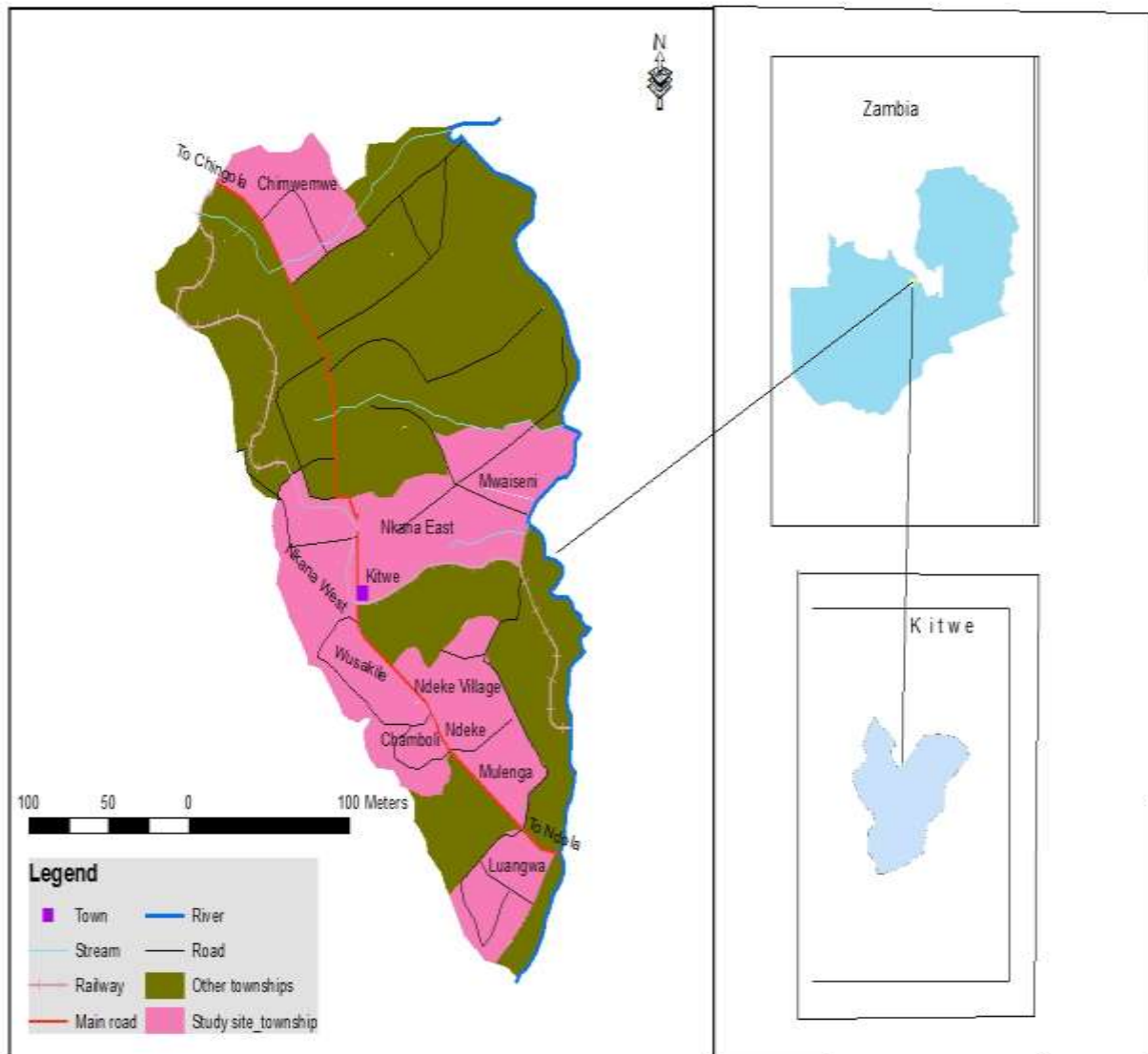
Figure 3.1. A map of Kitwe showing townships selected for the study

Source: Researcher's own Map, 2017.

3.5 Social - Economic profile of Kitwe

Kitwe is commonly referred to as the economic hub of the Copperbelt. This is because of the city's developed mining industries that generate a lot of income for the province. Copper mining is the city's central economic activity and it is the major source of employment and bustling business opportunities for the population. Apart from the large scale copper mining, small-scale mining of precious stones (emeralds) is also done in the rural part of the district in Chief Nkana's area (UN- Habitat.2009.P.10). The city is also home to some manufacturing industries in the heavy and light industries. It also has three malls; Mukuba, Copperhill and ECL Malls that house a number of retail outlets. It also houses Chisokone market, which is one of the largest markets on the Copperbelt, where a variety of goods are sold.

On the social aspect, Kitwe is home to the second highest learning institution in the country, the Copperbelt University. It also has a number of private universities and wide range of colleges. There are also a number of primary and secondary schools. In the health sector, Kitwe Central Hospital ranks highest with a number of other private hospitals. There are also clinics doted around the different townships in the city. ZESCO limited is the service provider of electricity in the city while NWSC provides the water and sanitation services.

CHAPTER FOUR

RESEARCH METHODOLOGY

4.0 Introduction

This chapter will explain the research design used and the sampling procedure followed. It will further highlight the data collection method used and how the process was done. The chapter will also give an explanation on the data analysis tools and how different data sets were analysed.

4.1. Research Design

The research used both quantitative and qualitative research design. The combination of the two approaches was chosen for triangulation of the information collected. Triangulation entails the use of more than one method or source of data in studying social phenomenon. Triangulation was used to very and sometimes to reject results from quantitative data using qualitative data. It leads to a thorough understanding of a particular phenomenon, resulting in greater confidence in results.

4.2. Sampling Procedure

A sampling frame was devised using housing records from Kitwe City Council. A sample of 390 household respondents and 13 key informants was used in this study. The sample size was arrived at using Krejcie and Morgan's (1970) sample size table (see Appendix F). Stratified random sampling was used to ensure that both former Mine and Council townships were selected. Further, stratified sampling was used to ensure that township of all income and density levels (low, medium, and high density) were all represented. Then systematic random sampling was used to select households from the purposively sampled townships. This was done to ensure that there was equitable representation from all the townships.

As mentioned already, systematic random sampling was used to choose respondents from the selected townships. In this regard, proportional sampling was used and proportions were as given in the Table 4.1. A total of 390 households were sampled from 24302 households in the study area. The targeted sample was 300 but 390 households were sampled in order to take care of

replacements for none available respondents or those that refused to take part in the survey. In doing that, ten households were added to each stratum. Based on the sample size for the respective township, a calculation was made by dividing the total number of housing units by the sample size to arrive at the number of housing units to go through before administering a questionnaire. For instance, Nkana West: 620/18 = 34. This means that in Nkana West, the first house was randomly chosen between 1 and 34. Then from that point, every 34th house was administered a questionnaire.

Snowball sampling was also used to selected households whose residents had lived there for more than 25 years. In this case, after identifying a respondent who had lived more than 25 years in the township, they would be asked to lead us to another respondent who had lived longer in the area.

Purposive sampling was used to select key informant from different institutions (NWSC, KCC, Ward Development Committees and ZCCM-Holdings) in Kitwe. Nine officials were selected from NWSC, two from KCC, two from ZCCM-Investment Holdings and four from ward development committees were selected.

Table 4.1. Townships and Respondents from the Study Area

Township	No. of Housing Units	Percentage	No, of Respondents
Nkana East	2154	8.86	37
Nkana West	620	2.55	18
Wusakile	4128	16.99	61
Chamboli	2967	12.21	47
Mulenga	2870	11.81	45
Mwaiseni	656	2.70	18
Chimwemwe	5841	24.04	81
Ndeke	2898	11.92	46
Luangwa	2168	8.92	37
Total	**24302**	**100**	**390**

Source: Field data, 2017.

4.3 Data Collection

Data collection was done between February and November 2017. The researcher and his two assistants collected primary data from the respondents. Questionnaires and semi-structured interviews were the methods used to collect data.

4.3.1. Structured Interview

A household questionnaire was administered to the respondents and was used to collect quantitative data. The data collected includes household characteristics, performance of water service provider, household perception of water and willingness to pay for water. The questionnaire was used because it helps in collecting data from a large sample as it uses precise and preplanned sets of questions that are designed to gather specific information needed in a research. A total of 300 questionnaires were used and were distributed as shown in Table 4.1. Two research assistants were trained on how to administer and interpret (from English to Bemba when need arose) the questionnaire. The researcher and the research assistants read the questions to the respondents and recorded the responses in the questionnaires. Heads of households were targets for this research but in cases where they were not available, the oldest person available in the household was used.

4.3.2. Semi-Structured Interviews

The researcher collected primary data from key informants using a semi-structured interview. Qualitative data from these key informants (officials from NWSC, Kitwe City Council and Ward Development Committees) was collected (See Appendix B). The interview used open ended questions to allow for further probing on a particular topic. It further allowed key informants to elaborate further and give concrete explanations. The key informants were chosen due to their presumed abundance of knowledge in a particular area of this research. Appointments were made before the interviews and permission from relevant authorities was obtained (see Appendix G and H). The following were the key informants interviewed:

1. Nkana Water and Sewerage: 8 officials.
2. Kitwe City Council: 2 officials
3. ZCCM-Investment Holdings: 2 officials

4. WDC: 4 WDC members

4.3.3. Observations

Personal Observations on water supply in the study area, which were recorded through photography and jotting in a note book, were used to corroborate and supplement the findings from household respondents and key informants. These observations were made and recorded by the researcher and his two assistants.

4.3.4. Secondary Data

Secondary data was collected from published and unpublished sources from the libraries of relevant NWSC, KCC, and ZCCM/IH. Some of the data on the history of water supply in Kitwe was collected from NWSC. Further, NWSC provided data on billing, tariffs and the current water supply to the study area. KCC provided records with data on the number of housing units in the study area and the history of water supply in the former council houses. Part of the data on the former ZCCM houses and water supply in the same houses was collected from ZCCM/IH.

4.4 Data Analysis

Thematic analysis was used to analyse qualitative data from interviews with Key Informants, some household respondent, secondary data and from observations. Thematic analysis is a method for identifying, organizing, describing and reporting themes within the data set (Braun and Clark 2006). In using this method, the researcher firstly farmiliarised himself with the data that was collected and then the triangulation of the data from interviews, observations and secondary sources was done. This was followed by the generation of codes using a coding framework. A coding framework was generated by identifying concepts and relationships from the data that was collected. Then the placing of the coded data into themes that were formed deductively was done. The themes were then reviewed by testing them for referential adequacy by returning to the raw data for the purpose of referential adequacy. The raw data was collected from the field by the researcher and his assistants and then the researcher archived a portion of it from the field which was used for referential adequacy. He then conducted an analysis on the remaining data and drew preliminary findings. The researcher then returned to the archived data

and analysed it in order to verify or reject the preliminary findings. Finally, the naming and defining of themes was done in redness for report writing.

For quantitative data, descriptive statistics where generated using SPSS IBM SPSS Statistics version 20 and Excel 2010. These were used for descriptive results which were expressed in frequency tables, and figures. SPSS was used to analyze survey data in order to generate tables and percentages. It was further used for inferential statistics in calculating for association, in this case, Pearson's Chi Square Test to test for association between customer satisfaction and willingness to pay at 0.05 level of significance. Excel on the other hand was used to generate different graphs for the report.

4.5 Limitations of the Study

The main limitation in this study was unavailability of data concerning the history of NWSC. Records on water supply were lost when the two entities, NWSC and KCC were separated. This resulted in the inability to have a thorough set of data on the history of water supply. NWSC was also unable to avail certain information such as the length of their network as it was not yet available and also the criteria used to select meter readers. This was important on the part of residents' satisfaction water supply and understanding their willingness to pay. Data on water consumption in volume per township was also not available. This made the researcher infer this information from the billing data that was availed as opposed to the actual volumes of water.

4.6 Ethical Issues

In order to ensure that the research was done in an ethical manner and according to the expectations of all authorities, ethical Clearance was obtained from the UNZA's Natural and Applied Sciences Research Ethics Committee (NASREC). The researcher first obtained an introductory letter from the UNZA to collect data from NWSC, KCC, ZCCM/IH and residents of Kitwe. Further, the researcher informed the respondents that the data that was collected for research purposes only and the respondent's identity would be kept confidential.

4.6 Chapter Summary

A mixed research design method was used for this research as it is better for triangulation of results. Purposive, stratified, systematic and snowball sampling methods were used to come up with a sample of 300 hundred respondents and 16 key informants. Data was collect using a questionnaire, semi-structured interview, observations and from secondary sources. In terms of analysis, thematic analysis was used to analyse qualitative data whereas quantitative data was analysed using SPSS version 20 and Excel 2010. These methods used produced desirable results as will be seen in the next chapter.

CHAPTER FIVE

RESULTS AND DISCUSSION

5.0 Introduction

This chapter contains the research findings and discussions on the findings based the literature that was reviewed. The findings follow the research objectives and the discussions draw references from the reviewed literature.

5.1 Descriptive Statistics of Household Respondents

Majority of the respondents in the survey were females. There was more female participation in this survey partly because most men were out for work or other activities when the research was conducted. This is shown in Table 5.1.

Table 5.1 Respondents and their position in the household

	Respondent/s			household Head	
	Male	Female	Married Couple	Yes	No
Frequency	86	196	18	152	148
Percentage	28.7	65.3	6	50.7	49.3

Further, women dedicate more time to household activities that are perceived as feminine and require the use of water. These activities include the cleaning of houses, washing dishes, laundry and bathing children. This finding is similar to the finding in Moldova in the National Strategy on Water and Sanitation 2014 – 2028 (WHO, 2019). Since the responsibility of household water gaining and management usually falls on women and girls, the dangers and consequences of accessing water usually fall on them. This contributes to the social gender stratification and differentiation. As Truelove (2011) argues, the depiction of a greater number of women points to their social position and access to rights as being tied to the problems they face in compensating for the unreliable water supply. One woman from Wusakile explained that girls in her household had to wake up at 02.00 AM to fetch water from one of their neighbours as that was the time water would start flowing in their pipes. The water situation in the area compounds the gender

inequality in society as men were usually left with more time to concentrate on activities that can improve their status in life and had little involvement in water issues.

The study further revealed that it is not very common to find a married couple in a household during the time of the survey. This could indicate further that only one amongst married couples in the study area was involved in ensuring that there was sufficient water in a household. It is important to note that married couples were interviewed as a couple and their agreed responses were recorded. The study also shows that 50.7 percent of the people interviewed were household heads (that included widows, widowers and divorcees) whereas 49.3 were not. In terms of the number of years the respondents had stayed in the household, 44.3 percent had stayed for over 25 years and only 23 percent had stayed there below 5 years. Majority stayed longer in the houses because they now own the houses after buying them from ZCCM or KCC. This could be one of the reasons why many respondents were finding it difficult to perceive urban water supply as a commercial good after having been used to a minimal unnoticed charge (Mwale, 2006)

5.2. History of Water Supply in Kitwe

Asset Holdings Corporation-Mining Municipal Service (AHC-MMS) was a five-year (2001-2006) water management contract involving Saur (a French Multi-National Water Company) contracted with the support of the World Bank. The purpose of the company and contract was to provide water and sanitation service to the mine township. As mentioned in chapter one, the role of water provision in the mine townships was for the mines but after privatization, this role was moved to AHC-MMS. When the contract ended, AHC-MMS was handed over to NWSC because the company did not perform better than the local authorities around the country (Dagdeviren, 2008). It is important to note that before privatization, ZCCM did almost everything for the residents in the mine townships as RAID, (2000, p162) reports on its spending between 1990 and 1997:

The array of capital purchases or facilities rehabilitated is astonishing: the relaying of sewers, the replacement of municipal pumping stations, water reticulation, the sinking of boreholes, the provision of a new chlorination plant and a one million gallon reservoir; the installation of an electricity substation to power a local cinema, floodlights at a local sports ground, the upgrading of electrical supply systems; home ownership schemes, the demolition of defunct housing, the building of new houses, road rehabilitation, the repair of streetlights, expenditure

on the local market, money to revamp a telephone exchange; the provision of libraries, training and youth schemes, the rehabilitation of women's centres, the building of shelters for mourners at local cemeteries; hospital refurbishments, the purchase of X-ray equipment, ventilators, blood banks, mortuary chambers, pathology labs, the construction of entire health centres; the purchase of laundry equipment, furniture, typewriters, fridges and cookers, kennels for the dogs of the mine police, a lawn mower, a fish pond, and three Tata buses. (RAID, 2000, p162).

The report shows clearly that history, social services that included the supply of water and repair of water facilities was done by ZCCM in the mine townships. The residents never lacked in social amenities. The prevailing social conditions at that time were informed by the social policy the government had adopted. Ideology plays an important role in determining a country's development mission. In Zambia, during the 1960s and 1970s, Humanist or Socialist principles gave direction to social policy's programmatic interventions (Kandeke, 1977). Currently, there are pronouncements about fighting poverty and service provision that may all be well-intentioned, but the crucial question remains: from which ideological orientation? It is not clear whether Zambia is a neo-liberal state or a Leftist or Centre-Right or Centre-Left? (Noyoo, 2010). However, the change in ideological policy brought about the change in provision water supply in urban areas of Zambia.

A Key informant from NWSC reported that before NWSC, there were two service providers of water in Kitwe. These were ZCCM mainly for Mining Township and KCC for the council houses in Kitwe. Another Key Informant who worked for NWSC then, but now a member of Ward Development Committee (WDC) for Bupe Ward, said that before NWSC, AHC-MMS was a contracted company that took over from ZCCM in 2001. After five years, the responsibility of water supply and sanitation services moved given to NWSC in 2006. Water provision before the Water Utility Companies was purely a service and not for business. This led to the worsening situation as there was no recapitalization. Some facilities date as far back as 1950s and have deteriorated. The tariffs did not reflect the cost because there was a subsidy. "Water tariffs in all the urban centres of Zambia were heavily subsidized. Charges were paid as part of rents and were mostly unnoticed by users," (Dagdeviren, 2008: 4). This explains the perception held by some of the respondents that ZCCM used to provide water free of charge. From 1989 to 2006, the Zambian government created water utilities to have tariffs that would cover operation costs.

By 2005, unaccounted for water reduced from 59 percent in 2001 to 44 percent (Dagdeviren, 2008). Unaccounted water mainly results from leakages usually due to run down infrastructure.

Further, a key informant from NWSC was of the view that current tariffs are not cost reflective as they are regulated by NWASCO. Before approving tariffs, NWASCO uses a tariff plus setting approach to analyze proposals. This approach aims at equating costs and revenues by the CU's efficiency, operation and maintenance costs as well as the plight of the customers (NWASCO, 2007). The approach ensures that the CUs are financially sustainable and the commodity is affordable for all. However, this assertion that water becomes affordable for all is disputed by many scholars (Bakker, 2003; Loftus, 2009; Swyngedouw, 2006) Bakker (2003) argues that under commercialization, water ceases to be a service, supplied to citizens as a right at a subsidized rate, but sold to consumers on a profit-making basis of willingness-to-pay rather than ability to pay. Many low income areas in Kitwe continue facing water challenges partly due to high tariffs but also the poor service delivery from the water utility company and this situation ensures that inequality between those that are able to afford deepens even further. UNDP (2006) argues that the approach of combining equity with efficiency by raising the price with the volume of water used locks the poorest households in higher tariff bands.

5.3. Consumption Rates and Payment Profiles

The Catchment area for NWSC is Kitwe, Kalulushi and Chambeshi. As at 31st December 2016, 739,942 against a total household population of 777,149 were serviced. This translated in 60554 connections. It has been observed by the company that residents who have accrued huge bills opt for other sources of water.

The Tables; 5.3.1, 5.3.2, 5.3.3 show the payment profiles for water in Kitwe from which consumption rates of water for the different parts of the study area have been deduced. The three tables have different numbers of townships because at the time of data collection, NWSC had only received the presented information. Open balance in the Table 5.3.1 refers to the total outstanding revenue owed to the utility company by a township at the time of billing in that particular month. Billing on the other hand refers to the total amount of money that was expected from the township for the water that was consumed whereas collections is the total amount of money that was collected from the summation of billing and open balance. Close balance is the amount of money that was outstanding after collection.

Table: 5.3.1. JANUARY 2016 GROSS BILLING AND COLLECTION (IN ZMW) BY TOWNSHIP

Township	Open Balance	Billing	Collections	Close Balance	Collection Efficiency
Parklands	2,271,858	513,442	279,892	2,457,972	55%
Riverside	3,046,767	704,649	470,146	3,239,308	67%
Nkana East	3,788,005	1,219,614	810,960	3,837,772	66%
Nkana West	2,428,626	206,681	164,298	2,464,977	79%
Ndeke	7,750,732	724,857	205,651	8,251,470	28%
Chamboli	3,605,255	257,412	82,359	3,778,940	32%
Chimwemwe	15,164.523	853,743	307,458	15,693,151	36%
Wusakile	3,720,460	323,935	43,666	4,000,310	13%
Luangwa	1,120,570	30,257	9,188	1,141,595	30%

Source: NWSC, 2017.

In terms of water billing and revenue collection, Table; 5.3.1shows that both are high in high income areas which are Parklands, Riverside, Nkana East and Nkana West. These are lower in the middle and low income areas that make up the rest of the table. Efficiency of revenue collection in the last column of the table is also higher in the high income areas.

Table 5.3.2. JUNE 2016 GROSS BILLING AND COLLECTION (IN ZMW) BY   TOWNSHIP

Township	Billing	No. of Households	Per Household Billing(ZMW/Household)	Collections	Collection Efficiency
Nkana East	1,308,604	2,154	608	754,208.83	58%
Nkana West	191,845	620	309	183,407.88	96%
Ndeke	550,433	2,898	190	142,447.29	37%
Chamboli	244,524	2,967	82	72,520.31	30%
Chimwemwe	786,484	5,841	135	423,808.77	54%
Wusakile	340,106	4,128	82	44,220.00	13%
Luangwa	106,131	2,168	49	15,201.81	14%
Mulenga	20,584	2,870	7	7,728.00	38%

Source: NWSC, 2017.

Similar to Table; 53.1, Table 5.3.2 also shows the billing and revenue collection of water by township. However, these two tables also show the number of households and per capita billing. Per capita billing was found by dividing billing by the number of households. It should be noted that the low income areas are represented by Luangwa and Mulenga residential area. It is clear from per capita billing that high density areas like Wusakile, Chamboli and Mulenga receive low billing per household which translate to very little amount of water received.

Table 5.3.3. DECEMBER 2016 GROSS BILLING AND COLLECTION (IN ZMW) BY TOWNSHIP

Township	Billing	No. of Households	Per Household Billing (ZMW/Household	Collections	Collection Efficiency
Nkana East	1,073,782	2,154	499	925,324.23	86%
Ndeke	382,027	2,898	132	103,661.08	27%
Wusakile	419,710	4,128	102	166,869.07	40%
Chamboli	223,955	2,967	75	73,164.89	33%
Chimwemwe	608,014	5,841	104	264,080.46	43%
Luangwa	87,275	2,168	40	12,545.00	14%

Source: NWSC, 2017.

Like Tables; 5.3.1 and 5.3.2, Table; 5.3.3 also shows the billing and collection of revenue for water supply. Ndeke, Ndeke Village, Chimwemwe, Chamboli and Wusakile represent the middle income townships. The collection efficiency for Ndeke in all three tables was lower mainly due to disputed bills by residents as some claimed that they had not been receiving water for a long time. However, it was observed by the utility company that residents who had accrued huge bills and were disconnected from the water network opted for other sources of water.

In terms of water consumption, from the billing records in Tables; 5.3.1 and 5.3.2, Table; 5.3.3 it can be inferred that low density areas consume more water compared to the medium and high density ones. The three tables show that in the three months   (January, June and December) Nkana East recorded billings exceeding a million kwacha and implies that the area recorded the highest consumption of water. Similarly, Riverside and Parklands which are also low density areas have been recording high consumption rates. However, high density townships such as Wusakile with a population almost twice as high as that of Nkana East in the study area have been recording lower consumptions despite having higher populations. NWSC explained that the three tables high amounts of billing in low density areas than the high density ones because the low density areas are more consistent with paying their bills compared to the medium and the high density ones. The findings that high density areas consume less water compared to the low density conform to NWASCO (2017) that reported that minimum water supply was recorded in Chamboli and Wusakile.

However, the situation in Tables 5.3.1, 5.3.2 and 5.3.3 clearly indicates as Abubakar (2018) argues, that being connected to a piped water network in developing countries does not guarantee

a reliable access, as the supply is usually inadequate and unreliable especially for the urban poor. The finding is clearly in tandem with Bakker (2003)'s findings in Durban, South Africa and her argument that the affluent consume more water than the poor in urban societies. The finding is also consistent with Rusca *et al.*'s (2017) finding that the unequal distribution of water across the city of Lilongwe in Malawi is inherent to the structure of the network, designed to divert and store larger quantities of water in higher-income areas. This is clearly against the Neo-Malthusian theory that an increase in population will lead to shortage of natural resources. If the affluent in society can change their life style (Figure 5.3.1), it is possible to reduce the amount of water they use and redistribute to areas lacking it. The shortage of water in high density areas of Kitwe is due to uneven distribution of water as the affluent are having more water.

Figure 5.3.1. Well-watered lawn in Nkana East, a low density area in Kitwe.
Source: Field data, 2017

According to NWSC, the service hours for high density areas per day are 12 hours and medium density areas is 16 hours. For low density areas, the service hours are 22 hours. However, this is not the situation on the ground as majority of the respondents in the medium and high density areas complained that they are serviced for less than 6 hours per day. Clearly, townships such as Mulenga, Lungwa, Chamboli and Wusakile have very little hours of water or nothing at all in a

day whereas areas like Nkana East and Nkana West have less of such problems. This kind of water scarcity in high density areas maybe one created by the elites who are mainly found in the low density areas where decision makers are found and earn high and stable incomes to pay for water. As Bakker (2003) argues, water supply is relatively abundant for the urban elite but a daily struggle for the urban poor.

5.4. Residents' Sources of Water in Kitwe

The main sources of water in the study area were tap water, wells and boreholes. The information is as summarised in Figure 5.4.1.
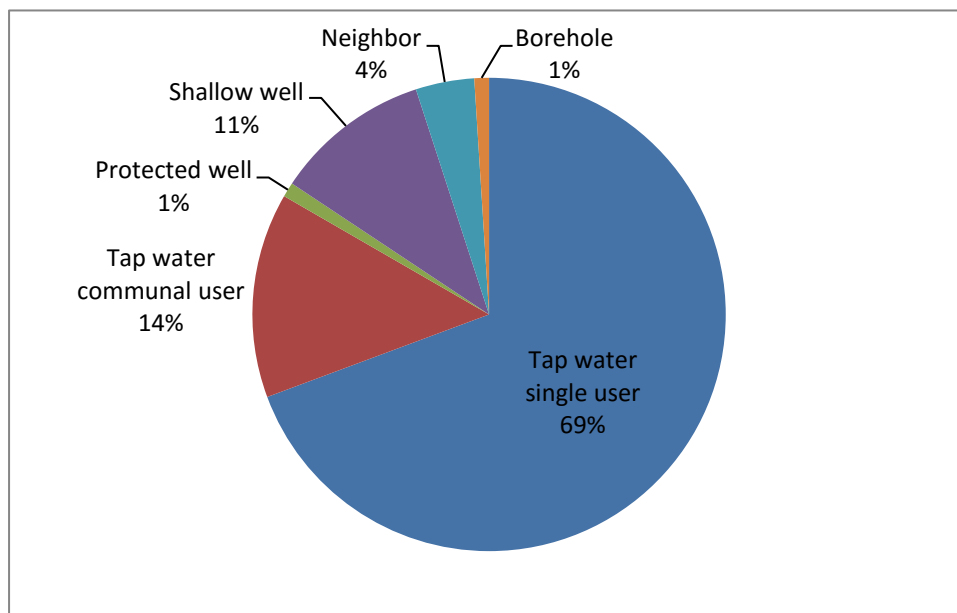
Figure 5.4.1 Respondents' different sources of water.
Source: Field data, 2017.

Most of the residents in the study area have taps in their households. These households are found across the entire study area. Single in this case implies that they household does not share their source of water with members that do not belong their household. This finding is nearly the same with NWASCO's (2017) survey findings. NWASCO found out that 69.7 percent of the population were served by NWSC household taps while in 2017, the figure rose to 70 percent. However, this finding does not imply that every household receives sufficient water supply because others are forced to fetch from their neighbours. They may have the water network in their household without water flowing in them. This case is prevalent in Ndeke township.

For the remaining percentages, some residents obtained their water from multiple user taps which maybe one communal tap or a household that receive a constant supply of water in that area. Some residents, especially those that cannot afford and those who no longer receive water from NWSC in their household, obtain their water from shallow wells. These shallow wells are mainly found in Mulenga and Luangwa townships, but also in some homes of Chamboli, Wusakile and Ndeke townships. This finding is in line with Nyirenda et al (2016) who reported that majority of the people in Mulenga informal settlement depend on shallow wells for drinking and other domestic use. These have been necessitated by the non-availability of piped water from NWSC. It is important to note that the water from the shallow wells is not always potable as it is subject to pollution and contamination from runoffs and nearby latrines. Nyirenda et al (2016:110) further report that "groundwater in Mulenga informal settlement is generally contaminated with pathogenic organisms as indicated by the presence of total and   faecal coliforms in all the analysed water samples." They further reported that some parameters which include turbidity, pH and nitrates did not comply with ZABS drinking water guideline values at the majority of the wells (Nyirenda et al, 2016).

A key informant from NWSC indicated that people in some areas of Kitwe were reluctant to connect to NWSC's water network. This was because they were used to using water from shallow wells, which are free, as their source of water. Therefore, to connect to NWSC water network and start paying for a service they considered to be free was difficult for them. This finding is similar to Kelly (2016)'s findings that the African population in Mikindani community of Tanzania were unwilling to connect to the water network because of their unwillingness to pay for the piped water when open wells were available.

5.5. Residents' Level of Satisfaction with Water Supply

The survey gathered information on the residents' level of satisfaction with the water supply from NWSC. The results are presented in Figure 5.5.1.
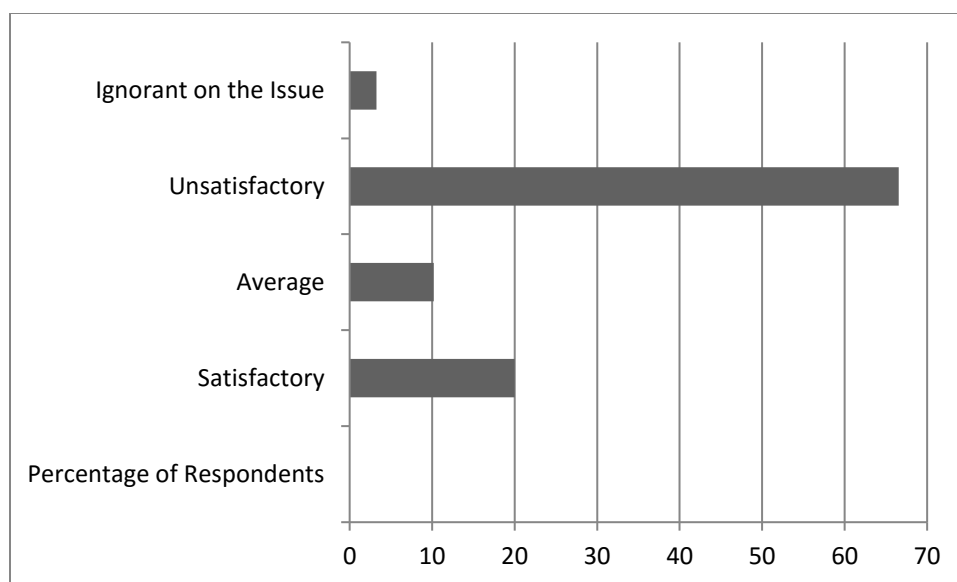
Figure 5.5.1: Respondents' levels of satisfaction of water services from NWSC.

Source: Field data, 2017.

A larger percentage of respondents as can be seen in Figure 5.5.1 indicated that they were not satisfied with water supply in terms of hours of water supply and turbidity. In terms of hours of water supply, 66.55 percent of the respondents indicated that they received less than six hours of water supply per day. Further, in some households, some respondents complained of low water pressure and were unable to access it in their home. This forced them to dig holes near the main line in order to have a bit of water coming out and draw the water from there. This is consistent with Nkowani (2013)'s findings regarding customer service satisfaction. He reported that majority of the residents in the Kitwe were not satisfied with the service ours, the quality of water, adequacy and reliabity. These respondents are mainly from high and medium density areas. One of the Key Informants from Bupe Ward Development Committee indicated that some houses within the ward do not receive running water whereas others receive water for up to 30 minutes in a day and others have water for some few hours. Some households are metered yet they are charged on fixed tariffs. The Key Informant asserted that NWSC knows that they do not supply water to those households but still bills them. Figure 5.5.2 shows a household that does not receive at all and has opted to dig a shallow well in Ndeke. The findings shown in figure 5.5.2 is similar to Kelly (2016) who found that the community in Mikindani area of Tanzania opted to use water from the well as it was more reliable.

Figure 5.5.2. A household that has switched to the use of a shallow well.
Source: Field data, 2017.

Only 3 percent of the respondents received water for hours ranging from 18 to 24 hours. These are low density areas (Nkana East and Nkana West). This is different from the situation when ZCCM and the council were supplying water to the townships in the study area as can be seen in Figures 5.5.4. and 5.5.5. The finding is in tandem with Chitonge (2011) who reported that there had been little progress in the number of hours of water service for most of the CUs in the past ten years in Zambia. Clearly, 45 of the people who have experienced the two eras indicated that they were more hours of supply during the ZCCM and Council era compared to the current situation.
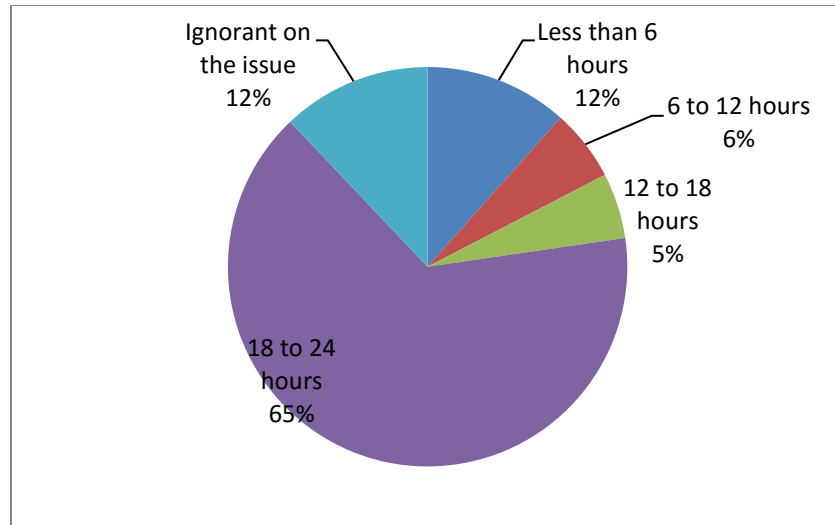
Figure 5.5.3. Water service hours in the era of ZCCM/Council

Source: Field data, 2017.

The respondents that were categorised as 'Ignorant on the issue' are those that expressed ignorance on the hours of provision of water in that era mostly because they were just visiting or were not residents of the area.
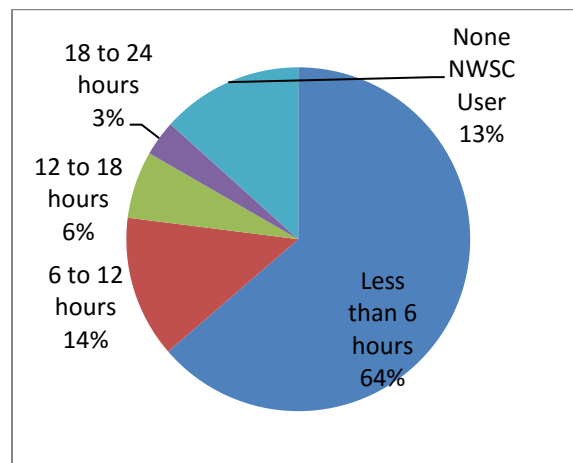
Figure 5.5.4. Water service hours in the era of NWSC

Source: Field data, 2017.

Comparing Figure 5.5.3 and Figure5.5.4, it has been revealed that majority of the residents that were present in the era of ZCCM and Kitwe city council water supply era were satisfied with the hours of supply. They perceived the water supply then to have been reliable as there was always

a sustained supply of water of between 18 to 24 hours daily. A female respondent from Wusakile Township explained that the ZCCM era of water supply were best days as they not suffering as status was at the time of the survey.

Water would through the taps throughout the day. We would shower at any time of the day or night without worrying of the supply being cut. If for some reason they wanted cut the water supply for repair works, we would be informed and it would only be for a few hours. (Female Respondent, April, 2017).

In terms of water cloudiness, 40 percent of the respondents reported that water was clearer during the ZCCM/Council era of water supply whereas 10.7 percent indicated that the water they received during the era of ZCCM/Council was not clear especially when water was restored after maintenance works. Most of these respondents were from the former council houses. The rest of the respondents were not in the category of those that experience the ZCCM/Council era nor had a view on the matter. Currently, majority of the respondents (63.7 percent) reported that the water supplied from NWSC is not clear, and in some cases, respondents claimed that it had sewage odour. One respondent from Chamboli township complained that the little amount of water received in their area contributed to the blockages of the sewerage system.

*The water that we use in our toilets and sinks is not enough to push the sewage through to the end. As a result, the sewage remains stack within the system and eventually causes the blockage and overflow. In the long run, the overflowing sewage mixes with water through broken pipes,* (Respondent, Chamboli, March 2017).

Many others (63.7%) complained that the water they receive is not clear as it usually has particles of sand and solid particles in water. Some responded went further to say that the water supplied by NWSC is not fit for human consumption and as such, they buy mineral water for drinking and cooking, and use tap water for washing and watering the lawn. One of the WDC key informants from Ndeke ward stated that the water quality is compromised as the system has leakages and roots. Roots of trees had cracked some of the pipes in the area and grown through them in the process blocking the water.

I had to push hooks in the pipes in order to pull out avocado roots from the system, (Key Informant, Ndeke, February 2017).

The water that households receive is usually brown in colour as can be seen in Figure 5.5.5. While water quality problems affect the entire city, it was clear that most of these problems were in high density areas. This is because the areas have very old and leaking pipes that easily allow the mixing of water with sewage and sand. It should be noted however that generally, all the townships in the study area complained of the poor water quality. Further, a Key Informant from Ndeke Ward complained that there has been selective replacement and maintenance of pipes, mainly favouring the low density areas because they pay bills. Further, one resident and a former employee of NWSC complained that whenever funding for projects aimed at improve water infrastructure was sourced, the directors and mangers of the company start with acquiring themselves big vehicles before the core business of the project. As such, funds are usually depleted even before the project reaches 70 percent completion.

Figure 5.5.5. Cloudiness of water from the tap (Ndeke).
Source: Field data, 2017.

A male respondent from Wusakile Township and a former employee of ZCCM complained of lack of urgency from NWSC to attend to leakages and other faults on the water supply line. He

further said that what had caused the status quo was the mentality of government workers that the company has adopted.

During our time in ZCCM, we used to respond very swiftly to problems even as small as installation of a new bulb in a house. But what has happened now leaves much to be desired. NWSC responds to faults the same way most government institutions do, without any sense of urgency, (Male Respondent, Wusakile, March 2017).

These findings are similar to Rusca et al.'s (2017) findings in their study in Lilongwe city of Malawi. They argue that inequalities in water quality are embedded in the infrastructural configuration of the network which leads to higher risk of pipe breakage, intermittent supply, corrosion, low pressure and culminating into water contamination. Their study also shows that although there were high rates of pipe bursts and leakages in low income areas of Lilongwe, maintenance took longer (months) when compared with the high income areas (days).

Another factor that could contribute to turbidity and general poor quality of water could be storage containers of water. A female respondent from Old Ndeke Township lamented the erratic water supply as a factor that contributes to poor quality. She lamented,

Because we receive water for a few unpredictable hours and sometimes not, we have to store water in these containers. These 2.5 and 5 liters containers do not assure us quality and they take a lot of space in our small kitchens and houses, (Female Respondent, Old Ndeke, April, 2017).

The findings above are in tandem with other scholars (Chege and Agha, 1999; Chibuye, 2011; Abubbakar, 2018) who argue that storage containers of water are one of the major sources of contamination for water thereby reducing its quality. Further, NWASCO (2017) reported that in 2015 and 2016, the major complaint recorded from NWSC customers to NWASCO was one to do with poor water quality. Only 14.7 percent of the respondents in the entire study area reported that they receive clear water. Most of these respondents were from low density areas. This is shown in table 5.5.1.

Table 5.5.1: Respondents' Perception on Cloudiness of Water in Kitwe

	Cloudiness ZCCM/Council Era	Cloudiness in NWSC Era
	Percent	Percent
Clear	40.0	14.7
Not clear	10.7	63.7
Average	7.3	8.7
No View on matter	9.7	.3
Other Water Sources	32.3	12.7
Total	100.0	100.0

Source: Field data, 2017.

It is clear from the table that at the time of the study, majority of the residents do not receive clear water from NWSC in their households. This is different from those that received water from ZCCM/Council where majority indicated receiving clear water. This situation has an influence on some residents' lack of acceptance of water as a commodity as the water received is worse than that from the shallow well. A few residents had no view on the issue of turbidity as they had little understanding of the matter. Those that had different sources of from the ZCCM/Council and NWSC did not contribute information on turbidity.

5.6. Customers' Views on Water Tariffs

Majority of the respondents who experienced both eras indicated that water tariffs are higher now compared to the ZCCM/Council era. This information is summarized in tables 5.6.1. In fact, respondents from the former mining townships (Chamboli, Wusakile, Nkana East and Nkana West) reported that during the ZCCM era, water supply and other utilities were provided by the mines for free. Others especially the male respondents who worked in the mines were quick to mention that a small amount of money was deducted from their salaries to go towards the household utilities. Ballance and Tremolet (2005) argue that despite the successive real increases over the years, water charges applied by Zambian utilities are still the lowest in sub-Saharan Africa. They further argue that the affordability of these low tariffs is still problematic

NWSC stated that tariffs charged to customers are not uniform for the household that are on fixed charge and what is paid depends on the usage. The tariffs are low in high density areas and high in the low density areas because of the economic status coupled with the hours of supply. This similar to Dagdeviren (2008)'s findings that in Zambia, households have been charged for water according to the housing category they occupy. Households in low-cost housing pay less than those in medium and high-cost housing. However, according to the billing section of NWSC, households that are metered are charged the same regardless of the area. They also reported that when fixing tariffs, the company has to meet certain benchmarks like reducing wasted water before increasing water tariffs. They further indicated that disparities in water service hours may strongly contribute to the reluctance of some residents to connect to NWSC water system.

Table 5.6.1: Respondents' Views on Water Tariffs in Kitwe

	Tariffs in ZCCM/Council Era	**Tariffs in NWSC Era**
	Percent	Percent
Low	49.7	12.0
Average	1.7	6.7
High	7.3	54.3
Dependent	9.0	13.7
Other water Sources	32.3	13.3
Total	100.0	100.0

Source: Field data, 2017.

Further, 30 percent of the respondents indicated that their households were not metered and because of this, they said that they were paying more than they would if metered. This was because they were billed even when they had not received water for the entire month. Only 58.7 percent of the respondents reported that their households were metered, with some complaining that their meters were not working. Others had opted to remove the meters because when the meters were fixed, the water stopped running in their household due to low pressure. These are some the households that been put on fixed charge or have decided to stop paying for water services. Some respondents complained that the people who were tasked to read the meters did not give the correct readings for billing as customer receive identical amounts on their monthly

bills for three or months consecutively. Others claimed that they did not see the meter readers visiting their homes to get readings but they received the bills. Others also claimed that some meter readers could barely write later on read besides lacking customer courtesy. Because of this, they gave wrong readings for billing. Ntengwe (2004) argues that mistake free meter readings and billing build confidence among the community in the water providers. This can only be achieved if meter readers were consistent in taking readings.

However, the consumers in the study area have little confidence in the water providers in that what is presented on the bills is not believed to be correct. This is because of the frequent appearance of errors in meter readings and billing. Besides that, household that have for many years not been receiving water and have opted for shallow wells still receives bills. On this matter, NWSC billing section refuted the claim as they ensure that before being employed, meter readers are trained and carefully guided on how to go about their work. The company however, failed to back their claim as they were unable avail a training manual for the meter readers. If the company has meter readers who are consistent reading the meters, they would not be generating bills for household that do not receive water. Chitonge (2011) argues that the metering ratio average in Zambia is below the average for the region and this contributes the problems CUs have in revenue collection.

The majority of the respondents showed great displeasure with NWSC and given a chance, they would go back to ZCCM or Council. Answering a question on whether they would be willing to go back to ZCCM or Council era, 55 percent of the respondents answered in the affirmative to go back. This similar to Musasa (2014)'s findings as she reported that her informants looked back to the 'good life' before the privatisation of the mines with more than a hint of nostalgia. They main reasons they advanced for the wish to go back to the old ZCCM were the poor service delivery in terms of water quality and hours of supply, and the high tariffs charged by NWSC. On the other hand, 24 percent negatively answered the question, most of them with the knowledge that there is no possibility of bringing back ZCCM. This is as shown in the Figure 5.6.2

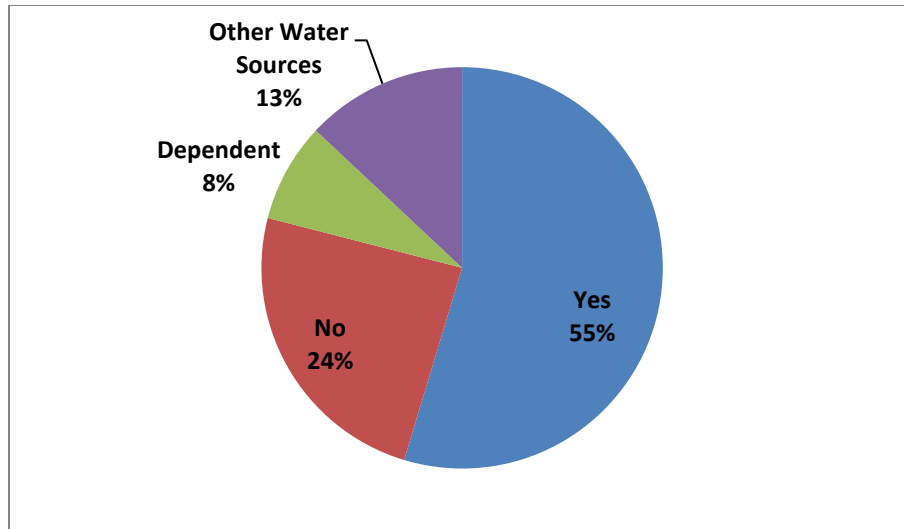**Figure 5.6.2:** Respondents' views on whether to take back water provision to ZCCM/Council or not.

Source: Field data, 2017.

5.7. Perceptions of Water and Its Value

In this study, information on the residents' perceptions of water and its value was surveyed and the results are shown in Figure 5.7.1.
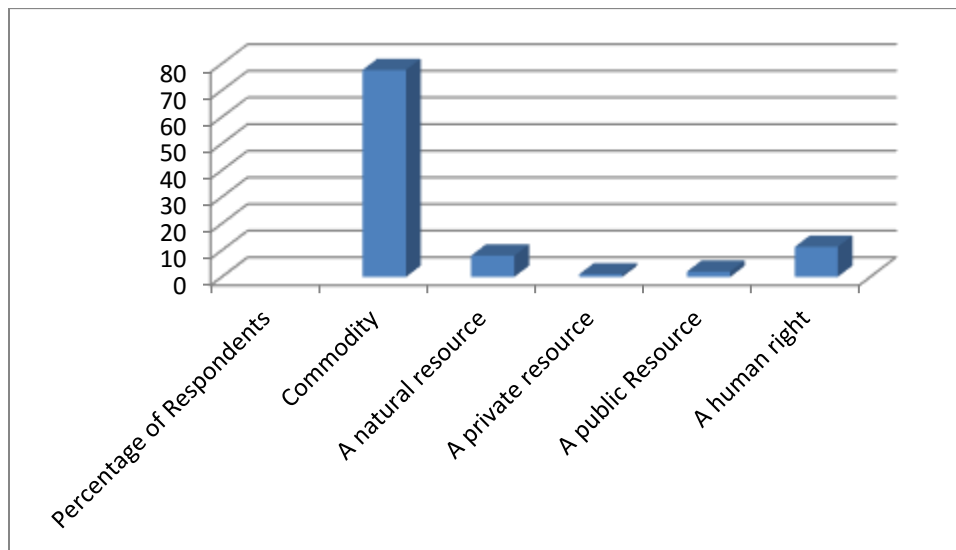

Figure 5.7.1: Respondents' perception of clean water in Kitwe

Source: Field data, 2017.

Respondents were asked questions on how they perceive water resources whether as a commodity, a natural resource, private resource, a public resource or a human right. Majority of the respondents (77.7%) indicated that clean water is a private resource because firstly, the utility company spends money in abstracting the water, treating it and then pumping it to the household. Secondly, the customer has to pay for that water. As such it has to be treated as a commodity and a private resource. But 8% of the respondents perceive it as a human right which should be provided by the government. Further, 1% of the respondents perceived clean water as a natural resource which is provided to the people by God. It must be noted like Noga and Wolbring (2013) that those that perceive clean water as natural or public resource consider it to be free whereas those that perceive it to be a private resource consider it to have a price.

On the question of whether clean water is a human right, 11.3 percent of the respondents indicated that clean water is a human right and that every human being whether rich or poor should have access. They said that the local authority should be responsible in ensuring that their community has access to clean water. Some respondents said that one must earn access to clean water through working hard and paying for it. Generally, residents of Kitwe appreciate the importance of clean water to humans and the need for everyone to have access to it. They also appreciate clean water requires money to purify and supply it. Therefore, there is need to strike a balance to ensure that all have access but also that the utility company collects enough revenue for running the operations.

Regarding the perception of open lake or river water (water sourced from the river or lake directly by the respondent), whether it should be considered as natural, public or private resource, 53.3% of the respondents indicated that it is a natural resource and 34.7% of the respondents said that it is a public resource. They backed their responses by saying that the water is from God and as such, it is supposed to be free. Others said that this type of water is not supposed to be paid for because no treatment of any kind is done to it and it is not pumped to the households. Individuals go to draw it on their own and because of that, it cannot be a commodity.

A Key informant from NWSC believes that about 98 percent of the population in Kitwe acknowledges that it is their responsibility to pay for water. However, he also asserted that a few residents still believe that the resource is from God. A key informant from NWSC revealed that there are still residents of Kitwe who still feel that the government should provide water for free.

For instance, in Chimwemwe and Kalulushi, there are two water lines, the old one laid by the council and the new one laid by NWSC. Some residents of these two areas believe that water from the old line should not be paid for despite coming from the same source. They consider it as coming from council and should be for free. There are also some customers who still want NWSC to fix broken and leaking pipes in their homes. These two scenarios point to how much some residents in some townships are unwilling to pay for water supply services and reflect on the low revenue collection by NWSC. NWASCO (2017) reported that the collection efficiency of revenue for NWSC for 2015 and 2016 was at 61 percent which is way below the acceptable benchmark of 85 percent for the water bills. This can be partly attributed to the way residents of Kitwe perceive water as demonstrated from the two water lines in Chimwemwe and Kalulushi.

A Key informant from NWSC also feels that residents' perceptions of water are not influenced by the history of water supply in Kitwe.

> *Our customers' perceptions of water supply are influenced by the old bills they accrued and the poor supply of water in many townships. For example, in Mindolo Township, residents stone NWSC workers who distribute bills (*Key Informant, NWSC, March, 2017).

Some Key Informants in Wusakile and Ndeke Townships suggested that NWSC should wave old bills and started afresh. This was because the existing bills were inaccurate and did not reflect the amounts owed to the company. However, a Key Informant from NWSC felt that the residents were not being sincere because the bills were written off before in Wusakile yet they were still calling for the same to be done again.
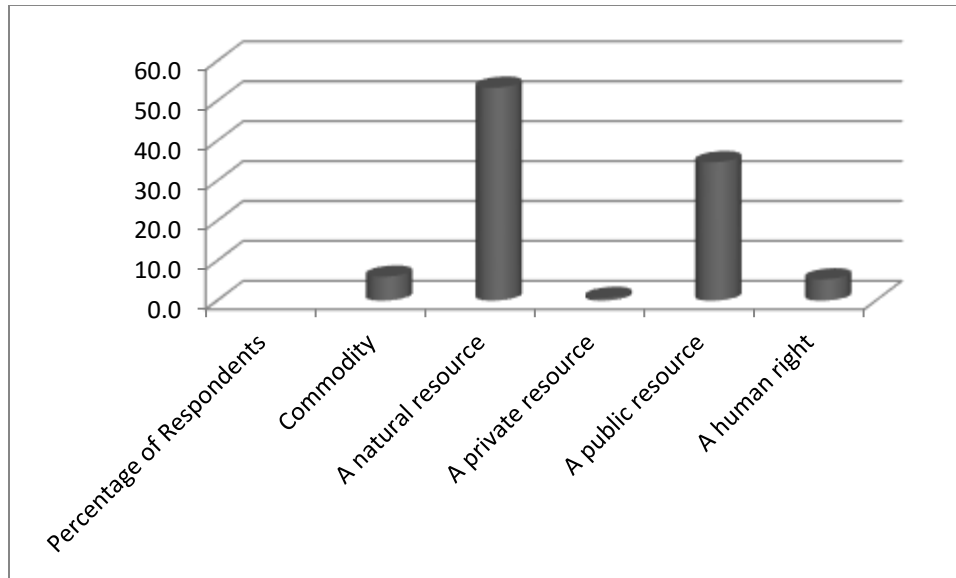
Figure 5.7.2: Respondents' perception of open source water (lake and river water) in Kitwe

Source: Field data, 2017.

Respondents were asked on how they appreciate the value of water. Majority (71 percent) of the respondents indicated that water is life. This was because it was needed for a person to survive, for household chores such as cooking, washing and bathing. This finding is in tandem with Noga and Wolbring (2013) who argue that water is essential for life and that the world is coming to an end of the golden age of water. With this realization of the importance of water and the ZCCM/Council era gone, there is an urge for proper management and sustainable use of water. Without this awareness and sustainable use, the future can bless itself with water related problems. The views of 20.7 percent were that the value of water could be seen by comparing those without with those with water. Others, 5 percent, indicated that the value could be seen by looking at a waterfall whereas 3 percent said that the value was seen through the price of a bottle of water.

In terms of the views respondents had on how much water should cost given an opportunity to sell, majority of the respondents indicated that water should be for free because it is the most important basic human necessity. The results are as shown in table 5.7.2. This finding is similar to Omole and Okunowo (2016)'s findings where they reported that over 60% of the residents in

Ogun State in Nigeria where not willing to pay anything for water supply services as they felt that the government should be responsible for that.

Table 5.7.1. Respondent's View on Price of Water

	% of Respondents
Nothing, water should be free	61.0
Price based on supply and demand	33.0
Same price as NWSC	4.7
Same as mineral water	1.3
Total	100.0

Source: Field data, 2017.

The result from the questionnaire survey showed that 33 percent of the households pay an amount ranging from ZMW100 to ZMW300 per month for water. These households are mainly in Ndeke, part of Chamboli and Chimwemwe townships. Others, 29 percent pay below ZMW100 and these are mainly in Mulenga compound, part of Chamboli and Luangwa townships. Those that pay nothing for water made up 26 percent of the survey and these include households from Mulenga and Luangwa that use shallow wells as well as those that use boreholes. This group also includes households from Wusakile Township that have decided not to pay for water because they are not happy with the erratic water supply situation which they experience. They reported that whenever NWSC disconnect, they report to the ward councilor who leads them to go and compel the reconnections. This different from the study of Mbeu (2013), that found that erratic water supply and poor quality of water had a moderate effect on payment of water bills by residents of Embu County in Kenya. The behaviour of not paying water bills by some residents of Kitwe indicates the negative attitudes they have towards paying for water service. The findings also indicated that 8 percent of the respondents indicated that they pay above ZMW500 per month and these were mainly from the low density areas (Nkana East and Nkana West). Most of these complained that NWSC overcharged them because they were usually paying without defaulting. Further, they complained that they were overcharged so as to make up for the lost revenue that they could not collect in other areas like Wusakile. They also indicated that NWSC was quick to disconnect water from their households without reasoning with them, which was different with the low and medium density areas.
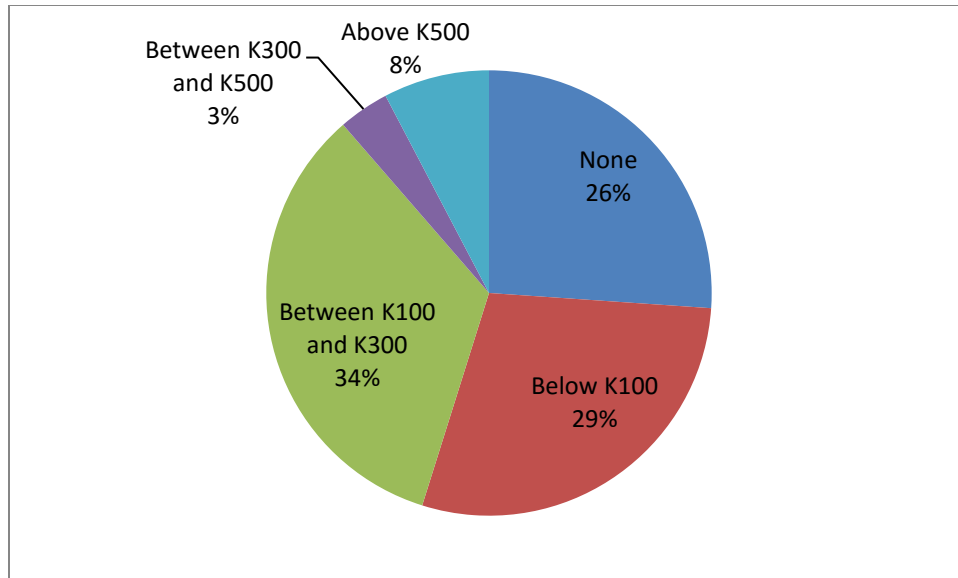
Figure 5.7.3: Respondents' monthly payments for water in Kitwe.

Source: Field data, 2017.

The survey results also show that 59 percent of the respondents think that the money they pay per month is not equal to the value of water services they. This is because of the erratic or non-availability of water supply besides the poor quality in terms turbidity and odour. Others, 16.7 percent, affirmed that the amount they paid was equal to the value whereas 14 percent of the respondents were not sure. Those who were not sure were mainly non-household heads who were not involved in the payment of water.
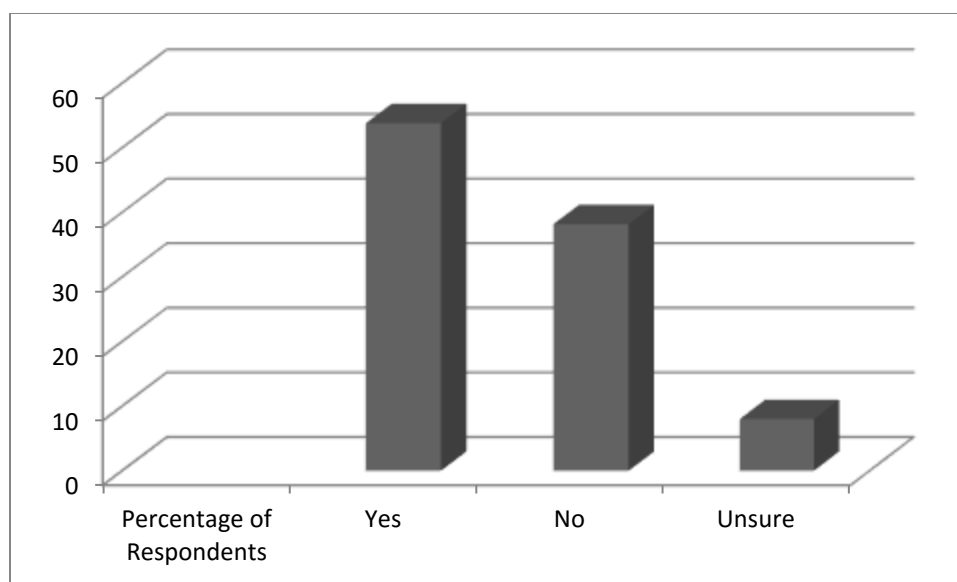
Figure 5.7.4: Respondents' willingness to pay for water.

Source: Field data, 2017.

The questionnaire survey found that 53.82 percent of the respondents were willing to pay more than what they pay now in order to have a sustained supply of water. They emphasized that for them to do that, NWSC should also improve the quality of water. Results of from a study by Hinda et al (2018) similarly highlighted that the residents of Thar Coal Field in Pakistan were willing to pay for the provision of water services, as long as the service was improved and supply sustained. Mbeu (2013) also reported that residents of Embu County in Kenya were willing to pay for water services. Some respondents, 38.18 percent, indicated that they were not willing to pay more, arguing that what they are paying now surpasses the value of water they get. In other words, this group of residents is not happy with the current service but if improved upon, they are willing to pay the value of the improved service. A key informant from NWSC said that many of the connected customers would be reluctant to pay an additional amount of money in order to maintain a steady supply of water as they are already complaining that the current tariffs are high. Those that were not sure were 8 percent of the total respondents.

A Pearson Chi Square test 0.05 significance level was conducted on SPSS as shown in table 5.7.2. A test using a null hypothesis, 'There is a significant relationship between service satisfaction and willingness to pay', was conducted and the results show a significant association

between the residents' level of satisfaction and willingness to pay. The categories under service satisfaction were satisfactory, average, Ignorant and unsatisfactory. Under willingness to pay, the categories were yes, no and unsure. Therefore, the null hypothesis was accepted.

Table: 5.7.2. Chi-Square Tests Results on Level of Satisfaction and Willingness to pay

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	10.129a	4	.038
Likelihood Ratio	10.262	4	.036
Linear-by-Linear Association	2.002	1	.157
N of Valid Cases	300		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 9.01.

Further, a Chi-square test of association between hours of water supply and WTP showed an association $x2 = 303.4$, $p<0.05$. In addition, a Chi-square test on meeting of water needs and WTP also showed an association there $x2 = 231.4$, $p<0.05$.

Of those who were willing to pay more, the majority were willing to pay below ZMW100. It is important to note that many of these indicated that they were willing to pay ZMW50 and below because amounts above ZMW 50 were above the value of water they were receiving. Another group, 19 percent of the respondents, was willing to pay between ZMW300 and ZMW500 whereas 6 percent indicated that they would pay as much as necessary to ensure a sustained supply of water. Only 1 percent indicated the willingness to pay more than ZMW500. However, 28.3 percent were not willing to pay anything for water. The reasons advanced by those that were not willing to pay were poor water supply and the high tariffs charged by NWSC. This information is as shown in the Table 5.7.3. The findings are in line with Ntengwe (2004)'s findings that non-availability of water or irregularity of supply breeds conflicts between residents of Kitwe and Lusaka and the water provider, leading to unwillingness to pay and loss of revenue for the service provider. He further reported that households in low cost areas of Kitwe display high levels of inability to pay and unaffordability of bills. Further, Omole and Okunowo (2016) had similar findings in Nigeria. They also reported that residents of Egun State were not satisfied

with the water supply service and that they were parting away with more than what they were not supposed to.

Table 5.7.3: Amounts Respondents are Willing to Pay

	Percentage
None	28.3
Below K100	45.3
Between K100 and K300	19.3
Between K300 and K500	1.0
As much as necessary	6.0
Total	100.0

Source: Field data, 2017.

5.8 Chapter Summary

This chapter presented the results of the study basing them on the objectives that were set in chapter one. The results were also discussed while making reference to the literature that was reviewed. The history of water supply in Kitwe and the consumption rate of water in different townships were discussed. Payment for water and the willingness to pay were other themes that were discussed in the chapter.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.0 Introduction

This chapter presents the conclusion and recommendation the study. The conclusions are generated from the findings and the recommendations equally drawn from the same thereafter.

6.1. Conclusion

The water supply situation in Kitwe is one which is not very different from the situation in other developing countries. High population density areas face a lot of challenges in accessing water compared to the low density ones.

The study established that the history of water supply in Kitwe has an influence on how some people perceive water. Before privatization, water was highly subsidized and bills were paid through their salaries. Residents thought it was provided for free. As such, some residents still think that water supplied from NWSC is a public good which should be provided for free. This partly contributes to inadequate revenue by the water utility company. However, others do realize that provision of water has now been commercialized and that residents need to pay for it. The only difference is that before commercialization, water provision was a social service but now, it is sold on a profit making basis of willingness to pay rather than ability to pay.

It was can also be asserted from the study that despite having fewer people in low density areas, these areas consume more water compared to the high density ones. This situation clearly demonstrates that water scarcity in some areas of Kitwe is manufactured. The choreographies of power that determine which areas will get the water infrastructure and for how long the water will be supplied in a day are very much at play. In terms of revenue collection, the study revealed that the water utility company collects more from the high income township than the middle and low income townships. The implication of this is that NWSC will mainly concentrate on those areas that pay more for the supply of water than those that pay less thereby worsening the inequality between high and the income areas.

During the study, it was revealed that majority of the residents access water from NWSC despite the level of access differing. However, it was also revealed that about 11 percent of the residents

in Kitwe still get water from shallow wells. This situation is unacceptable to government's efforts of trying to ensure that all residents should have access to clean and safe water. What is hindering these residents from accessing piped water from NWSC are water tariffs, lack of water supply and inability to connect to the water network.

In terms of satisfaction, it was established that majority of the residents were not satisfied with water service provision. Water quality in terms of turbidity, odour and service hours left much to be desired for the majority of Kitwe residents. Most of the residents even wished that they could go back to the ZCCM/Council era when the service provision was far much better. The water situation in Kitwe is in tandem with the thinking of some scholars (Bakker, 2003; Loftus, 2009; Crifasi, 2009; Truelove, 2011) about water provision in urban areas of developing countries. The water scarcity for the urban poor, the differences in water quality, distribution of water infrastructure and the service hours all manifested in the water situation in Kitwe. These strongly influence whether a resident will be satisfied with water service provision or not.

Furthermore, it was established that residents of Kitwe perceive water as a commodity because they pay for it to access. It was clear that they viewed water from the rivers and lakes to be a natural or public good that should not be paid for. However, it is important to point out as NWSC stated that some residents still strongly believe that water is from God and should be provided for free. On the value of water, it was established that residents equate water to life as without it, there cannot be life. Due to this fact, access to water should be a human right.

6.2. Recommendations

1. Water as a human right should be enshrined in legislation. A lifeline water supply policy where a pre-set volume of 50-60 litres of water per person per day should be provided at minimal or no cost to the poor. This will ensure that the number of residents without access to clean and safe water is reduced significantly.

2. To reduce on disputed meter readings, the NWSC should ensure that readings are taken in the presence of a household member and such a one should sign for proof. Alternatively, the company should invest in pre-paid meter so that customers can pay for what they will use as is the case with electricity.

3. Once prepaid meter are installed or put in place, NWSC should consider a wave on disputed bills in order to encourage payment of bills and increase on collection efficiency.

4. NWASCO should improve its monitoring of the service hours of NWSC. This should be done to ensure that the company adheres to the guidelines and also to improve the service hours in low income areas.

5. Both the Central and Local Government should prioritise high density and hard hit areas in terms of water supply, for projects aimed at putting up infrastructure to improve water supply.

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APPENDICES

APPENDIX A

TABLE 1
Table for Determining Sample Size from a Given Population

N	S	N	S	N	S
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note.—N is population size.
S is sample size.

APPENDIX B

HOUSEHOLD QUESTIONNAIRE

I am a final year student at the University of Zambia pursuing a Master of Science degree in Environmental and Natural Resource Management. I am currently carrying out a study on the perceptions of water resource in Kitwe. You have been randomly selected and asked to participate in the study by answering the questions below honestly. The information to be collected is for academic purposes only and your response will be kept strictly confidential and your name will not be published.

Thank you in anticipation of your full support.

Household Characteristics		
1	Sex of Respondent (s)? Don't ask, just note!	1. Male 2. Female 3. Couple – male and female
2	Are you the household head (s)?	1. Yes 2. No
3	How long have you been living in this house?	1. Below 5 years 2. 5 to 10 years 3. 10 to 20 years 4. 20 to 25 years 5. More than 25 years
Performance of Service provider		
4	What is your source of drinking water?	1. Tap water (single users) 2. Tap water (multiple users) 3. Kiosk 4. Communal tap 5. Hand pump 6. Protected well 7. Shallow well 8. Other, specify …………….
5	Who supplied water to your	1. Council

	household/community before NWSC?	2. ZCCM/Mines
		3. DWA
		4. Water Trust
		5. NGO / Civil society
		6. Self
		7. I don't know
		8. N/A
6	What is your comment on service provision in your household/ community?	1. Satisfactory
		2. Average
		3. Unsatisfactory
		4. Other specify………………
		5. I don't know
		6. N/A
		Explain your answer …………….
7	How many hours was the provision of water supply to your community on a daily basis during the council/ZCCM days?	1. Less than 6 hours
		2. 6 – 12 hours
		3. 12 – 18. Hours
		4. 18 – 24 hours
		5. I don't know
		6. N/A
8	Were the hours of supply suitable to meet all your household water needs (drinking, bathing, washing etc)?	1. Yes
		2. No
		3. I don't know
		Explain your answer …………….
9	Approximately, how many hours is the provision of water supply to your household/community, on a daily basis?	1. Less than 6 hours
		2. 6 – 12 hours
		3. 12 – 18. Hours
		4. 18 – 24 hours
		5. I don't know
		6. N/A
10	Are the hours of supply suitable to meet all your household water needs (drinking,	1. Yes

	bathing, washing etc)?	2. No Explain your answer …………….
11	What is the quality of water in terms of turbidity that you drink?	1. Clear 2. Not clear 3. Average 4. Other specify ……………. 5. I don't know 6. N/A
12	What was the quality of water in terms of turbidity that you drank in the ZCCM/council era?	1. Clear 2. Not clear 3. Average 4. Other specify ……………. 5. I don't know 6. N/A
13	Is there any difference in the supply situation now compared to the ZCCM/council era in terms of proximity and availability to the water source?	1. Yes, water is available in the house 2. Yes, water is nearer 3. No water still not available 4. No, water is still further 5. No difference 6. Other specify ……………. 7. I don't know 8. N/A
14	Is there any difference in the supply situation now compared to the ZCCM/council era in terms of hours of supply?	1. Supply hours have increased 2. Supply hours have reduced 3. No difference 4. Other specify ……………. 5. I don't know 6. N/A
15	How did you perceive the water tariff that you paid to access water per month n the ZCCM/council era?	1. Not expensive 2. Average 3. Expensive 4. Other specify........................

		5. I don't know
		6. N/A
16	How do you perceive the water tariff that you pay to access water per month?	1. Not expensive 2. Average 3. Expensive 4. Other specify........................ 5. I don't know 6. N/A
17	Is your water metered?	1. Yes 2. No
18	During the ZCCM/council era was your water metered?	1. Yes 2. No 3. I don't know
19	Do you think water provision service should be given back to ZCCM/council?	☐ 1. Yes ☐ 2. No ☐ 3. I don't know
Household Perception of Water		
20	Imagine a full glass of clean drinking water. In your opinion, this water is primarily (please indicate as many as you feel are accurate in numerical order, 1 being the most accurate):	☐ 1. A commodity ☐ 2. A natural resource ☐ 3. A private resource ☐ 4. A public resource ☐ 5. A human right
21	Imagine a fresh water lake in a field on the side of a highway. In your opinion, this water is primarily (please indicate as many as you feel are accurate in numerical order, 1 being the most accurate):	☐ 1. A commodity ☐ 2. A natural resource ☐ 3. A private resource ☐ 4. A public resource ☐ 5. A human right
22	Having access to clean water for drinking and sanitation is:	1. A human right 2. A luxury 3. Similar to income, one must earn his/her own
23	In your opinion, whose responsibility is it to ensure a community has access to clean water for drinking and sanitation? (you may	1. The local authority

	select more than one answer)	2. The central government
		3. Non-government organizations
		4. Trans/International bodies (ex. United Nations)
		5. It is the responsibility of the individual
24	The greatest way to appreciate the value of water is to:	1. Look at the price of a bottle of water in a convenience store
		2. Look at a waterfall
		3. Compare the condition of those who have clean water to those who do not have clean water
		4. Water does not have a value
		5. Other (please specify)
Willingness to Pay		
25	If water was to be sold on a drop-by-drop basis, how much would you charge for one litre?	1. Nothing, water should be free
		2. Price would be based on supply-demand
		3. The same price as NWSC
		4. The same mineral water
26	How much do you pay for the water per month?	1. None
		2. Below K100
		3. Between K100-300
		4. Between K300-500
		5. Above K500
27	Do you think the amount you pay is equal to the value of the service you receive?	1. Yes ………………………………………………
		2. No ………………………………………………….
		3. Unsure
28	Would you be willing to pay an additional amount on your monthly bill in order to ensure a sustained supply of water for yourself?	a. Yes
		b. No
		c. Unsure
29	Regardless of whether you are currently paying for your water, how much would you be willing to pay out of a pocket monthly in order to ensure a sustained supply of water for your household?	a. None
		b. Below K100
		c. Between K100-300
		d. Between K300-500
		e. As much as is necessary to maintain a secure water supply

30	Rank the following utilities and services in order of importance to you:	☐ Electricity
		☐ Water
		☐ Telephone service (both cellular and land line)
		☐ Wireless internet

APPENDIX C
INTERVIEW GUIDE FOR NKANA WATER AND SEWERAGE COMPANY

1. Generally describe the history of water supply in Kitwe.

2. Compared to the rest of the country, how different is the history of Kitwe's water supply?

3. In your view, do you think the water situation was better off then compared to the current situation?

4. Briefly describe the history of Nkana Water and Sewerage Company (NWSC) in Kitwe.

5. Who owns NWSC?

6. In terms of performance, how does NWSC compare with the previous water providers in the city?

7. What challenges and opportunities are their now which the previous water companies did not experience?

8. What is the catchment area for NWSC?

9. What percentage of the population in the catchment area has access to water supplied by NWSC?

10. What are the water service hours for high, medium and low density areas?

11. What is the frequency of payment in the high, medium and low density areas?

12. Do you charge a uniform tariff for water in all the areas (low, medium and high density areas)?

13. Would your customers be willing to pay an additional amount on their monthly bill in order to ensure a sustained supply of water?

14. What percentages of your customers feel that it is their responsibility to pay for water?

15. What are the payment profiles for each residential area?

16. In terms of frequency and rate of payment, how do the former mine areas compare with the rest of townships

17. Does the history of water supply in Kitwe influence people's attitudes towards water and their willingness to pay?

18. Do you still have customers from the former mine areas who still fill that the government or the mine should provide water free of charge?

19. Do you have residents who have opted for other sources of water and not from NWSC?

20. Are the tariffs charged equal to the value of water supplied?

21. Are tariffs collected from the customers sufficient to cover reinvestment of assets per year?

22. Apart from funding form tariffs, where else do you get funds to run water supply operations?

23. What is the consumption rate of water in different categories of residential areas (low, medium and high density) per month?

24. What is your company doing in the area of water conservation?

25. Do you have programs aimed at educating residents of Kitwe to see water as economic resource?

INTERVIEW GUIDE FOR KITWE CITY COUNCIL

Position: Date:

26. Describe the history of water supply in Kitwe from the 1930s.

27. How does the history of Kitwe's water supply differ from the rest of the country?

28. In your view, do you think the water situation was better off in the 1930s up to 1991 compared to the current situation?

29. Briefly describe the history of Nkana Water and Sewerage Company (NWSC) in Kitwe.

30. Who owns NWSC?

31. In terms of performance, how does NWSC compare with the previous water providers in the city?

32. What challenges and opportunities are their now which the previous water companies did not experience?

33. What was the catchment area for K.C.C?

34. What percentage of the population in the catchment area had access to water supplied by K.C.C?

35. What were the water service hours for high, medium and low density areas?

36. What was the frequency of payment in the high, medium and low density areas?

37. Where you charging a uniform tariff for water in all the areas (low, medium and high density areas)?

38. Does the history of water supply in Kitwe influence people's attitudes towards water and their willingness to pay?

39. Did you have residents who opted for other sources of water and not from K.C.C?

40. Were the tariffs charged equal to the value of water supplied?

41. Were the tariffs collected from the customers sufficient to cover costs of supply as well as reinvestment of assets per year?

42. Apart from funding form tariffs, where else were you getting funds to run water supply operations?

43. Why was the responsibility of provision of water in Kitwe taken away from K.C.C.?

44. Currently, what role does K.C.C. play in the supply of water in Kitwe?

45. Do you think people in the city of Kitwe consider water as an economic resource?

46. What should K.C.C. do in order to help people's willingness to pay for water improve positively.

APPENDIX E
INTERVIEW GUIDE FOR R. D. C.s

Position: Date:

1. What is the major source of drinking water in your community?

2. Who supplied water to your community before NWSC?

3. What is your comment in terms of satisfaction water provision in your community?

4. How many hours was the provision of water supply to your community on a daily basis during the council/ZCCM days?

5. Were the hours of supply suitable to meet all your community's water needs (drinking, bathing, washing etc)?

6. Are the hours of supply suitable to meet all your community's water needs (drinking, bathing, washing etc)?

7. What is the quality of water in terms of that you drink?

8. What was the quality of water in terms of that you drunk in the ZCCM/council era?

9. Is there any difference in the supply situation now compared to the ZCCM/council era in terms of proximity and availability to the water source?

10. Is there any difference in the supply situation now compared to the ZCCM/council era in terms of hours of supply?

11. How did you perceive the water tariff that you paid to access water per month n the ZCCM/council era?

12. How do you perceive the water tariff that you pay to access water per month?

13. Do you think water provision service should be given back to ZCCM/council?

14. Do you think people in your community consider water as an economic resource?

15. In your opinion, whose responsibility is it to ensure your community has access to clean water for drinking and sanitation?

16. What is the greatest way of appreciating the value of water?

17. How much do you think people should pay for water services in your community?

18. How much do households pay for the water per month/per litre?

19. Do you think the amount you pay is equal to the value of the service you receive?

20. Would your community be willing to pay an additional amount on the monthly bill in order to ensure a sustained supply of water?

APPENDIX F
INTERVIEW GUIDE FOR ZCCM HOLDINGS

Position: Date:

1. Describe the history of water supply in Kitwe from the 1930s.

2. How does the history of Kitwe's water supply differ from the rest of the country?

3. In your view, do you think the water situation was better off in the 1930s up to 1991 compared to the current situation?

4. Briefly describe the history of Nkana Water and Sewerage Company (NWSC) in Kitwe.

5. Who owns NWSC?

6. In terms of performance, how does NWSC compare with the previous water providers in the city?

7. What challenges and opportunities are their now which the previous water companies did not experience?

8. What was the catchment area for ZCCM?

9. What percentage of the population in the catchment area had access to water supplied by ZCCM?

10. What were the water service hours for high, medium and low density areas?

11. What was the frequency of payment in the high, medium and low density areas?

12. Where you charging a uniform tariff for water in all the areas (low, medium and high density areas)?

13. Does the history of water supply in Kitwe influence people's attitudes towards water and their willingness to pay?

14. Did you have residents who opted for other sources of water and not from ZCCM?

15. Were the tariffs charged equal to the value of water supplied?

16. Were the tariffs collected from the customers sufficient to cover costs of supply as well as reinvestment of assets per year?

17. Apart from funding form tariffs, where else were you getting funds to run water supply operations?

18. Why was the responsibility of provision of water in Kitwe taken away from ZCCM?

19. Currently, what role does ZCCM/IH play in the supply of water in Kitwe?

20. Do you think people in the city of Kitwe consider water as an economic resource?

21. What should ZCCM/IH do in order to help people's willingness to pay for water improve positively?

APPENDIX G

NWSC/DEID-023/012/01-17

25 January 2017

The Head of Department
The University of Zambia
School of Natural Science
P.O. Box 32379
LUSAKA

Dear Sir

COLLECTION OF DATA – KELLY KANAGU (ID512800123)

Reference is made to your letter dated 1st February 2017 on the above subject matter.

Please be advised that your request to have the above mentioned Postgraduate student pursuing Masters of Science in Environment and Natural Resources Management from the School of Natural Science to gather information on the number of housing units where we provide services is acceded to. You can therefore proceed with the research.

By copy of this letter, the Billing Manager is advised to make necessary arrangements for your research.

Yours faithfully
NKANA WATER AND SEWERAGE COMPANY

PP

ENG. CLIFF Y BWALYA
DIRECTOR ENGINEERING & INFRASTRUCTURE DEVELOPMENT

Cc   Managing Director
      Billing Manager
      Public Relations Manager
      A/Manager Human Resources

APPENDIX H

KITWE CITY COUNCIL

TOWN CLERK
CIVIC CENTRE
P.O. BOX 20070
KITWE.

TEL: 02-224698
FAX: (00260) 224698
E-mail: kcc@zamnet.zm

REF: DHRA/PERS/KS

8th November, 2017.

C/o university of Zambia
School of Natural Sciences
Department of Geography and Environmental Studies
P.O BOX 32379
LUSAKA

Dear Sir,

RE: PERMISSION TO CARRY OUT A RESEARCH – KELLY KABANGU

Reference is made to the above captioned matter and to your letter 2nd November, 2017 in which you requested for permission to carry out a research.

I wish to inform you that Kitwe City Council has granted you permission to carry out your research.

Your research will be for a period of one (1) month effective 13th November, 2017

Yours faithfully,

P.M. NYIRENDA
DIRECTOR OF HUMAN RESOURCES AND ADMINISTRATION