# FACTORS INFLUENCING CUSTOMER ACCESS TO PIPED WATER AND SANITATION SERVICES IN LOW INCOME URBAN AREAS: A CASE OF MERU TOWN, MERU COUNTY, KENYA

**BY**

**RICHARD MWIRIGI KIUGU**

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## DECLARATION

This project is my original work and has not been presented to any institution for research or for any award

Signed_____ Date_____

**Richard MwirigiKiugu**

**L50/83677/2015**

This project has been submitted for research with my approval as the Supervisor

Signed_____ Date_____

**Dr John M. Wanjohi**

**School of Physical Sciences**

**University of Nairobi**

## DEDICATION

I dedicate this piece of work to my ever supportive children, Dr Belinda Mwirigi and Sharon Mwirigi who have continuously encouraged me to continue even when things seem difficult.

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## TABLE OF CONTENTS

**DECLARATION** ..... **ii**

**DEDICATION** ..... **iii**

**ACKNOWLEDGEMENT** ..... **iv**

**TABLE OF CONTENTS** ..... **v**

**LIST OF TABLES** ..... **ix**

**LIST OF FIGURES** ..... **xi**

**LIST OF ABBREVIATIONS AND ACRONYMS** ..... **xii**

**ABSTRACT** ..... **xiii**

**CHAPTER ONE** ..... **1**

**INTRODUCTION** ..... **1**

1.1 Background of the study ..... 1

1.2 Statement of the problem ..... 2

1.3 Purpose of the study ..... 3

1.4 Specific Objectives ..... 3

1.5 Research questions ..... 4

1.6 Significance of the study ..... 4

1.7 Delimitation of the study ..... 4

1.8 Limitation of the study. ..... 5

1.9 Assumption of the study ..... 5

1.10 Definition of the significant terms ..... 5

1.11 Organization of the study ..... 6

**CHAPTER TWO** ..... **7**

**LITERATURE REVIEW** ..... **7**

2.1 Introduction ..... 7
2.2 Access to piped water and sanitation services ..... 7
2.2.1 Access to Sanitation ..... 9
2.2.2 Nature of Water ..... 10
2.3 Physical parameters and customer access to piped water and sanitation services ..... 11
2.3.1 Difficult Topography ..... 12
2.3.2 Unplanned settlement ..... 12
2.3.3Overreliance on old Conventional Service-Delivery Systems ..... 13
2.4 Affordability and customer access to piped water and sanitation services ..... 14
2.4.1 High Costs of Water and Sanitation, versus Low Family Incomes ..... 14
2.4.2 Additional Charges to the Family ..... 15
2.4.3 Lack of Capital for Investment ..... 16
2.4.4 Cost Recovery: Return on investment ..... 17
2.4.5 Poor Economic Rates of Return ..... 18
2.5 Institutional constraints on customer access to piped water and sanitation services ..... 19
2.5.1 Complicated and Disorganized Water service providers' Systems ..... 20
2.5.2 Emphasis on Financial Discipline and lack in Subsidies for the Poor ..... 21
2.5.3 Inability of water service providers' Systems to Service Low-Income Communities ..... 22
2.5.4 Susceptibility to Corruption and Politicization ..... 23
2.6 Structural constraints and customer access to piped water and sanitation services ..... 23
2.6.1 Defining Cities According to Fully Serviced Areas ..... 24
2.6.2 Planning by Zoning ..... 24
2.6.3 The Failure to Consider Population Growth Rates ..... 25
2.6.4 Complications with Planning Codes ..... 26
2.6.5 Approving Legalization and Property Rights First ..... 27

2.6.6 Limitations on the International Donor ..... 28
2.7 Theoretical Framework ..... 30
2.7.1 Brett Fischmanns economic theory of infrastructure ..... 30
2.7.2 Technological Acceptance Model ..... 30
2.8 Conceptual Framework ..... 31
2.9 Research Gap ..... 33
2.10 Summary of Literature Review ..... 33
**CHAPTER THREE ..... 34**
**RESEARCH METHODOLOGY ..... 34**
3.1 Introduction ..... 34
3.2 Research Design ..... 34
3.3Target population ..... 34
3.4 Sample size and sampling procedure ..... 34
3.4.1 Sample size ..... 34
3.4.2 Sampling procedure ..... 35
3.5 Data collection instrument ..... 35
3.5.1 Pilot testing of the instruments ..... 36
3.5.2 Validity of the instrument ..... 36
3.5.3 Reliability of the instrument ..... 36
3.6 Data collection procedures ..... 36
3.7 Data analysis techniques ..... 37
3.8 Ethical considerations ..... 37
3.9 Operational definition of the variables ..... 37
**CHAPTER FOUR ..... 38**
**DATA ANALYSIS, PRESENTATION AND INTERPRETATION ..... 38**

4.1 Introduction ..... 38
4.2 Response Rate ..... 38
4.3 Personal Data ..... 38
4.4 Factors Influencing Customer Access to Piped Water and Sanitation Services ..... 41
4.12 Inferential Statistics ..... 50
**CHAPTER FIVE ..... 52**
**SUMMARY, CONCLUSIONS AND RECOMMENDATIONS ..... 52**
5.1 Introduction ..... 52
5.2 Summary of the Findings ..... 52
5.3 Discussion ..... 54
5.4 Conclusion ..... 57
5.5 Recommendations ..... 58
5.6 Recommendations for Further Studies ..... 59
**REFERENCES ..... 60**
**APPENDICES ..... 64**
Appendix I Letter of Transmittal ..... 64
Appendix II Questionnaire for households ..... 66
Appendix III Questionnaire for Officials: ..... 71

## LIST OF TABLES

Table 3. 1: Operationalization of the Variables ..... 37
Table 4. 1: Return Analysis ..... 38
Table 4. 2: Sex ..... 39
Table 4. 3: Age of the Respondents ..... 39
Table 4. 4: Marital Status of the Respondents ..... 39
Table 4. 5: Respondents Household Size ..... 40
Table 4. 6: Respondents Level of Education ..... 40
Table 4. 7: Respondents Area of Residence in Meru Town ..... 41
Table 4. 8: Access to the House/Compound ..... 41
Table 4. 9: Topographical Issues ..... 42
Table 4. 10: Cost of Water ..... 42
Table 4. 11: Current Tariff/Price ..... 43
Table 4. 12: Effect Level of Tariff / Price ..... 43
Table 4. 13: Diseases had for the Last 12 Months. ..... 44
Table 4. 14: Institution Constraints ..... 44
Table 4. 15: Problems with Water Supply and Delivery ..... 45
Table 4. 16: Connection to MEWASS Water Supply ..... 45
Table 4. 17: Causes of the Water Problems ..... 45
Table 4. 18: Pro-Poor Policy in the Organization ..... 46
Table 4. 19: Structural Constraints ..... 47
Table 4. 20: Issues of Water Supply and Delivery ..... 47
Table 4. 21: Period Living in the Current House ..... **Error! Bookmark not defined.**
Table 4. 22: House Ownership ..... **Error! Bookmark not defined.**
Table 4. 23: Respondents Reason to Move to the House ..... **Error! Bookmark not defined.**
Table 4. 24: Main Type of Water Source Used by Household ..... 48
Table 4. 25: Type of Water Point ..... 48
Table 4. 26: Location of the Water Point ..... 49
Table 4. 27: Period of Main Water Source lasts ..... 49
Table 4. 28: Whether Respondent Pay for Water Used ..... 49

Table 4. 29: Distance to Walk to where they Fetch Water .....**Error! Bookmark not defined.**
Table 4. 30: Public Roads/Path to Access Area.....**Error! Bookmark not defined.**
Table 4. 31: Toilet Facility Used by the Household .....**Error! Bookmark not defined.**
Table 4. 32: Whether Toilet Facility is Located within the Dwelling**Error! Bookmark not defined.**
Table 4. 33: Covering of the Pit Latrine .....**Error! Bookmark not defined.**
Table 4. 34: Pit Latrine Improvements .....**Error! Bookmark not defined.**
Table 4. 35: Pit Latrine Improvements ..... 50
Table 4. 36: Action Taken when the Toilet is Full ..... 50
Table 4. 37: Wash after Visiting the Toilet.....**Error! Bookmark not defined.**
Table 4. 38: Hand Washing Facilities Used.....**Error! Bookmark not defined.**
Table 4. 39: Diseases had for the Last 12 Months. .....**Error! Bookmark not defined.**
Table 4. 40: Correlation Matrix ..... 51

## LIST OF FIGURES

Figure 1: Conceptual framework ..... 32

## LIST OF ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| **ASAL** | Arid and semi Aid lands |
| **GDP** | Gross Domestic Product |
| **GNI** | Gross National Income |
| **GOK** | Government of Kenya |
| **MDG**s | Millennium Development Goals |
| **SSA** | Sub-Sahara Africa |
| **UNESCO** | United Nations Education Science and Culture Organization |
| **USD** | U.s dollar |
| **WHO** | World Health Organization. |
| **WARMA** | Water Resources Management Authority |
| **NRW** | Non-Revenue Water |
| **NWSS** | National Water Service Strategy |
| **NGOs** | Non-Governmental Organization |
| **MEWASS** | Meru Water and Sewerage Services |
| **MDDP** | Meru District Development plan |
| **SPSS** | Statistic Package for Social Scientists. |
| **WSP** | Water Service Provider |

## ABSTRACT

A large number of urban residents in sub-Sahara Africa live in slums often characterized by lack of basic services such as water, sewerage and electricity. This is as a result of pressure due population growth, aging infrastructure, climatic change and unsustainable convention water management mostly employed in the region thus posing a huge challenge in managing the unreliable and scarce water resource. Meru Town is not exemption to this phenomenon as in that there are few sanitation facilities and also many people do not access to safe drinking water source. The purpose of this study was to establish the factors that influence customer access to piped water and sanitation services in low income urban areas in Meru Town. The study aimed at determining the influence of; physical parameters, affordability, institutional and structural constraints on customer access to piped water and sanitation services in low income urban areas. The research design used in the study was descriptive research. The target population comprised of 1080 households and 15 staff members of Meru Water and Sewerage Services. The sample size was from two stakeholders namely (i) 105 households and (ii) Purposively sampled 15 staff members of Meru Water and Sewerage Services. To determine the validity and reliability of the interview schedule, a pilot- testing was carried out in a different slum (Kigore) with similar characteristics like those other three. During the field study, information was collected from randomly selected households from three urban poor areas on accessibility and affordability of piped water and sanitation services. The instruments used were questionnaires and interview. Data analysis was carried out using SPSS. The study sought to determine how physical parameters influence customer access to piped water and sanitation services in low-income areas of Meru town. The study was interested in assessing the influence of Cost of water on customer access to piped water and sanitation services in low-income areas of Meru town. The study further sought to find out the influence of institutional constraints on customer access to piped water and sanitation services in low-income areas of Meru town. The study further sought to determine the influence of structural constraints on customer access to piped water and sanitation services in low-income areas of Meru town. The study concluded that physical parameters, and the influence of cost of water positively and significantly influence customer access to piped water and sanitation services in low-income areas of Meru town. The study further concluded that institutional and structural constraints moderately influence positively and significantly the customer access to piped water and sanitation services in low-income areas of Meru town. The study recommends that water, sanitation and hygiene education programmes should be in place. The study also recommends that community should be sensitized to participate in water supply development needs to be fostered through expression of the demand, the selection of technology and its sitting, the provision of labour and local materials, cash contribution towards project costs and the selection of the management type. The study further recommends that the WSPs should focus on building the capacity of the community on the maintenance of existing water sources.

# CHAPTER ONE
# INTRODUCTION

## 1.1 Background of the study

Water is essential for drinking and other domestic uses, such as bathing, cooking and other washings. Almost 1.1 billion people worldwide do not have access to clean water and over 2.2 billion lack access to basic sanitation facilities,80% these people being in Asia and Sub-Sahara Africa (Zuinet al., 2011). In a WHO of 2010 study, it was reported that only 35% of the urban population in sub-Sahara Africa have access to a piped water connection in their households (Zuinet al., 2011)

The focus of this research project will be to examine the factors affecting accessibility of water and sanitation service provision in low in-come areas of Meru town, Meru County, Kenya. Kenya's development of the water sector has been based on the fact that water is fundamental human right and basic needs essential for ecological and socio-economic development. The need to provide access to good quality water and sanitation services to low-income urban residents cannot be overemphasized. Many governments in sub-Saharan African countries concentrate their priorities on middle and upper income households to the detriment of the poor (Kahkonen 1990) mainly due to political power of the middle and upper classes. Access to water is a key factor in improving health, economic productivity and social well being of the human populace as both social and economic activities rely heavily on the quality and quantity of water. Access to water is therefore an essential component of any effort to alleviate poverty. The eight millennium Development Goals (MDGs) are directly or indirectly related to (access to) water. For example, Goal 7, target10 of MDG – providing sustainable Water Services aims at halving the proportion of world population without access to sustainable safe drinking water by 2015.The water sector reforms currently being implemented in Kenya are also considered an essential pillar in the government's poverty reduction strategies, the economic Recovery strategy for Wealth and Employment Creation(Kenya, 2003),and the ambitious Vision 2030.The government recognizes that in order for the country to achieve the MDGs there is need to make water available, accessible and affordable to all consumers.

The water Act No.8 of 2002 requires a county government to form autonomous water companies with independent boards of directors. The companies should be formed to provide water and sewerage services, and re-invests accrued revenues in service delivery and improvement. Ironically, these companies do not own both the water resources and capital investment, these are owned by the licensors constituted as regional Water Service boards and in this case Tana water Services Board (TWSB) .The boards are also vested with powers to license private water companies. Water is one of the most important public services that any government should strive to avail to its citizens. Human beings at whatever stage of development and social economic conditions have the right to access drinking water in quantities and quality equal to their basic need. Prior to enactment of Water act 2002, the government had in place a policy paper that intended to ensure water for all by the year 2000.However, it was not achieved and hence the current reforms took effect. (Ministry of water and Irrigation, 2007; Water Sector Reform in Kenya and human Right to Water)

Despite recent increase in sector investments due to water sector reforms, improvements in water supply services, coverage have not kept pace with population growth. This implies that the overall water supply provision is not adequate (Ministry of Water and Irrigation; 2009; Water Services for Kenya, National Water Services Strategy and Pro-poor Implementation plan) .Provision of water especially in the rural areas remains the biggest challenge facing the water sector. This is because most of the people who live in rural areas are poor and may not be able to meet water bills as they have no regular source of income.

### 1.2 Statement of the problem

Water, being an essential part of human life is required for day to day activities. However, the problem lies in accessing and affording it. Many people in developing countries lack access to clean and affordable water (Millennium Development Goals report, 2008). Commercialization of water services has increased the inaccessibility of water services (Multinational, monitor, 2001). In developing countries like Kenya, withdrawing public services only creates a vacuum in social services since the private actors operate on commercial or market principles which may not necessarily take care of social responsibilities that the state is supposed to take care of. (Ba, 2006). In Kenya, the government has set up a regulatory body to regulate and monitor the operations of the water supply services, but this does not absolve government's obligations. Both

regulator and the service providers have to complement and not replace government measures to ensure equal and adequate access to water for all.

The price of water has tremendously increased following commercialization of water service provision. The service provider pegs any investment on value for money and return on investments. The high price for water will results in the use of untreated water, which will ultimately affect the health, social and lives of the people.

In Meru town, there is very low connectivity to the public water distribution system, and even when water Kiosks are introduced to serve in areas where pipe networks are not possible, it does not stay in operation for long. The kiosk ends up being shut by water service provider for non-payment and people result to getting water from other sources. This is common in the three proposed study area. These residents are not fully benefitting from the current water utility because of myriads of drawbacks.

The big question to be posed to this study will be; 'what are the main factors affecting accessibility and affordability of water and sewerage services to residents in these areas. This research project will focus on finding out what constraints there are and the strategies needed by water service provider to make water and sewerage accessible and affordable to residents as a means of improving their livelihood.

### 1.3 Purpose of the study

The purpose of this study was to establish the factors influencing customer access to piped water and sanitation services in low-income areas of Meru town.

### 1.4 Specific Objectives

The study was guided by the following specific objectives

i. To determine the influence of physical parameters on customer access to piped water and sanitation services in low-income areas of Meru town.
ii. To assess the influence of Cost of water on customer access to piped water and sanitation services in low-income areas of Meru town.
iii. To find out the influence of institutional constraints on customer access to piped water and sanitation services in low-income areas of Meru town.

iv. To determine the influence of structural constraints on customer access to piped water and sanitation services in low-income areas of Meru town.

**1.5Research questions**

i. How do physical parameters influence customer access to piped water and sanitation services in low-income areas of Meru town?
ii. What is the influence of affordability on customer access to piped water and sanitation services in low-income areas of Meru town?
iii. How do institutional constraints influence customer access to piped water and sanitation services in low-income areas of Meru town?
iv. What influence do structural constraints have on customer access to piped water and sanitation services in low-income areas of Meru town?

**1.6 Significance of the study**

In both rural and urban areas of low income countries, millions of people lack access to improved water and sanitation services. Meru town is not exemption to this in that there are few sanitation facilities and also majority of people do not have access to safe drinking water source.

The study is also very significant because it's a stepping-stone towards achievement of Kenya Vision 2030.Kenya vision 2030 'the globally competitive and prosperous country with high quality of life by 2030'',aims at transforming Kenya into a newly industrialized middle-income country providing a high quality of life to all citizen's in a clean and secure environment (G.O.K,2007)

Water is life and one cannot talk of quality life when the citizens of a country do not have access to clean and safe drinking. The research will focus on water which is a natural resource and which should be well managed if MDGs have to be achieved, (Fox and Liebenthal, 2006).

It's hoped that the finding from this study will not only benefit the MEWASS alone but other towns with similar situations.

**1.7 Delimitation of the study**

The study would focus on the existing water customers being served in the study area by existing water service provider (WSP-MEWASS) within the supply area of its jurisdiction. The supply

area is mapped into 8 zones from zone 1-8 and the study will be undertaken in zone 5, low-income areas which immediately borders central business district which has an estimated population of 5724.These areas are Mjini, Majengo and Shauri yako.

### 1.8 Limitation of the study.

This research was limited in terms of time, accessibility, poor households setting in compromising land, language barriers and a lot of suspicions requiring the research assistant to be accompanied by local trusted elder to some households in order to interview the occupants..

### 1.9 Assumption of the study

The respondent would co-operate with the researcher and that they would give accurate and reliable information, the consumer is conversant with the water sector reforms, the respondent would be objective in filling the questionnaire, the political environment would remain stable. The data collected would represent the total population and the data collection instruments would be valid and would measure the designed constructs

### 1.10 Definition of the significant terms

**Affordability**: The extent to which prices (for a commodity) are within the financial means of users

**Customer access to piped water and sanitation services**: The ability to obtain and have right to make use of water and sanitation services.

**Excludable good/service**: is the possibility of preventing a person from enjoying its advantage if they have not paid for it.

**Institutional constraints**: Use of ineffective and inefficient methods/system which end up becoming a stumbling block and restrict the end user access to water and sanitation

**Low-income areas**: A substandard dwelling places lived mainly by people of relatively small income in urban areas.

**Physical parameters influence**: This is lack of adequate space and compromising landscape for infrastructure development

**Structural constraints**: Conflicting values, regulations and policies and viewpoints which make it difficult for access and affordability of water and sanitation services.

### 1.11 Organization of the study

The study is organized into five chapters which include; chapter one that contains background information of the study, statement of the problem, purpose of the study, research questions, objective of the study, significance of the study, delimitations, of the study, limitations of the study, assumptions of the study, and the definition of significant terms.

Chapter two consists of the literature review which covers known information on the themes being researched upon. It also includes the theoretical and conceptual frameworks .Chapter three contains the research methodology to be used and includes the research design, target population, sample size and sampling procedure, research instruments, validity and reliability of the instruments, data collection procedure, data analysis techniques, ethical considerations and operational definition of variables. Chapter four shall consist of data analysis and discussion of research findings, while Chapter five shall be the summary of the findings, conclusion and recommendations.

# CHAPTER TWO
# LITERATURE REVIEW

## 2.1 Introduction

In this chapter, the focus is on the literature related to the study. The literature review covers studies related to affordability and accessibility of water and sanitation services as public goods/services. The main concern here is the importance of water in poverty eradication in line with National Poverty Eradication Plan. 1999-2015

## 2.2 Access to piped water and sanitation services

The importance of water cannot be overemphasized as it is used in for many purposes such as domestic household chores, drinking and non-domestic purposes. The 1977 Mar Del Plata Action Plan adopted by the UN General assembly enshrines access to water as an essential human right. This human right relating to water includes having access to drinking water of adequate quality and quantity. Exclusion of anyone from access to improved drinking water due to poverty or place of habitat is a violation of their human right (Gronwall 2008).

According to the United Nations Development Programme (UNDP 2006), a person not having access to at least 20 litres of clean water each day has his or her fundamental human rights violated. WHO has defined basic access to water as 50 litres per person per day(Smith & Hanson, 2003).However, in 2003 the WHO redefined basic access to water as having access to average quantity not below 20 litres per capita per day and with a total collection of 5 to 30 minutes(Howard, 2003).This definition notwithstanding, for one to be able to do laundry, get enough to drink and perform other house chore with basic hygiene, about 30 to 40 litres of water per capita per day are required (Bartlett 2003).UN –Habitat (2009) suggest several factors that are required for the achievement of a minimum level of safe and affordable drinking water. These are: (1) the households must have 20 litres of water per person per day; (2) the drinking water must not cost more than 10% of the total household income; and (3) it must be available without extreme effort which means less than 1 hour per day for collection time.

A household is considered to have access to improved water source if it gets drinking water primarily from a pipe borne water supply system, a public standpipe, borehole and dug well with

pump, a protected spring, a well-developed rain water harvesting system, a reliable water vendor or water tank truck. Sources such as direct from surface waters –i.e. rivers, lakes, Ponds, etc. and unprotected wells and springs are regarded as unimproved water sources.(UNICEF and WHO, 2008). Worldwide, the percentage of people without access to treated water and sanitation has been virtually constant at about 17%, despite the increase of infrastructure during the 1990's (UNFPA, 2003a). Bremner and Bilsborrow (2005) pointed out that, given the population increase that will occur until 2015, the additional number of people to be served is in the order of 1.6-2.2 billion. What makes matters worse is that if per capita consumption continues its current upward trend, about two thirds of the world population will face moderate or severe water scarcity. The Latin, American and Caribbean (LAC) countries are undergoing an intensive process of expansion of coverage for drinking water, according to WHO/UNICEF (2005).

In 1990 coverage for drinking water was 83% and 89% in 2002. There is an important differential in terms of rural and urban distribution of access to water. According to Lenton (2003), in 2000 the urban population of the LAC region not served by improved water was only 6 million, compared to 34 million in rural areas. For sanitation, these numbers were 14 and 48 million, respectively. However, these numbers change dramatically once population change is taken into account. Due to the fact that all population growth in coming years will be urban, the need for providing water and basic sanitation in the cities actually exceeds that of rural areas. In urban areas, 121 million people will require improved water supply and 132 million improved sanitation, compared to 20 and 29 million, respectively, in the rural areas (UNFPA, 2003a). These projections are based on aggregate trends that do not take into account population growth in under-served urban areas that may be higher than in areas that already have adequate infrastructure. If this difference is factored in, then the urban requirements may even be higher, but to our knowledge, no such scenarios have been carried out so far (UNFPA, 2003).

According to International Water Association (IWA, 2004), "access to good, safe and reliable drinking water is one of the most basic needs of human society and as such requires integrated approach, close cooperation and partnership between all stake holders". Again, research has shown that access to good, reliable and sufficient water supply increases the health status of people. However, many people in the world today lack this basic need. In 2000 Global Water Partnership observed that most countries give first priority to satisfaction of basic needs for

water, one fifth of the world's population is without access to safe drinking water and the service deficiencies primarily affect the poorest segments of the population in developing countries. It goes on to say that: 'water supply and sanitation for both urban and rural areas in these countries represents one of the most serious challenges in the years ahead".

As the amount of water accessed every day is largely determined by the distance to the water source and the collection time, a reasonable distance is one that allows everyone to collect sufficient water to cover personal domestic uses. According to WHO, in order to have a basic access to 20liters per day, the water source has to be within 100 metres of the home and collection time should not exceed 30 minutes. When water is piped into the home, access is optimal and at least 100 litres per person per day is likely to be ensured. In this respect, UNDP confirms in its human development report 2006 that having a regular supply of clean water piped to the household is the optimal type of provision for human development. Access to a regular supply of water within the home also eliminates the need for women and children to spend time and physically exert themselves to collect water from distant sources.

### 2.2.1 Access to Sanitation

The UN millennium project defined basic sanitation as: Access to, and use of excreta and waste water facilities and services that provide privacy and dignity while at the same time ensuring a clean and helpful living environment both at home and in the immediate neighborhood of users. An improved sanitation facility is defined as a facility used for excreta disposal whereby the human excreta are hygienically separated from human contact or their immediate environment, thus reducing the risk of faecal-oral transmission to its users. Facilities meeting this condition include: toilet with sewer connection/septic tank, pour flush toilet/pour flush latrine to sewer, septic tank/ pit, ventilated improved pit (VIP) latrine and latrine with a slab (UNICEF and WHO, 2008).

Good sanitation is foundation for health that affords protection from a wide range of infection including diarrhea, a leading cause of child deaths, yet 2.6 million people still do not have a safe means of excreta disposal at home (WHO and UNICEF, 2004). A target to have this number was added to the Millennium Development Goals in 2002. The enormity of the challenge, however, comes with the acknowledgement that public resources alone are unable to solve this global problem and new demand-oriented approaches are needed (Mehta and Knapp, 2004; WSSCC

and WHO, 2005). Lack of sanitation facilities compound the situation by contaminating water sources such as rivers as defecation along water banks introduces various helminth ova from infected person's excreta into the water bodies posing a serious public health problem. If sanitation is not provided within the home, privacy and physical security are also an issue. If there are no adequate sanitation facilities within the home, women and children often have to go to shared latrine or open spaces to defecate.

### 2.2.2 Nature of Water

Water is a unique utility, whose privatization should be done with extreme care. The focus here will be to understand the unique features of water. The characteristics of water needs to be understood, whether it's a commodity (good) or a right. From economic theory point of view, there are(1)normal goods (2) luxury goods (3) given goods (4)inferior goods and (4) necessities. Where the first 4 categories comprise goods that have suitable substitutes whose consumption is discretional. Hence, there is an enhanced opportunity for access and affordability of the categories of goods. Water being in the last group goods, the consumption of which is necessary for human existence and incidentally, it has no substitutes. This makes water a commodity that must be made available to people as a matter of right. Hence accessibility and affordability of water must be guaranteed by government. Hence water is both a commodity and a right. This basic principal put water in a special category which needs to be taken into consideration while privatizing it.

There are many related factors to help explain why infrastructure services such as water supply have been traditionally supplied by the public sector. First, the presence of economies of scale, network delivery systems, high suck of money needed and barriers to entry lead many infrastructure services and water services in particular, to be viewed as natural monopolies that are not conducive to competitive conditions for service production and delivery (Kahn, 1988) .The market power delivered from monopoly conditions may lead to abusive pricing and customer relations practices if the monopoly firms operates on pure profit-making motives. Hence natural monopoly production characteristics in the case of basic necessity goods such as water supply have often led to public sector management and/or ownership, or private operation with strong regulation. Second, the value of these services to these services to society, and the impact that the absence of such services might have on individual, household and societal well

being, may lead the public sector to maintain control over them in order to avoid the under-provision of these services to certain groups or areas where cost cost-recovery can be low (Rondinel and Kasrdra,1993).In addition the government may want certain services to be available free of charge(or at subsidized fee) to population, in the interest of basic needs and of individual rights. It may also consider that it has crucial role to play in preventing environmental and social externalities such as poor public health and reduced production that would stem from absence of water services (Jacobson and Tarr, 1996). Finally, public services provision may be a vehicle for redistribution policies to alleviate poverty and provide employment within public utilities (Suleiman and Waterbury, 1990).

The approaches differ markedly from one country to another depending on the relative strength of pro-welfare state views. However, a major theoretical shift has modified the way in which academics and policy makers think about infrastructure services. Recently literature has emphasized that many infrastructure goods are actually closer to private goods. For example, water scarcity especially during a dry season, or in an arid climate) may render water services rivalries; if some consumers pump all of the water out of the networks system or of an aquifer, others are left without water (Kessides, 1993). The case of water is of particular interest, because it's the 'least public' among the infrastructure goods. Indeed, with the widespread use of metering and the increasing awareness about water scarcity in many regions, water is almost always a rivalrous and excludable good.

In addition, industries exhibiting natural monopoly characteristics on the surface may in fact be restructured in order to introduce competition, and hence incentives for high performance and fair treatment of customers. The main thrust of such restructuring is towards vertical unbundling and competitive tendering of isolated functions in the industry (Guislain, 1997).

**2.3 Physical parameters and customer access to piped water and sanitation services**

Water and adequate water facilities and services, must be within safe physical reach for all sections of the population. Sufficient, safe and acceptable water must be accessible within, or in the immediate vicinity of each household, educational institution and workplace. (Geneva Convection III; comment no.4, 1991 and no.14, 2000).All water facilities and services must be of sufficient quality, culturally appropriate and sensitive to gender, life-cycle and privacy requirements. Physical security should not be threatened during access to water facilities and

services; urban households in slums or informal areas are more likely to have limited connectivity to piped water and sewerage partly due to the haphazard nature of their settlements. This poses a challenge literally in all their upgrading endeavors. They include difficult sites and terrain; complicated site layouts; and overreliance on conventional service-delivery systems. More often than not the water and sanitation needs of the poor urban communities are hardly incorporated into urban and region planning (Bosch et al.2001).

Franceys&Gerlach, (2008) indicate that though most of the urban poor are housed in slums, many such areas are often denied access or face cumbersome administrative procedures when it comes to connecting them to official water sources partly because of lack of security guarantees for land and pipelines as well as the problems of affordability. Though utility prices are cheaper for those connected to the water systems, most of the poor are denied access because they lack formal property rights to where they live. Their places of resident's serve as a barrier to getting access to these facilities because of undeveloped infrastructure networks.

### 2.3.1 Difficult Topography

The poor urban dwellers tend to settle on the most undesirable pieces of land. They do it for clear and rational reasons: the more unbuildable the lot, the less its market value, and therefore the more affordable it is to less income earner. Such sites may be located where no road, water main, or sewer line could ever reach, resulting in a market value of zero. The low-income households can be found in a range of urban situations, all of which requires slightly a different approaches and strategies. (Ministry of Foreign Affairs of Denmark: Danida,Good Practice Paper,(2006):water and Sanitation in low-income Urban areas.) Examples include the mountainsides in Rio de Janeiro and Caracas, the river gulches of San Salvador, the black cotton soil of Mombasa, or the floodplains in Indonesia and Cameroon. Ironically, where the land cost goes down, the cost of bringing in services goes up, and these areas are precisely where residents are less likely to be able to meet such exorbitant costs. City planning practices tend to exacerbate this tendency by limiting the amount of land available for development. Hence, it become very difficult for households in these areas to get connected to these services (UNDP 2006)

### 2.3.2 Unplanned settlement

Since informal urban settlers lack technical know-how and assistance, they often develop their areas haphazardly, without allowing adequate space for installing infrastructure lines. Extending

large-scale network-based solutions may not be immediately feasible for economic and logistical reasons. Adding new infrastructure or extending existing infrastructure is complex and expensive, especially in the marginal areas of cities. The poor are often forced to live in areas that are undesirable for formal development. These settlements can be very dense, leaving little space for sewer lines (Hogrewe et al. 1993).Latin American communities, for the most part, have mastered the art of neighborhood site planning, at least when they find a flat site. Their problems arise on hillsides.

By contrast, urban settlers in parts of Africa and Asia plunk down their houses according to village traditions that is, patterned according to family formation, with houses directly abutting their neighbors on all sides, with no room left for service right-of-ways. Laying pipes under such circumstances conventionally calls for the creation of streets and the consequent removal and relocation of houses (rather than bending pipes around them). In these situations, the cost of service delivery is higher, both in financial and social terms. Sometimes, an entirely new neighborhood must be built to accommodate relocated families. These development costs must be considered part of the costs in providing water and sanitation to the original settlement.

### 2.3.3Overreliance on old Conventional Service-Delivery Systems

Due to declining economic performance and urbanization, many people have settled in informal settlement, which are often increasingly characterized by rising poverty levels and growing in informal sector. These informal settlements are often not planned, underserved and sometimes illegal. For the utilities to meet their future demand, they will require to develop skills and knowledge adequate enough to respond to the demands of these households, who comprises the majority of potential new consumers.(Web.mit.edu/urbanupgrading/water and sanitation/…)

MEWASS (WSP), and the Japanese consultant who rehabilitated the water supply system, preferred to use service-delivery systems which they are familiar with. Usually the most modern, even though these systems may turn out to be inappropriate for the difficult topography, soils, and other conditions of informal neighborhoods. In particular, these conditions can make the installation of conventional infrastructure extremely costly much more expensive than less-familiar technologies that have been developed as appropriate responses to these conditions (Bakalian and Jagannathan, 1991). Two factors that contribute to WSP overreliance on conventional service-delivery systems are the adoption of foreign engineering standards/donor

conditions and the traditional curricula of engineering schools. Another important constraint is that affordable technology usually requires much higher levels of user involvement than conventional technology to function properly. Engineers, who formulate most sector projects, often have little regard for the social mechanics of projects, such as mobilizing communities and involving future users, and have little patience for the sheer time it takes to address them.

There exist examples of simple and ingenious solutions in providing water and sanitation under adverse conditions (such as the simplified sewerage system of Northeastern Brazil) that have turned out to be cheaper than conventional systems. But for the most part, the distrust and ignorance that many engineers and others have about alternative systems translates into higher costs or lack of services for poor families living on difficult terrain. There also exists a finite set of terrible conditions facing families residing on troublesome terrain swamps, slopes, and river valleys, to name three. Engineers have important contributions to make in finding optimal systems for introducing water, sanitation, and garbage disposal under each of these conditions. MEWASS would insist on installing its infrastructure on a public land for ease of operations and maintenance and to avoid compensations and vandalism of the systems if it passes through private land.

### 2.4 Affordability and customer access to piped water and sanitation services

The key economic and financial factors to providing water and sanitation services in informal settlements includes; the cost of water and sanitation as to compared to their low income(equal/less than 5% of income),shortage of capital for investments(installation fee) and limitations of housing.

#### 2.4.1 High Costs of Water and Sanitation, versus Low Family Incomes

Pricing of water and sanitation services is based on a number of such factors as depreciation, operational and maintenance cost, re-investment and profit. Determining the price of service for a particular category of the customer profile vary according to the objectives of the utility, political and social criteria.(web.mit.edu/urbanupgrading/waterand sanitation/funding…)

When the cost of piped water is compared with what low-income families actually spend for Water, it generally turns out that water from vendor trucks and buckets costs far more than water from a domestic hook-up. It is also generally true that whatever the cost, families will sacrifice

food, heat, and shelter to pay for minimum water consumption. For these reasons, the provision of a close, safe source of drinking water can usually be demonstrated to be amply affordable to beneficiary families. If water is priced at full recovery levels, this translate to only those who live in formal settlement are the only who mostly benefits

Delivery costs are oftentimes overlooked in economic analyses. These can include the cost of Off-site trunk lines that bring water to a neighborhood and take wastewater away, or of sewage treatment plant, which is increasingly becoming a requirement for any new sanitation system. Economists recommend that those who benefit from public services pay the marginal costs that their new service represents. But when the cost of additional infrastructure includes a new trunk line, reservoir, or additional treatment plants, as they can when peri-urban or suburban sites are linked up to a municipal aqueduct, the marginal costs tend to increase, and with them the burden on poor families, which are the last to get services. In these cases, the poor families living in the informal settlements end up paying more than the higher-income families living in the formal sector, because the costs of extending a water line today is considerably higher than the cost of installing a system of pipes was 20 years earlier (Hermanson and Owens, 1990).

### 2.4.2 Additional Charges to the Family

While families usually save on water charges when they hook up to a municipal aqueduct and stop buying by the gallon from water vendors, they also find themselves subject to additional charges, which may mount up. The cost of the initial connection fee (usually the cost of the water meter and house connection) plus the amortization of the capital investment costs can look very high for families with low incomes, as can the charges for additional services that invariably emerge from the service provider billing department. These might include costs for sewage collection, sewage treatment, trees and parks, garbage collection, fire brigades, meter rent and a municipal zoo. Few billing departments differentiate between who gets trees, parks, garbage collection, and protection from fire when they send out their bills as long as the customer is within the supplied area.

The process of land legalization and rezoning, an almost universal requirement for the provision of urban water and sanitation, can give rise to additional costs often the most burdensome. These requirements often make the cost of infrastructure unaffordable to low income families.

Moreover, these families will not always appreciate the net benefits of a title deed and a zoning variance (De Soto, 1989; Hermanson and Owens, 1990).

### 2.4.3 Lack of Capital for Investment

*The a*ction of deploying funds with the intention and expectation that they will earn a positive return on investment. (www.assignmentpoint.com) Low-income families have neither the money to invest in infrastructure nor the support of others who could lend to them, so they turn to the County goverment for financing. Yet Third World cities are notoriously short of funds and sources of financing, so they traditionally turn to the national government, which is usually more or less in the same straits. National governments can borrow both externally and internally and usually do, but they prefer to do so for projects that are more likely to pay off the loans, such as ports, roads, or power plants, than those that are not. (Health Bureau for Research and Development; U.S Agency for international Development, under WASH TASK No.338)

An additional constraint in providing infrastructure to the urban informal sector is the lack of a local financial institution willing to make loans and collect revenues. In other words, even if a completely affordable system for providing water and sanitation could be found, and even if the capital were available for its installation, an infrastructure project would still be stalled until an appropriate credit agency could be identified or established to contract loans to the beneficiaries and to collect payments. It is rare to find municipal public works companies or municipalities with in-house credit agencies or financing departments. Attempts to get local private banks to finance informal settlement upgrades have been largely unsuccessful. Even credit unions, which make loans to lower-income individual members, are reluctant to get involved in financing infrastructure. Their logic is understandable: Even a shanty can be offered as a guarantee, but no one can claim a stretch of pipe to back up a loan for water supply.

When banks have made loans available for home improvement in lower-income settlements, they insist on financing housing that is already fully serviced and that has a legal private domain land title. Thus far, the private banking system has rarely come up with programs to finance the installation of infrastructure in poor illegal and/or irregular urban settlements. In Mexico, Colombia, and Chile, however, programs have been developed for private banks to make loans available to municipal governments. Municipal governments then, if willing, can use these funds

to upgrade informal settlements. At present, these funds come from national governments or external lending sources; they do not represent the commercial banks own assets.

Even when credit institutions do agree to finance infrastructure projects for poor neighborhoods, they often stumble in the process. The right conditions for financing just do not exist in these areas. For example, loans for infrastructure must be made to an association that has no legal existence and no equity. The alternative making loans to individuals for shares in a water delivery and sanitation system runs into a new set of problems, since the urban poor, without steady jobs and with no collateral to offer, no savings, and low incomes, are hardly deemed credit worthy.

### 2.4.4 Cost Recovery: Return on investment

Poor levels of cost recovery are often cited as the reason that utilities and municipal service Providers do not deliver services in low-income urban communities. Many utility operators would assume that low-income households will consume low quantities of water and will therefore not be financially attractive to serve or that they will simply not be able to pay at all. Most of the available evidence refutes this position; the value of a reliable water supply and access to basic sanitation is particularly high in households who live in precarious urban environments. Access to reliable services can have a significant positive impact on such households because it frees them from the high costs of purchasing services from alternative unreliable sources (vendors) and simultaneously frees up time spent queuing for water and attending to sick family members for more productive activities (Ministry of Foreign Affairs Denmark,(2006) Water Supply and Sanitation in Low in-come areas; Good practice Paper 2006)

Urban upgrading has traditionally been highly subsidized and, as a result, cost recovery has not been a major issue in such projects (Serageldin, 1989). Today, as subsidies become scarcer, local governments and international donors are attempting to recover capital costs for public works. These attempts, however, have been met with significant resistance by the urban poor, which have resulted in a poor track record for recovering the capital investment costs of peri-urban water and sanitation projects (Serageldin, 1989). Consequently, international and national lending agencies are reluctant to invest in infrastructure for the urban poor. The costs of infrastructure installation include charges for regularization, legalization, and sometimes the expropriation of land that appear exorbitant to beneficiary communities. Many of these

communities balk at paying development levies or charges for amortization of infrastructure investments.

### 2.4.5 Poor Economic Rates of Return

The economic internal rate of return is considered as a useful tool for accessing investment in the areas of any development and during economic evaluation. It tends to measure expected cost and benefits ignoring social and environmental factors.(planet-risk.org/index.php/pr/article/view/43/145)

Any investment, albeit public or private must theoretically, undergo cost-benefit analyses that compare its benefits with other alternative investments. The financial internal rate of return (FIRR) compares cost with revenue streams based on the expected sales of water, which in turn are based on existing or expected tariffs (service charges). The economic internal rate of return (EIRR), which looks at infrastructure projects comprehensively, uses the increase in land values as an approximation of benefits.

These analyses are really looking at the payoffs a project will bring and measuring the virtues of one project compared with others. Thus, the better project is the one that brings in greater net revenues to the public works company and/or causes land prices to rise more than the original cost of the land plus the cost of the investment. Either of these methods of measuring return tends to make investments in services for the poor less attractive than the same investments in services for the upper and middle classes. Not only are earnings greater in middle-class neighborhoods, where the same pipes will produce a greater consumption of water (probably at higher prices), but land values are likely to rise more quickly there too. Meanwhile, it is difficult to discover sales and rental prices of real estate in poor neighborhoods. The situation becomes more complicated in the majority of cases where families do not hold clear title to property. Finally, whatever amenities a property may have, its value in the real estate market is generally dictated by its location and jeopardized by poor neighbors.

In short, economic analyses based on land revaluation or on Service Company revenues tend to lead to the rejection of social investment in favor of that considered to be more profitable investment. The upper and middle classes are apt to consume more water, and their property values are likely to increase more quickly. They represent a far better economic and financial

investment than the poor. An EIRR analysis often confirms that putting water into informal settlements bears far fewer benefits than putting new sidewalks and parks into middle-class neighborhoods. By the same deduction, putting water into all the neighborhoods that need it will not come close in EIRR terms to putting all services, including telephones and full paving, into a single neighborhood.

A Kenyan case example of atypical of slum-upgrading projects below illustrates how the EIRR analysis has worked against the interests of the poor. The lesson in developing an urban project and in analyzing the EIRR is to make sure that it is indeed the poor and not the land that get the services (Solo, 1990).In Kenya, one urban project targeted low-income populations with new housing and urban-upgrading components. Although the project ran into many problems-site conditions, land tenure, and cost recovery to name a few-the sum of the costs came to far less than the sum of the benefits, because the sale and rental price of the land soared after its improvement. Thanks to the project, however, the former slum became a home for the elite, not low-income families. The upgraded areas included three-story, ultra-modern villas with gardens in tiers. The original targets of the project, the poor, were run out of their neighborhoods and into gulches outside the city. They felt safer there, they said, because nobody would try to take the gulches from them. They failed to realize, of course, that the gulches with their difficult terrain would probably never get water and sewers. In terms of EIRR, the project was an all-out success. In terms of bringing water to the poor, it failed miserably.

**2.5 Institutional constraints on customer access to piped water and sanitation services**

There are several institutional constraints that prevent poor from accessing adequate urban services. Some examples could be drawn from a centralized supply solution which may be sustainable or even not work at all if region or local levels of government are not involved by adapting the solutions to specific local needs (Tear Fund, 2007) .The mismatch between demands for improved sanitation and the type of services provided often results in unused or underused sanitation infrastructure for improved sanitation and the type;

According to the Government of Kenya's National Water Development Report of 2006, Kenya's water resources have been mismanaged through unsustainable water and land use policies, laws and institutions, weak water allocation practices, growing pollution, and increasing degradation of rivers, lakes, wetlands, aquifers and their catchments.

The adoption of new technology regarding water and sanitation may at times involve large investments that require local institution and legal arrangements that are irreversible. Slum dwellers usually live in premises with insecure property rights. This mainly weakens their incentive to make long term capital investment or use their property as collateral to secure loans for further capital investments. For example, connecting a house to the water or sewage network, or building a safe latrine, are investments requiring the consideration of the support structure, such as the local institutional and legal arrangements ;(Esther Duflo, at al,(2012);Improving access to Urban Services to the poor; Open issues and a Frame work for a Future Research Agenda)

The other drawbacks is the lack of knowledge and skills about accessible and inclusive design among water engineers in low-income countries, mainly because this is not part of their training (Reed and Coates, 2003), and because they are unlikely to have seen real examples of inclusive design. The majority of these engineers are male and they traditionally design and construct facilities for the 'average' person, with no user consultation and without considering that, in real communities, people come in a wide range of shapes, sizes and ages and with a wide variety of needs (Jones and Reed, 2005)

Another challenges' bedeviling the institutions includes their weak and disorganized operation; Emphasizing on financial discipline, revenue collection, and pricing policies, Sometimes thereby undermining broader public needs ;inability to service low-income communities; and susceptibility to corruption and politicization. They include cases where politicians use services as patronage tools, where there are mismatches between national and local government strategies and policy frameworks and where users themselves opt out of formal provision and instead rely on unregulated, informal providers. (Common constraints and incentives problem in service delivery-working paper 351 by Leni Wild at al, (2012)

### 2.5.1 Complicated and Disorganized Water service providers' Systems

Barriers to improvement of urban services is insufficient supply, especially of networked services .Some of the reasons for this inadequate supply of safe water and sanitation is that building a water and sanitation infrastructure and distribution is costly and may involve numerous technical and bureaucratic and legal constraints(Water and Sanitation Program,2007)

A WSP's systems in the Third World have long been recognized as complicated and disorganized. Most urban utilities in Third World cities are not strong organizations and do not provide good services in general. Efficient public works companies do exist, but far too many are plagued by government interference, poor leadership and management, lack of autonomy, and a policy environment that hinders their development. While these issues require more discussion on their own, the focus here is on their effect on satisfactory service and expanded coverage in existing but underserved neighborhoods, i.e., the informal sectors.

Municipal services in less developed countries are frequently managed either by several companies or by one company usually with multiple functions. The first instance is exemplified in Mexico City, with a population of some 15 million. General company supplies water, other district companies install the piping, another citywide company reads the meters and charges the customer, and still another company collects and reinvests the payments. The other extreme can be seen in the typical municipal public works company in Colombia. There, one company usually manages water distribution, the sewers, garbage collection, municipal markets, slaughterhouses, the city zoo, and public transportation. With such a broad range of activities to oversee, management responsibility within the company often gets diluted due to failure to maintain core business. It becomes difficult for the technician, and indeed for the company itself, to know where to initiate a project to bring services to a poor neighborhood.

In the Kenyan water sector, horizontal coordination was reportedly 'very weak', with 11 ministries sharing some responsibility for water (Rampa, 2011). An ambitious reform programme in 2002 established an additional 13 new parastatals, and decentralization further increased the number of autonomous regional bodies. This resulted in a 'the more the merrier' situation, with a proliferation of actors and a large influx of funds opening up multiple opportunities for rent seeking and a 'scramble for resources' (ibid.). This is a useful example of the potential interaction between common constraints, with policy incoherence reinforcing existing political market imperfections.

### 2.5.2 Emphasis on Financial Discipline and lack in Subsidies for the Poor

The focus in recent years on encouraging utility companies to apply financial discipline and to become more efficient so that the poor hopefully can be reached is certainly a step forward. However, the basic formula applied increasing charges and collection of payments to cover

operating costs and to leave a small margin has tended to focus exclusively on eliminating deficits and providing autonomy, while eclipsing any discussion of needs and of the public nature of a utility. In theory, the introduction of a systematic pricing and collection system may raise revenues significantly and thereby increase the possibilities of cross subsidy. For most, readjusting the pricing schedules has not been easy. Not only has accounting never been a fault of many utility companies in less developed countries, but pricing schedules are also further complicated by confusing or combined institutional roles, as illustrated in the Colombian example above.

However, even with adequate pricing policies, when utility companies operate as monopolies, they create no incentive to trim operating costs or to improve efficiency or coverage. Indeed, the utility company that introduces an effective profit motive into its operations tends to view investment in poor neighborhoods as increasingly unattractive (Peterson, 1987).Free-market theories of development suggest that a privately owned and operated water and sanitation company will find ways to increase efficiency and expand services to all possible markets, including the poor. Experience to date, though, suggests that the private service companies have not shown eagerness to extend infrastructure to poor informal neighborhoods. While there may be successful examples, the majority of privatized water and sanitation companies tend to avoid the poor neighborhoods, limit investment in new infrastructure, and demonstrate the more nefarious features of monopoly operations.

### 2.5.3 Inability of water service providers' Systems to Service Low-Income Communities

Water service providers companies in less developed countries follow the model of companies from developed countries: they are set up to receive and to operate reticulation systems, but they are not equipped to build new systems on their own. This characteristic is especially apparent in low income communities, where installing infrastructure requires public relations, social work, and more on-site engineering than most companies are able to offer. (WASH Technical report No.85, Tova Maria and Perez).Introduction of appropriate technologies adaptable to local needs, one to use and maintain is encouraged. Some technologies introduced are not suitable for the use in the country. Some drain financial resources, particularly on spare parts that are not locally available or are too expensive to run on petroleum fuel, stretching the management capacity. There is need to identify and access the technologies that are adaptable, environmentally friendly

and cheap to maintain (WB,MDG's for water and sanitation assessment-Kenya,2004).In the past, attempts have been made by international donors and non-governmental organizations(NGOs) to meet these infrastructure and other needs through urban-upgrading projects. Although the results from donors have generally been poor, NGOs have served in a useful bridging role between communities and municipal utilities.

### 2.5.4 Susceptibility to Corruption and Politicization

Public works in any country can be highly susceptible to corruption and politicization. On the one hand, public works companies are synonymous with large contracts and lucrative payoffs. On the other hand, they offer ample opportunities for patronage employment. When the corrupted interests begin to dominate the company, its objectives can change from offering good service, improving coverage, and performing efficiently to concentrating on maximizing employment and the possibility for payoffs. Interest in bringing services to poor neighborhoods then plummets. Devolved services have really devolved everything including nepotism in the workplace.(World Bank,2009)

## 2.6 Structural constraints and customer access to piped water and sanitation services

These are the constraints that are at the heart of urban sector definitions and development objectives. They are the constraints that are the most difficult to address, let alone resolve, because they involve conflicting values and policy viewpoints. (Aqua Consultant, 2002)

Development planners may well find that once they have figured out how to solve the physical problems with an excellent design, once they have secured funding and identified all the financing angles, once they have the support of a capable public works company, then the truly serious barriers to bringing infrastructure to the poor begin to appear. Not the least of them is structural constraints. The structural constraints that impede the provision of water and sanitation services to the informal sector include the following:

Cities are often defined according to fully serviced areas, which do not always include the poor.

Planning is by prohibitive zoning.

Population growth rate is not always taken into account.

Prohibitive land-use planning distorts the urban land market.

Town planning and building codes define housing without services as unacceptable.

Legalization and property rights must first be approved before ownership of land is recognized.

### 2.6.1 Defining Cities According to Fully Serviced Areas

Structural constraints here will focus on defining who is entitled to urban services: first, according to the definitions of urban area, of urban standards, and of property rights; and second, according to the objectives and policies of urban development. Definition of the city does not always include the poor.

In most cases, land-use planning defines a city according to fully serviced areas. Those areas where low-income families live without access to water and sanitation, by this definition, are not considered urban land. Similarly, often no cadastral database exists for families living in informal peri-urban settlements. Hence, they are not included in municipal development plans. But definition alone is not totally responsible for the exclusion of these neighborhoods from municipal development plans. Compounding this constraint in definition are two disturbing characteristics of land-use planning in less developed countries: planners try to control this process of land transfer and development, and they allow their land-use plans to fall out of date very quickly.

Traditional land-use planning applied in Latin America and Africa regulates the transfer of agricultural land to urban land. In any city, the demand for new land for housing and urban uses will eventually win out over the price of corn. Farmers will move farther away and send their crops into town. Neighborhoods fully serviced or not, will spring into existence.

### 2.6.2 Planning by Zoning

Informal peri-urban settlements do develop and improve over time, if allowed to. Unlike U.S slums, they are not in any process of deterioration. Shantytowns they may be, but they turn slowly, but resolutely, into respectable neighborhoods. They begin as scattered huts, without streets, house numbers, or connections to public services. They may pirate electricity from the nearest cables, bring water in drums from their neighbors who have standpipes, walk through fields to get to streets with public transportation, and rely on a stack of tires (a commonly improvised toilet) and an occasional bonfire to take care of excreta. Gradually, however, the shanties get rebuilt in cement, the community acquires a certain degree of present ability and

some political clout (because the process of getting public services is as much political as technical and economic), and public services are extended to the neighborhood. Commerce follows and, finally, small industry.

This entire process is, however, regularly jeopardized by the controls set on a Town's growth, as well as problems with acquiring permits .Planners control the process of land development by zoning, which essentially defines what is not allowed in an area. This model of planning was introduced by planners from developed countries, and is a model that many see as inappropriate because it is prohibitive: it prevents development from occurring. As Hernando DeSoto points out, a more appropriate model for urban development in the Third World might have been the U.S. Homesteading Act, which encouraged people to develop vacant land (De Soto, 1989).To be sure, it is important for planners to tell people where it is dangerous or inappropriate to build, but it is equally important that they be ready and willing to encourage people to settle on legitimate and ultimately serviceable land. A new approach to urban planning should focus on the actual city, that is, on what is already there, instead of on a conventional, imported vision of what a city should be and look like.

When zoning practices and land-use planning effectively turn legal land into a scarce and therefore expensive commodity, they combine to distort the urban land market, causing illegal land to fall in price and become more attractive to low-income families.

In Latin America, where urban land prices have been documented, land prices adjust upward in permissible areas and fall in prohibited areas, with the result that low-income families move precisely where they should not. Indeed, urban development plans are the primary reason for peripheral settlements surrounding Latin American cities. The Mexican urban land market, one of the most distorted in the region, is a case in point. (SomikVLall at al, 2006)

### 2.6.3 The Failure to Consider Population Growth Rates

Few municipal development plans in less developed countries take the actual rate of population growth into account. It is very difficult to get planners to think ahead to define the city limits according to the needs of a growing population, rather than the limits of infrastructure, land, and investment. In Bogotá in the 1960s, for example, A.I.D. financed the city's first municipal development plan. The plan, developed by a U.S. firm, is notable for stating flatly that no

population change had been considered for the future of Bogotá because London, England, had a minimal growth rate at that time (Hamer, 1985).

### 2.6.4 Complications with Planning Codes

As a result of the land-use definition of urban land, most urban poor are living on nonurban land: by this definition, their residences are illegal. Before they can get urban services, their land must be reclassified as urban, and rezoned for residential use. These two changes may take from two to many years because of another roadblock often encountered with municipal or governmental offices: administrative procedures that prolong and complicate the granting of permits. For the most part, the municipal planning departments of Third World cities simply do not grant permits for anything less than fully serviced neighborhoods and dignified housing even though some 75 percent of the population can afford such settlements and 70 percent of the communities never began as fully serviced. Since planners, by definition, approve communities before they are inhabited, the planning codes simply refuse to admit the sale, subdivision, and occupation of land that has not won planner's previous approval. As a result, there are no comfortable mechanisms for transforming unapproved, pirate developments into approved subdivisions.

Who is to blame for this municipal planning concept? Northern concepts of planning developed in countries that had largely managed to deal with the problems of urban poverty were pushed hard in developing countries during the 1960s and 1970s. U.S. foreign aid financed city plans for most Latin American national capitals, while the French financed city plans throughout Africa and Asia, as did the international development banks. The unfortunate application of U.S. planning standards in Latin America continues to inhibit the development of low-cost communities and the recognition of existing ones. Rather than calling for a reliance on public transportation, for example, municipal plans regularly require a minimum of one parking space per family, in addition to house setbacks for the installation of garages. The setback requirements exemplify concessions to the U.S. tradition of a garden in front of the house and owning an automobile. They have very little to do with the reality of less developed countries, and much less to do with poor urban settlers. Even so, when an informal community wishes to get services, it must demonstrate compliance with the building codes, which means rebuilding the home at significant cost to conform to irrelevant standards, in addition to battling city hall to get a building code approval.(World Bank, Washington DC,USA)

### 2.6.5 Approving Legalization and Property Rights First

A common characteristic of slum dwellers is that they live in houses with unsecure property rights or they lack a title altogether. This is a consequence of the lack of planning for urban growth together with the inability of land and mortgage markets to reach these populations. Besley and Ghatak (2009) classify property rights into two types: use rights (the owner's right to use a good or asset for consumption and income generation, and transfer rights (the owner's right to transfer a good or asset to another party as a sale, gift, or bequest). When property rights are effective, it means mainly that the ownership structures are well-defined.

In Third World communities, legalization and property rights must first be approved before ownership is recognized and public services are extended. Until a neighborhood is legalized recognized formally with street names, house numbers, and registered deeds it cannot, in most cases, get water and sanitation infrastructure. Usually, the first requirement for legalization is that the neighborhood has adequate services that is, water and sanitation already installed. When the legalization of a previously occupied lot is an issue, an inordinate amount of time is usually required. This involves several layers of government, including both the central and local levels, and several ministries for example, public works, lands and urban development, health (water and sanitation), finance, and so on.

The requirements for legalization of purchased land in Lima, Peru, for example, involve 112 steps, and can take a minimum of four years in the very best of worlds. The steps include four presidential signatures on different occasions. The legal issues are such that most projects have had to skip over legalization if they are ever to get on with the physical upgrading. Most finish without ever processing a single title (De Soto, 1989).

Required procedures can include title searches, which are complicated in countries where most of the population was illiterate two generations back, and where titles often describe properties in terms of a tree no longer present or a brook that dried up a century ago. Brazil offers an example of at least one Latin American country that has made attempts to allow infrastructure to be put in place before land tenure has been regularized, though with mixed results .Next, all previous uses not simply present ones have to be registered for their conformity to current zoning regulations. In most Latin American countries, the land must then be expropriated, which involves tracking down and paying the former owners, even though they have already been paid, because the

earlier sale is not considered a legal one. The expropriation itself generally requires the blessing of the national government as well as the local city council. In most Third World countries, the history of titles and landholdings has little day-to-day importance for the urban poor, and so little effort has been made to streamline it. (Indonesians, accustomed to a weak judiciary and a virtually nonexistent registry of lands, refer to the situation as stability through confusion.) Problems arise, however, when low-income families want to improve their property by bringing in water and other public services. Then the legal condition of the land becomes of paramount importance.

In Africa, many urban-upgrading projects have been clouded by the fact that the urban poor are mostly renters. After the families there go through the dreadful gymnastics required to legalize and upgrade slum properties, the benefits of improvements can all accrue to landlords, without enhancing the tenants standard of living at all (World Bank, 1986).In Abidjan, for example, a slum-upgrading project introduced water and sewer connections to inner city tenements free of charge. Because of the improved facilities, the landlords raised the rents, and the tenants responded by dividing rooms and subletting to relatives to meet the higher rent. This densification of Abidjans courtyard housing has had negative implications for public health.

### 2.6.6 Limitations on the International Donor

When international development agencies attempt to promote policy changes to favor the poor, their attempts sometimes prove ineffective because of the time restraints that working within the framework of a project-implementation or loan-disbursement schedule can cause. Naturally enough, the international donors look for projects that fall within their own parameters. Still, trying to bring services to poor neighborhoods is fraught with complications, such as working with illegal neighborhoods or substandard communities. Consequently, such projects generally turn into time consuming enterprises and cannot always be completed or even adequately begun in the time a given schedule allows.

The greatest bottleneck to getting services to the poor is bias, as demonstrated by indifference, and even hostility, to low-income families at local, national, and international levels. Wittingly or not, decision-makers, in their attempts to do away with urban poverty, have managed to create a structure that instead preserves and virtually institutionalizes it.

The story of the constraints encountered in trying to get services to the poor is a story of consciously made poor decisions: decisions to emphasize the wrong type of technical solutions; to withhold information about land use; to control a city's new development to the point where it becomes unaffordable to most citizens; and to create laws, plans, and policies, with the very best intentions in the world, that soundly defeat their own purposes.

Of course, there are projects that have managed to rewrite the rules and overcome urban sector constraints. However, it would be very naive to assume that urban sector constraints will disappear if people are shown solutions that help urban poor. As long as the bias against the urban poor continues to exist, new constraints will appear every time the old ones are done away with. Less developed countries certainly cannot claim the monopoly on discriminating against low-income families. However, the bias of city authorities in the Third World may be more easily explained than that of First World governments. The problems of the urban poor are so overwhelming and their sprawling presence so frightening, that there are practical reasons, in addition to emotional ones, for trying to blot their existence out of the municipal and national consciousness.

Decentralization and democratization, new themes in international development, may well give informal settlements greater leverage and visibility, but it is not so simple, and it appears to take time and technical sophistication. In theory, once the poor have voting rights and representation they will keep in office those politicians who manage resources wisely and respond to their needs. Reaching this stage, however, appears to require a certain amount of experience and security (for voters and candidates), and the emergence of genuine leaders. Politicians have found that it is easier to command the loyalty of a population in need of services and security than one that already has full services.

Meeting the needs of informal peri-urban settlements will require significant structural reforms that facilitate and even encourage working with existing settlements, where the greatest need for water and sanitation exists. It also implies improving our knowledge about the urban poor. Turning around people and institutions takes time, and it takes a few good leaders.

## 2.7 Theoretical Framework

This study shall be based on two theories: Technological acceptance model and the Brett Fischmanns economic theory of infrastructure. A theory as defined by (Mugenda and Mugenda, 2003) is a set of concepts and interrelations that are presumed to exist among concepts. Theoretical Framework is a collection of interrelated ideas based on theories- a reasoned set of prepositions which are derived from and supported by data or evidence (Kombo and Tromp, 2006).The two theories will complement each other in this study.

### 2.7.1 Brett Fischmannseconomic theory of infrastructure

Brett Frischmanns economic theory of infrastructure and common management offers a comprehensive new proposal about managing types of resources by providing public access to them on an obligatory and non-discriminatory basis. It critiques any systematic right to exclude as inappropriate a right that would be an integral of a typical resource management scheme based on private property for many resources that are broadly shared and reusable. Brett argues, open access will be more conducive to maximizing the production of public and non-market goods on an ongoing basis. The beneficial process of shared use and re-use, with their many positive spillover effects, would be impeded by granting property right to an owner who then could exclude potential downstream users, based on inadequate signals about demand. Brett concludes that fundamental infrastructure should instead be shared. His theory is important and helpful in addressing current issues of management, organization structure and information

### 2.7.2 Technological Acceptance Model

This is one well-known model related to Technology acceptance and use. It originally, was proposed by Davis in 1986.Technology Acceptance model provides a basis with which one traces how external variables influence belief, attitude and intention to use. Two cognitive beliefs are posited by TAM; Perceived usefulness and perceived ease of use. According to TAM, on actual use of technology system is influenced directly or indirectly by the user's behavioral intentions, attitude, perceived usefulness of the system, and perceived ease of the system. The study will adopt this model to explain the role of information in enhancing efficiency and effectiveness of water and sanitation services

## 2.8 Conceptual Framework

The conceptual Framework portrays a picture of the proposed relationship between the variables of the study. Independent variables also known as predictor variable are the forces that are presumed to be the causes of the changes in the dependent variables. The dependent variables, also called the criteria variable, indicate total influence arising from the effects of independent variables. In this study, the independent variable will include those factors that influence access and affordability of piped water and sewerage services. The dependent variables are those variables affected by the independent variable

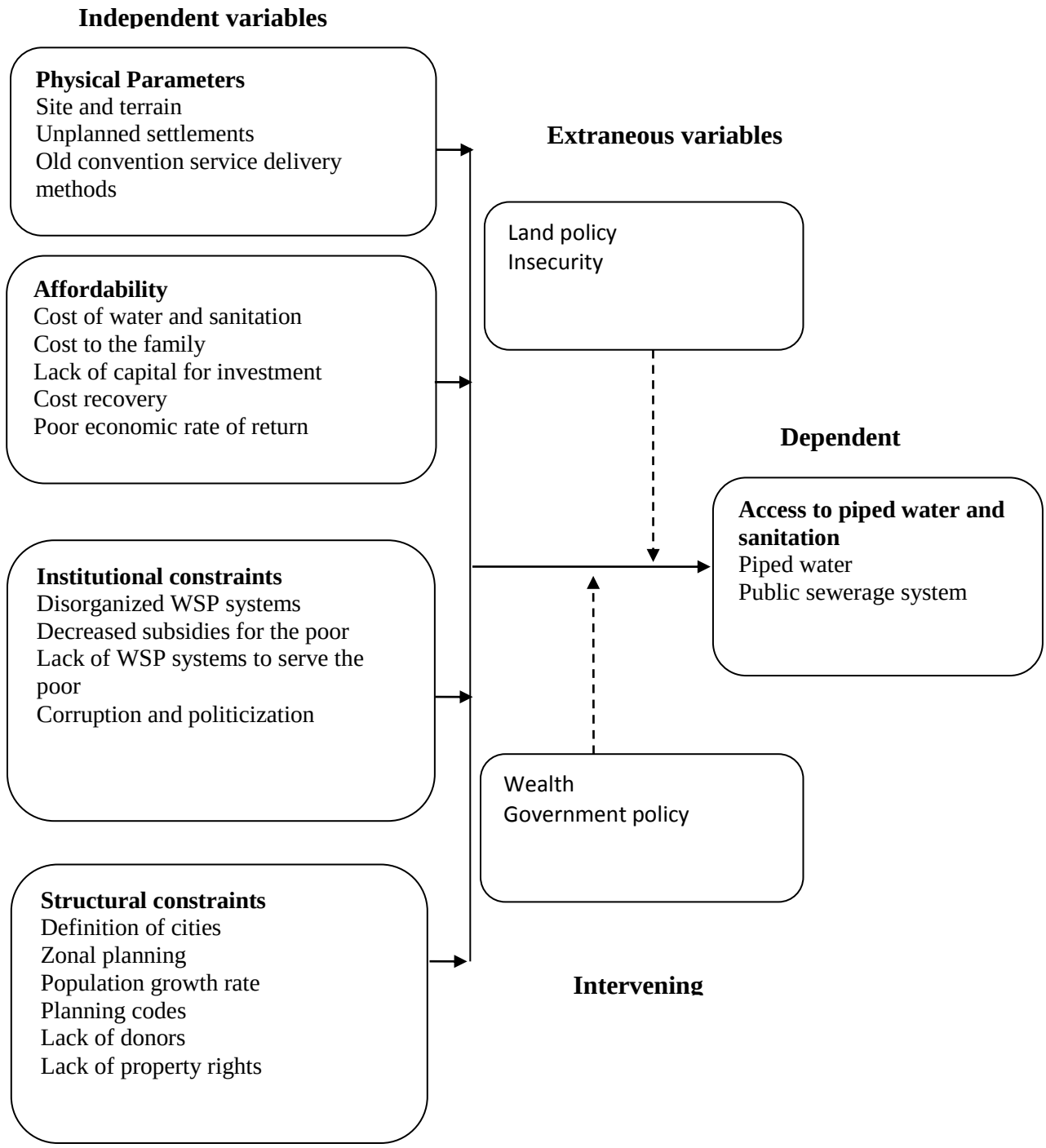


**Figure 1: Conceptual framework**

## 2.9 Research Gap

Most of the literature reviewed is mostly from different countries whose strategic approach and strategic fleeting is different from that of Kenya. Further, the studies do not centre into issues of water project. The study done in Kenya concerning water and sanitation services in low-income areas have not been done in Meru town. An example of a study done 2016 on access to water among slum dwellers in Nakuru town, Kenya-Kaptemwa Location indicated that only 65% of the basic water requirements are met and that only 25% of the households access the minimum recommended 50l/c/d-which is low according to international standards. The low levels of investments in water infrastructure are the major explanatory for reduced access to water services. Samwel B. Mokaya et al (2016)**.**

Therefore, there is need to find out or correlate the service coverage , distribution networks and mode of supply in these areas although these low income areas each has its unique problems depending on environmental and other geographical factors.

Thus, there is a research gap on the factors affecting accessibility and affordability of water and sanitation services in low-income areas of Meru town which this study seeks to fill.

## 2.10 Summary of Literature Review

This chapter has reviewed the literature on factors influencing accessibility and affordability of piped water and sanitation services in low income areas both globally and locally.

An example of a study done 2016 on access to water among slum dwellers in Nakuru town, Kenya-Kaptemwa Location indicated that only 65% of the basic water requirements are met and that only 25% of the households access the minimum recommended 50l/c/d-which is low according to international standards. The low levels of investments in water infrastructure are the major explanatory for reduced access to water services. Samwel B. Mokaya et al (2016)**.**

The literature will focused on all factors that influence accessibility and affordability that includes physical, structural, economical as well as institutional constraints. A conceptual framework is also included.

# CHAPTER THREE
# RESEARCH METHODOLOGY

## 3.1 Introduction

This chapter gives the methods that shall be applied in the research. It covers the research design to be used, the targeted population, sample size and sampling procedure. The instruments used in the study, their validity and reliability are also explained.

## 3.2 Research Design

This study was a cross-sectional survey of households in the three low-income areas of Meru town. The studies were descriptive one meant to describe the relationship of affordability and accessibility with physical, institutional and structural constraints. The major purpose therefore of employing this design, was to describe the nature of the condition as it is at the time of this study so as to explore the associations of a particular condition (Orodho, 2004), thereby giving a snapshot of the conditions of this study. The selection of this study design is in consideration by the researcher to acquire first-hand information from the respondent so as to formulate rational and sound conclusions and recommendation for the study.

## 3.3Target population

The target populations were the entire residents of those three areas:Majengo with population of 380, Mjini/Salama with 480 and ShauriYako with 220, all who reside and have houses there. They form a total of 1080 households with each household having an average of 5.3 occupants (Source;Maji data). The study also covered 15 staff members of MEWASS,the WSP purposively sampled to obtain the information.

## 3.4 Sample size and sampling procedure

The size of the sample and the procedure to use are indicated here.

### 3.4.1 Sample size

The sample size composed of 105 numbers of households, randomly selected from the three slum areas of Meru town and 15 Number of MEWASS staff purposively sampled to give the required information. The reason for this size of sample considered appropriate given the size of

the population and complexity of the area, need to get precision, cost and budget consideration. The number of sample size from each slum was distributed as follows:

Majengo 380/1080x105=37 households

Mjini 480/1080x105 =47 households

Shauri Yako 220/1080x105 =21

The total number of households in the three areas being 1080, with confident level of 85, marginal error of ±7, and a standard deviation of .5

Necessary sample size= (critical value) 2xSDx (1-SD/marginal error) 2

= (1.44)2x.5 (.5)/(0.07)2 =2.0736x, 25/0.0049=105(Sample size)

### 3.4.2 Sampling procedure

The sample size was composed of 105 numbers of households, randomly selected from the three slum areas of Meru town and 15 Number of MEWASS staff purposively sampled to give the required information. The reason for this size of sample considered appropriate given the size of the population and complexity of the area, need to get precision, cost and budget consideration.

### 3.5 Data collection instrument

The study used structured interview schedule/questionnaires to illicit information from respondents. The questionnaire involved closed-ended questions that were pre-coded; this enabled or allow placement of the respondent's response in the provided set of codes for each of the question. The interview schedule utilized questions that attract likert scale response, which ensured that the tool is adaptable, builds trust and rapport with respondents thereby making it possible to obtain information that respondents probably would not reveal by any other data collection methods. The schedule was administered to the households with help of research assistants due to the anticipated low level of literacy (Orodho, 2004), in addition it ensured collection of accurate information by minimizing respondents interpretation of the questions in the case of self-administered.

### 3.5.1 Pilot testing of the instruments

For the purpose of determining the validity and reliability of the interview schedule, pre-testing was carried out within indifferent slum with similar characteristics like those other three (Ntugumira) which is also within Meru town. The pilot slum did not participate in the study. A purposive sampling of 10 respondents was picked for the pilot test. The household interviewed was measured for consistencies with the test items and to which degrees the test items attract similar and related response from samples in pilot testing exercise-The questionnaire was sent out for external review of the items before and after pre-testing to ensure the tool is valid.

### 3.5.2 Validity of the instrument

Validity is the extent which a tool measure measures what its purport to measure (Borg and Gall, 1989) Validity is concerned with whether the findings are really about what they appear to be about. It's the relationship between two variables a causal relationship. Validity of a test instrument therefore is defined as the accuracy and meaningfulness of the inferences which are based on the research. For this study a pilot –study was administering a questionnaire to a small section of the respondent in Ntugumira slum in order to determine the validity of the tool. The indication of the variables was clearly defined and scrutinized and instruments developed to match the study objectives. After analysis of the pilot study, items which needed amendments were amended and those requiring to be removed were removed accordingly. This confirmed the reliability of the structure, question sequence and logical questions and the one which can elicit the required response. To further enhance validity of the instrument, the questionnaire was reviewed with the help of research experts on its relevance to the topic under study.

### 3.5.3 Reliability of the instrument

Reliability refers to the consistence of a measure ( Mugenda and Mugenda, 2003).A test is considered reliable if the same results are achieved repeatedly. The test re-test method was applied in the sample to test reliability.

### 3.6 Data collection procedures

The data collection involved self-administered questionnaires during the interview schedule to guide selected respondents. Explanation of the purpose of the study was done followed by seeking individual consent to participate in the study. Interviews were conducted in unstructured manner so that the research could be able to collect reliable data by building rapport the

respondents. The research assistant was meeting at the end of the day to compare notes and edits their works as well as handing over.

### 3.7 Data analysis techniques

It involved both descriptive statistics and inferential statistics to analyze the data and present them.

### 3.8 Ethical considerations

Before embarking on this research, a proposal was presented to the supervisor(s) for academic approval. More consent to conduct research was sought from the county government of Meru, the area administrator down to the Wazee ya NyumbaKumi as well as the youth leaders in the study area to introduce the study. The purpose of the study and its objectives were explained. Confidentiality of the response was assured and use of data as well as benefits and risks of participating in the study were all be explained.

### 3.9 Operational definition of the variables

The details of the variables used in the study are provided in Table 3.1

**Table 3. 1: Operationalization of the Variables**

| Objective | Variable | Indicators | Scale | Data collection methods | Level of analysis |
|---|---|---|---|---|---|
| To determine the influence of physical parameters on customer access to piped water and sanitation services in low-income areas of Meru town. | Independent | • Difficulty topography<br>• Unplanned settlement<br>• Reliance on old and convection service delivery systems | Nominal | Questionnaire | Descriptive |
| To assess the influence of Cost of water on customer access to piped water and sanitation services in low-income areas of Meru town. | Independent | • High cost of water<br>• Low family income<br>• External delivery cost<br>• High cost of land legalization and regulation.<br>• Shortage of capital for investment<br>• Cost recovery<br>• Poor economic rate of return. | Ordinal | Questionnaire | Descriptive |
| To find out the influence of institutional constraints on customer access to piped water and sanitation services in low-income areas of Meru town. | Independent | • Complicated and disorganized water Service provider systems<br>• Emphasis on financial discipline, resulting in less subsidies for the poor<br>• Inability of WSP's systems to service low-income communities<br>• Susceptibility to corruption and politicization. | Ordinal | Questionnaire | Descriptive |

| | | | | | |
|---|---|---|---|---|---|
| To determine the influence of structural constraints on customer access to piped water and sanitation services in low-income areas of Meru town. | Independent | • Planning by zoning<br>• Failure to consider population growth rate<br>• Distorted urban land markets<br>• Complicated planning codes<br>• Property Rights | Nominal | Questionnaire | Descriptive |

# CHAPTER FOUR

# DATA ANALYSIS, PRESENTATION AND INTERPRETATION

## 4.1 Introduction

This chapter presents the data analysis, presentation as well as the interpretation of the findings of the study based on the objectives and the research questions in chapter one. The chapter begins by outlining the response rate then reliability analysis and the personal data of the respondents after which the findings of the study variables are presented and interpreted.

## 4.2 Response Rate

The study focused on 105 households and 15 MEWASS officials. The research administered 120 questionnaires but only 72 from the households and 9 from the MEWASS officials were returned when fully filled. This gave a collective response rate of 67.5% which is above 50% which was set by Orodho (2004) as the lowest acceptable response rate for data analysis.

**Table 4.1: Return Analysis**

| | **Administered Questionnaires** | **Returned Questionnaires** |
|---|---|---|
| Households | 105 | 72 |
| MEWASS officials | 15 | 9 |
| **Total** | **120** | **81** |

## 4.3Personal Data

Under this section, the study presents the respondents personal data which includes; Gender, age, marital status, household size, level of education, occupation and resident in Meru town where the respondents stay.

### 4.3.1 Gender

The study sought to explore the gender of the respondents and the findings were presented in Table 4.2.

**Table 4.2: Gender**

| Gender | Frequency | Percent |
|---|---|---|
| Male | 39 | 48.1 |
| Female | 42 | 51.9 |
| **Total** | **81** | **100** |

Table 4.2 indicates the gender of the respondents where men wererepresented by 51.9% while female respondents were 48.1%. This implies that the study was not biased and obtained relevant information from all the respondents.

### 4.3.2 Age of the Respondent

The respondents were requested to indicate their age and the findings are presented in Table 4.3.

**Table 4.3**: **Age of the Respondents**

| Age | Frequency | Percent |
|---|---|---|
| 18-30 Years | 38 | 46.9 |
| 31-40 Years | 34 | 42.0 |
| 40-50Years | 9 | 11.1 |
| **Total** | **81** | **100.0** |

Table 4.3 indicates that the respondents who were aged between 31 and 40 years were 42%, those aged between 18 and 30 years were 46.9%, while 40 to 50 years were 11.1%. This implies that there wasrepresentation of all age categories in the study.

### 4.3.3 Marital Status

The respondents requested to indicate their marital status. Their responses are illustrated in Table 4.4.

**Table 4.4**: **Marital Status of the Respondents**

| Age | Frequency | Percent |
|---|---|---|
| Married | 47 | 58.0 |
| Single | 16 | 19.8 |
| Divorced/ Separated | 7 | 8.6 |
| Widowed | 11 | 13.6 |
| **Total** | **81** | **100.0** |

Among the respondents, those who were married were 58%, singles were 19.8% and windowed were 13.6% while divorced or separated were 8.6. This implies that majority of the respondents were mature and could give the information being sought.

### 4.3.4 Respondents Household Size

The respondents indicated their household size and the findings were as illustrated in Table 4.5.

**Table 4. 5**: **Respondents Household Size**

| Age | Frequency | Percent |
|---|---|---|
| 1-3 | 34 | 42.0 |
| 4- 6 | 23 | 28.4 |
| 7- 10 | 24 | 29.6 |
| **Total** | **81** | **100.0** |

The findings show that the respondents who had the household size of 7-10 members were 29.6%, those who had family size of 4-6 members were 28.4%, while those with family size of 1-3 were 42.0 %.

### 4.3.5 Respondents Level of Education

The respondents were requested to indicate their level of education. The findings are presented in Table 4.6.

**Table 4.6: Respondents Level of Education**

| | Frequency | Percent |
|---|---|---|
| No education | 8 | 9.9 |
| Primary | 18 | 22.2 |
| Secondary School / Tech/Vocational Institute | 32 | 39.5 |
| University | 23 | 28.4 |
| **Total** | **81** | **100.0** |

Table 4.6 indicate analysis of respondent's level of Education shows that those who had no basic education were 9.9%, primary education were 22.2% and university education were 28.4% while secondary school / technical or vocational institute education were 39.5%. This reveals that the respondents could give information on the subject under study.

### 4.3.5 Respondents Area of Residence in Meru Town

Respondents were requested to indicate the area in Meru town where they reside and the findings are in Table 4.7.

**Table 4.7: Respondents Area of Residence in Meru Town**

| Area of Residence | Frequency | Percent |
|---|---|---|
| Majengo | 29 | 40.3 |
| Mjini | 23 | 31.9 |
| Shauri Yako | 20 | 27.8 |
| **Total** | **72** | **100** |

Table 4.7 indicates area of residence of the respondents majority indicated that they residend in Majengo as shown by 40.3 %, 31.9% in Mjini area and at Shauri Yako as shown by 27.8%. The respondents were then familiar with the area and gave relevant information.

### 4.3.6 Access to the residents compound

The respondents were further asked to indicate how they access their house and their responses were presented in Table 4.8.

**Table 4. 8: Access to the residents compound**

| | Frequency | Percent |
|---|---|---|
| Public road | 68 | 84 |
| Neighbors plot | 13 | 16 |
| **Total** | **81** | **100.0** |

Majority of the respondents access their house through public road as shown by 84% while the rest access through neighbors plot as shown by 16%. Access to one's residence is crucial in terms of water connectivity.

### 4.4Factors Influencing Customer Access to Piped Water and Sanitation Services

The findings presented under this section were obtained in line with the research questions and objectives.

### 4.4 Physical Parameters

The study sought to determine how physical parameters influence customer access to piped water and sanitation services in low-income areas of Meru town.

### 4.4.1Area Topography

The study sought to find out how topography influenced piped water connectivity within low income areas of Meru town

**Table 4. 9: Topographical parameters**

| Topographical issues | Mean | Std dev. |
|---|---|---|
| Terrain and site conditions affect pipe network in the area | 3.8919 | .90627 |
| Drainage pattern of the area | 3.6940 | .67955 |
| Compatibility of service (Technology) delivery system used | 3.1676 | .64724 |

Table 4.9 indicates that the terrain and site conditions affect pipe network in the area as shown by a mean of 3.8919 and that the drainage pattern of the area as shown by a mean of 3.694. They also indicated that compatibility of service (Technology) delivery system used as shown by mean of 3.1676 had less impact on network connectivity.

### 4.5Affordability

The study was interested in assessing the influence of Cost of water on customer access to piped water and sanitation services in low-income areas of Meru town.

### 4.5.1 Cost of Water

Table 4.10 shows the findings on the cost of water.

**Table 4.10: Cost of Water**

| Cost of water | Mean | Std dev. |
|---|---|---|
| Slowing down of commercial & domestic activities | 3.9552 | .97335 |
| High water price from vendors/wsp | 3.6104 | .81102 |
| Cost of one $M^3$ billed by MEWASS? | 3.1676 | .64724 |
| Time wasted fetching water | 2.0373 | .70342 |

Table 4.10depicts that the slowing down of commercial & domestic water consumption activities influenced cost of water connectivity as shown by a mean of 3.9552 and high water price from vendors/water service provider as shown by a mean of 3.6104 influenced cost of water. They also indicated that cost of one $M^3$ billed by MEWASS as shown by mean of 3.1676 had no major impact while time wasted fetching water did not affect cost of access to water.

### 4.5.2Current Tariff/Price

The respondents indicated whether the current tariff/price enough to recover costs on operation as well as maintenance costs.

**Table 4.11: Current Tariff/Price**

| | Frequency | Percent |
|---|---|---|
| Yes | 76 | 93.8 |
| No | 5 | 6.2 |
| **Total** | **81** | **100.0** |

Most of the respondents (93.8%) indicated that the current tariff/price was sufficient enough to recover costs on operation as well as maintenance costs,5 percent of the respondents were of the opinion that the current charges for water connectivity were not sufficient to cater for operational and maintenance cost.

### 4.5.3Influence of Tariff / Price

The respondents indicated level of tariff / price whether they discourage or encourage the MEWASS in its efforts to improve services to the urban poor.

**Table 4.12: response on Tariff / Price**

| | Frequency | Percent |
|---|---|---|
| Discourages | 21 | 25.9 |
| Encourages | 60 | 74.1 |
| **Total** | **81** | **100.0** |

From the findings,74.1% of the respondents indicated that level of tariff / price encourages the MEWASS in its efforts to improve water and sanitation services to the low-income areas in Meru town, 25.9% indicated discouragement. This implies that level of tariff / price encourages the MEWASS in its efforts to improve water and sanitation services to the low-income areas in Meru town.

## 4.6 Provision of Water to Meru Town

The respondents indicated their opinions on various questions about the provision of water and their responses were in Table 4.13.

**Table 4.13: Water provision.**

| | Frequency | | | Percent | |
|---|---|---|---|---|---|
| | **Total** | **Yes** | **No** | **Yes** | **No** |
| Are other water and sewerage providers involved in the provision of water to Meru town area | 81 | 76 | 5 | 93.8 | 6.2 |
| Do you need water supply provision from any alternative providers to supplement available sources | 81 | 66 | 15 | 81.5 | 18.5 |
| Do you think water supply, operation and maintenance should be handled by a Private company | 81 | 3 | 78 | 3.7 | 96.3 |

Majority of the respondents indicated that there are un registered competitors involved in the provision of water to Meru town area as shown by 93.8 %. Also, the respondents indicated that they need water supply provision from other alternative providers to supplement available sources as illustrated by 81.5% and that they think water supply, operation and maintenance shouldn't be handled by a Private company as shown by96.3 % while 3.7% were of the opinion that water provision and maintenance should be handled by a private company.

### 4.6 Institution Constraints

The study further sought to find out the influence of institutional constraints on customer access to piped water and sanitation services in low-income areas of Meru town.

#### 4.6.1 Aspects of Institution Constraints

The respondents gave opinions on the institutional constraints and Table 4.14 shows the findings.

**Table 4.14: Institution Constraints**

| **Institutional Constraints** | **Mean** | **Std dev.** |
|---|---|---|
| Corruption and politicization of water service in the area | 3.2373 | .63552 |
| Stakeholder's consultation in water service provision. | 3.9006 | .83666 |

The respondents indicated that that the stakeholder's consultation in water service provision as shown by a mean of 3.9006 a minor constraint. They also indicated that corruption and politicization of water service in the area used as shown by mean of 3.2373 is a major constraint in provision of water to low income areas in Meru town.

### 4.7 Problems with Water Supply and Delivery

Respondents also indicated whether they have any problems with water supply or delivery and they came up with the findings in Table 4.15.

**Table 4.15: Problems with Water Supply and Delivery**

| | Frequency | Percent |
|---|---|---|
| Yes | 47 | 58 |
| No | 34 | 42 |
| **Total** | **81** | **100.0** |

Majority indicated they have had problems with water supply and delivery (58%) while the rest opposed (42%) indicating that there hasbeen no problem with the water supply and delivery.

### 4.7.1Connection to MEWASS Water Supply

Respondents also indicated whether they are connected to MEWASS water supply and they came up with the findings in Table 4.16.

**Table 4.16: Connection to MEWASS Water Supply**

| | Frequency | Percent |
|---|---|---|
| Yes | 57 | 70.4 |
| No | 24 | 29.6 |
| **Total** | **81** | **100.0** |

Majority indicated they are connected to MEWASS water supply (70.4%) while the rest were not connected to (29.6%). This indicates that majority have access to MEWASS piped water supply.

### 4.7.2Causes of the Water Problems

The respondents were requested to indicate the possible causes of water problems in Meru Town-low income areas. Their responses were presented in Table 4.17.

**Table 4.17: Causes of the Water Problems**

| Causes of water problem | Mean | Std Dev. |
|---|---|---|
| Illegal connections | 3.576 | 0.502 |
| Inaccessibility | 2.485 | 0.619 |
| Insecurity | 3.970 | 0.684 |
| Land owner do not want pipelines to pass through their land. | 3.394 | 0.609 |
| Vandalism | 2.485 | 0.508 |
| Unplanned housing for community, people built on pipeline | 3.576 | 0.502 |
| Frequent breakdown of infrastructure | 3.879 | 0.820 |
| Land with no distinct boundaries | 3.909 | 0.879 |
| Lack technical knowhow | 3.909 | 0.879 |
| Lack of financial support. | 2.576 | 1.251 |
| Lack of adequate water resources | 3.515 | 1.228 |
| Difficulty landscape | 2.455 | 0.617 |

The respondents indicated that insecurity (Mean=3.970), that land with no distinct boundaries (Mean=3.909), that lack technical knowhow (Mean=3.909), that frequent breakdown of

infrastructure (Mean=3.879), that illegal connections (Mean=3.576), that unplanned housing for community, people built on pipeline (Mean=3.576) and that lack of adequate water resources (Mean=3.515) were the major constraints to provision of piped water in low income areas in Meru town.

They also indicated that land owners prevented water pipeline from passing through their land (Mean=3.394) and that lack of financial support (Mean=2.576) affected water connectivity.

The respondents further indicated that inaccessibility (Mean=2.485), that vandalism (Mean=2.485) and that that difficulty landscape (Mean=2.455) influenced greatly water connectivity in low income areas in Meru town.

On the same issue the respondents indicated that MEWASS has ever involved chiefs & elders/ residents/ other stake holders in Meru town area in discussing water supply and delivery issues and many meetings have been held since the last 2 years. They also indicated that carrying out sensitization and talking to stakeholders will be helpful in solving some of water supply problems. They also thought that water tariffs should not be increased in order to recover the cost and delivery services.

### 4.8Water provision Policy in the Organization

The respondents were to indicate whether there is a friendly water provision policy in the organization as a service provider and Table 4.18 shows what they said.

**Table 4.18: friendly water provision policy in the Organization**

| | Frequency | Percent |
|---|---|---|
| Yes | 66 | 81.5 |
| No | 15 | 18.5 |
| **Total** | **81** | **100.0** |

Majority of the respondents (81.5%) indicate that there is a friendly water provision policy in the organization as a service provider while 18.5% indicated no friendly water provision policy. This implies that there is intention to provide water to all the town residents by organization as a service provider.

### 4.9Structural Constraints

The study further sought to determine the influence of structural constraints on customer access to piped water and sanitation services in low-income areas of Meru town.

#### 4.9.1 Aspects of Structural Constraints

The respondents also gave opinions on the structural constraints and Table 4.19 shows the findings on the same.

**Table 4.19: Structural Constraints**

| | Mean | Std dev. |
|---|---|---|
| Ownership effect connection to water supply | 3.5500 | 0.6054 |
| Population growth and water connection. | 3.8269 | 0.7364 |
| Privatization of water provision effect service delivery in the area | 3.7192 | 0.8765 |

The findings show that the population growth and water connection as shown by a mean of 3.8269 were the major structural constraints to water, that the privatization of water provision will improve service delivery in low income area as shown by a mean of 3.7192 and that ownership influence connection to water supply as shown by a mean of 3.55 other constraints.

#### 4.9.2 Issues of Water Supply and Delivery

The respondents were indicated the state of the issues with water supply and delivery and their responses are as shown in Table 4.20.

**Table 4. 20: Issues of Water Supply and Delivery**

| Water Issues | Mean | Std Dev. |
|---|---|---|
| Slowing down of both commercial and domestic activities | 2.6471 | 0.9237 |
| A lot of time wasted searching for water? | 2.0341 | 0.8241 |
| High prices from vendors | 3.5561 | 0.8236 |
| Risk of getting untreated water from unknown source | 2.4118 | 0.9927 |
| Children fail/late to go school because they fetch water far | 3.8128 | 0.9403 |
| Risk of getting hurt while drawing water in difficult terrain/source. | 3.394 | 0.609 |
| Is it a problem to supply water 24/7 in the supply area | 2.485 | 0.508 |
| Levels of infrastructure security | 3.576 | 0.502 |

The respondents indicated that children fail to go school because they fetch water far as shown by a mean of 3.8128, that levels of infrastructure security affected water connectivity as expressed by a mean of 3.576, that high prices from vendors as shown by a mean of 3.5561 was a major constraint in access to clean water.

They further indicated that risk of getting hurt while drawing water in difficult terrain/sourceas shown by a mean of 3.394 and that slowing down of both commercial and domestic activitiesas shown by a mean of 2.6471 had minimal effect on water provision and access.

They further indicated that it is not a problem to supply water in the areas connected with piped water shown by a mean of 2.485, that risk of getting untreated water from unknown source is not a problem as shown by a mean of 2.4118 and that a lot of time wasted searching for water is a not a problem as shown by a mean of 2 034.

### 4.10Access to Water Supply and Sanitation

The respondents were required to give their opinions on the access to water supply and sanitation and the findings are presented in subsequent sections.

### 4.10.1 Main Type of Water Source Used by Household

Respondents indicated the main type of water source used by the household. Table 4.24 shows the findings.

**Table 4.21: Main Type of Water Source Used by Household**

| | Frequency | Percent |
|---|---|---|
| Piped | 6 | 7.4 |
| Borehole installed with pump | 31 | 38.3 |
| Protected Hand-dug well | 17 | 21.0 |
| Unprotected well | 12 | 14.8 |
| Surface water/spring | 4 | 4.9 |
| Covered rainwater tank | 11 | 13.6 |
| **Total** | **81** | **100.0** |

Majority of the respondents were indicated to access borehole installed with pump as shown by 38.3%. Others indicated protected hand-dug well 21%, unprotected well 14.8%, covered rainwater tank 13.6% and surface water/spring 4.9%.

### 4.10.2 Type of Water Point

The respondents were asked to indicate whether the water point is public or private.

**Table 4.21: Type of Water Point**

| | Frequency | Percent |
|---|---|---|
| Private | 8 | 9.9 |
| Public | 73 | 90.1 |
| **Total** | **81** | **100.0** |

Those who indicated private were 9.9% while public were 90.1%. This shows that majority of the water points are public.

### 4.10.3 Location of the Water Point

The respondents were also asked to indicate the location of the water point used by their household.

**Table 4.223: Location of the Water Point**

| | Frequency | Percent |
|---|---|---|
| In own house | 12 | 14.8 |
| In neighbors' house/yard | 11 | 13.6 |
| Public place | 58 | 71.3 |
| **Total** | **81** | **100.0** |

Majority indicated the location of the water point as public (71.6%), in own house (14.8%) and in neighbors' house/yard (13.6%). This implies that most of the water points are located at public places.

### 4.10.4 Period of Main Water Source lasts

The respondents were to indicate how long the main water source last throughout the year.

**Table 4.23: Period of Main Water Source lasts**

| | Frequency | Percent |
|---|---|---|
| Yes | 58 | 71.6 |
| No | 23 | 28.4 |
| **Total** | **81** | **100.0** |

Majority indicated that the main water source lasts throughout the year as shown by 71.6% while the rest opposed as shown by 28.4%. This implies that the main water source lasts throughout the year.

### 4.10.4Payment for water and sanitation services

The respondent indicated whether they paid for water used and their results were presented in table 4.28.

**Table 4. 24 Payment for water and sanitation services**

| | Frequency | Percent |
|---|---|---|
| Yes | 74 | 91.4 |
| No | 7 | 8.6 |
| **Total** | **81** | **100.0** |

91.8% of the respondent indicated they paid for water used while 8.6 said they don't pay for water used implying that majority of the respondents use paid water.

### 4.11 Quality of Toilet in terms of Privacy and Cleanness

The respondents were again requested to indicate the quality of toilet in terms of privacy and cleanness and the researcher came up with the findings in Table 4.35.

**Table 4.25: Pit Latrine Improvements**

| | Frequency | Percent |
|---|---|---|
| Poor | 3 | 3.7 |
| Fair | 21 | 25.9 |
| Good | 57 | 70.4 |
| **Total** | **81** | **100.0** |

70.4% of the respondents indicated that quality of toilet in terms of privacy and cleanness is good, 25.9% indicated fair while 3.7 indicated poor. This implies that toilets in terms of privacy and cleanness are of good quality.

#### 4.11.1 Action Taken when the Toilet is full

The respondents were asked to indicate what they do when their toilet is full and their responses were as shown in Table 4.25.

**Table 4.26: Action Taken when the Toilet is full**

| | Frequency | Percent |
|---|---|---|
| Empty | 47 | 58.0 |
| Construct another toilet | 11 | 13.6 |
| Switch to another chamber | 23 | 28.4 |
| **Total** | **81** | **100.0** |

Most of the respondents (58%) indicated that they would empty their toilet when full, 28.4% would switch to another chamber while 13.7% would construct another toilet. This implies that toilets when full are mostly emptied and used again.

### 4.12 Inferential Statistics

Data was analyzed using Statistical Package for Social Sciences (SPSS Version 21.0). All the questionnaires received were referenced and items in the questionnaire were coded to facilitate data entry. Inferential data analysis was done using Pearson correlation coefficient.

### 4.12.1 Pearson Correlation Coefficient

This was used to determine the strength and the direction of the relationship between the dependent variable and the independent variable. The analysis using Pearson's product moment correlation was based on the assumption that the data is normally distributed and also because the variables are continuous.

**Table 4. 23: Correlation Matrix**

| | | **Access to water and Sanitation** | **Physical Parameters** | **Affordability** | **Institutional Constraints** | **Structural Constraints** |
|---|---|---|---|---|---|---|
| **Access to Water and Sanitation** | Pearson Correlation | 1 | | | | |
| | Sig. (2-tailed) | 0.000 | | | | |
| **Physical Parameters** | Pearson Correlation | 0.836 | 1 | | | |
| | Sig. (2-tailed) | 0.026 | 0.000 | | | |
| **Affordability** | Pearson Correlation | 0.724 | 0.512 | 1 | | |
| | Sig. (2-tailed) | 0.023 | 0.018 | 0.000 | | |
| **Institutional Constraints** | Pearson Correlation | 0.716 | 0.732 | 0.586 | 1 | |
| | Sig. (2-tailed) | 0.022 | 0.016 | 0.015 | . | |
| **Structural Constraints** | Pearson Correlation | 0.613 | 0.552 | 0.516 | 0.324 | 1 |
| | Sig. (2-tailed) | 0.025 | 0.026 | 0.015 | 0.003 | - |

Results in table 4.26 reveal that there is a strong, positive and significant correlation between nature of physical parameters and access to water and sanitation (r = 0.836). In addition, the study reveals that the correlation between affordability and access to water and sanitation is positive and significant (r=0.724). Again the study reveals a significant relationship between institutional constraints and access to water and sanitation (r=716). Finally the study reveals that the correlation between structural constraints and access to water and sanitation is positive and significant (r=0. 613). This implies that all the variables had a positive and significant correlation with access to water and sanitation at Meru County

# CHAPTER FIVE
# SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

## 5.1 Introduction

This chapter presents the discussion of key data findings, conclusion drawn from the findings highlighted and recommendation made there-to. The conclusions and recommendations drawn are focused on addressing the objective of the study.

## 5.2 Summary of the Findings

### 5.2.1 Physical Parameters

The study sought to determine how physical parameters influence customer access to piped water and sanitation services in low-income areas of Meru town. The study found that most of the residents live in Majengo area in Meru and that they have access to public roads. It was further indicated that the terrain and site conditions affect pipe network in the area and the drainage pattern of the area is poor. It was also indicated that compatibility of service (Technology) delivery system used is a minor problem.

### 5.2.2 Affordability

The study was interested in assessing the influence of Cost of water on customer access to piped water and sanitation services in low-income areas of Meru town. The study found that the slowing down of commercial & domestic activities and high water price from vendors was a major problem in ensuring accessibility to clean piped water and sanitation. They also indicated that cost of one $M^3$ billed by MEWASS is a minor problem while time wasted fetching water is not a problem. It was also revealed that Meru residence always observe hygiene. It was also revealed that level of tariff / price encourages the MEWASS in its efforts to improve services to the urban. The study further found that there are competitors involved in the provision of water to Meru town area, that they need water supply provision from any alternative providers to supplement water supply, operation and maintenance should be handled by a Private company.

### 5.2.3 Institution Constraints

The study further sought to find out the influence of institutional constraints on customer access to piped water and sanitation services in low-income areas of Meru town. The study indicated

that the stakeholder's consultation in water service provision is a minor constraint. It also indicated that corruption and politicization of water service in the area used is major constraint in water provision and that there has been a problem with the water supply and delivery. The study further indicated that Meru residents have access to MEWASS water supply. The study further indicated that insecurity, that land with no distinct boundaries that lack technical know-how, that frequent breakdown of infrastructure, illegal connections, unplanned housing for community, people built on pipeline and that lack of adequate water resources are major problems. It was also indicated that land owner does not want pipelines to pass through their land and that lack of financial support are minor problems. The respondents further indicated that inaccessibility, that vandalism and that that difficulty landscape. On the same issue the respondents indicated that MEWASS has ever involved chiefs & elders/ residents/ other stake holders in Meru town area in discussing water supply and delivery issues and many meetings have been held since the last 2 years. The also indicated that carrying out sensitization and talking to stakeholders will be helpful in solving some of your water supply problems. They also thought that water bills should not be increased in order to recover the cost and delivery service. It was also indicated that that there is a pro-poor policy in the organization as a service provider.

### 5.2.4 Structural Constraints

The study further sought to determine the influence of structural constraints on customer access to piped water and sanitation services in low-income areas of Meru town. The findings show that the population growth and water connection, that the privatization of water provision effect service delivery in the area and that ownership affect connection to water supply greatly. The respondents indicated that children fail to go school because they fetch water far, that levels of infrastructure security, that high prices from vendors are major water problem issues. They further indicated that risk of getting hurt while drawing water in difficult terrain/source and that slowing down of both commercial and domestic activities are minor problems. They further indicated that it is not a problem to supply water 24/7 in the supply area, that risk of getting untreated water from unknown source is not a problem and that a lot of time wasted searching for water is a not a problem.

## 5.3 Discussion

### 5.2.1 Physical Parameters

The study sought to determine how physical parameters influence customer access to piped water and sanitation services in low-income areas of Meru town. The study found that most of the residents live in Majengo an area in Meru and that they have access to public roads. It was further indicated that the terrain and site conditions affect pipe network in the area and the drainage pattern of the area are severe problems. These findings are in line with Bosch et al (2001) who argue that difficult sites and terrain; complicated site layouts; and overreliance on conventional service-delivery systems. More often than not the water and sanitation needs of the poor urban communities are hardly incorporated into urban and region planning

It was also indicated that compatibility of service (Technology) delivery system used is a minor problem. This concurs with Franceys and Gerlach (2008) who indicate that though most of the urban poor are housed in slums, many such areas are often denied access or face cumbersome administrative procedures when it comes to connecting them to official water sources partly because of lack of security guarantees for land and pipelines as well as the problems of affordability.

### 5.2.2 Affordability

The study was interested in assessing the influence of Cost of water on customer access to piped water and sanitation services in low-income areas of Meru town. The study found that the slowing down of commercial & domestic activities and high water price from vendors wasare severe problems. This concur with the Hermanson and Owens (1990) who claim that poor families living in the informal settlements end up paying more than the higher-income families living in the formal sector, because the costs of extending a water line today is considerably higher than the cost of installing a system of pipes was 20 years earlier

They also indicated that cost of one $M^3$ billed by MEWASS is a minor problem while time wasted fetching water is not a problem. It was also revealed that Meru residence always observe hygiene. This is similar to Serageldin (1989) who argue that urban upgrading has traditionally been highly subsidized and, as a result, cost recovery has not been a major issue in such projects.

It was also revealed that level of tariff / price encourages the MEWASS in its efforts to improve services to the urban. The study further found that there are competitors involved in the provision of water to Meru town area, that they need water supply provision from any alternative providers to supplement your efforts in water supply, operation and maintenance should be handled by a Private company Tuberculosis. These findings are in line with Reed and Coates (2003) who claim that he other drawbacks is the lack of knowledge and skills about accessible and inclusive design among water engineers in low-income countries, mainly because this is not part of their training and because they are unlikely to have seen real examples of inclusive design.

### 5.2.3 Institution Constraints

The study further sought to find out the influence of institutional constraints on customer access to piped water and sanitation services in low-income areas of Meru town.The study indicated that that the stakeholder's consultation in water service provision is a severe problem. This concur with Jones and Reed (2005) who claim that the majority of the engineers are male and they traditionally design and construct facilities for the 'average' person, with no user consultation and without considering that, in real communities, people come in a wide range of shapes, sizes and ages and with a wide variety of needs.

It also indicated that corruption and politicization of water service in the area used is a minor problem and that there has been a problem with the water supply and delivery. The study further indicated that Meru residents have access to MEWASS water supply. This is in line with Reed and Coates (2003) who claim that the other drawbacks are the lack of knowledge and skills about accessible and inclusive design among water engineers in low-income countries, mainly because this is not part of their training.

The study further indicated that that insecurity, that land with no distinct boundaries, that lack technical knowhow, that frequent breakdown of infrastructure, that illegal connections, that unplanned housing for community, people built on pipeline and that lack of adequate water resources are major problems. It was also indicated that land owners do not want pipelines to pass through their land and that lack of financial support are minor problems. These findings are in line with Leni Wild at al, (2012) who claim that common constraints and incentives problem in service delivery. The respondents further indicated that inaccessibility, that vandalism and that that difficulty landscape. On the same issue the respondents indicated that MEWASS has ever

involved chiefs & elders/ residents/ other stake holders in Meru town area in discussing water supply and delivery issues and many meetings have been held since the last 2 years. These findings correlate with World Bank (2009) who argues that there are the constraints that are at the heart of urban sector definitions and development objectives and devolved services have really devolved everything including nepotism in the workplace.

They also indicated that carrying out sensitization and talking to stakeholders will be helpful in solving some of your water supply problems. They also thought that water bills should not be increased in order to recover the cost and delivery service. It was also indicated that that there is a pro-poor policy in the organization as a service provider. This is in line with Peterson (1987) who claims that the utility company that introduces an effective profit motive into its operations tends to view investment in poor neighborhoods as increasingly unattractive.

### 5.2.4 Structural Constraints

The study further sought to determine the influence of structural constraints on customer access to piped water and sanitation services in low-income areas of Meru town. The study concurs with Aqua Consultant (2002) who argue that there are constraints that are the most difficult to address, let alone resolve, because they involve conflicting values and policy viewpoints.

The findings show that the population growth and water connection, that the privatization of water provision effect service delivery in the area and that ownership affect connection to water supply are severe problems. De Soto (1989) concurred with these findings by claiming that the legal issues are such that most projects have had to skip over legalization if they are ever to get on with the physical upgrading. Most finish without ever processing a single title.

The respondents indicated that children fail/late to go school because they fetch water far, that levels of infrastructure security, that high prices from vendors are major water problem issues. They further indicated that risk of getting hurt while drawing water in difficult terrain/source and that slowing down of both commercial and domestic activities are minor problems .The study findings concur with Hamer (1985) who said that the plan, developed by a U.S. firm, is notable for stating flatly that no population change had been considered for the future of Bogotá because London, England, had a minimal growth rate at that time

They further indicated that it is not a problem to supply water 24/7 in the supply area, that risk of getting untreated water from unknown source is not a problem and that a lot of time wasted searching for water is a not a problem. This is in line with SomikV,Lall at al (2006) who argue that the Mexican urban land market, one of the most distorted in the region, is a case in point.

### 5.4 Conclusion

The study concluded that physical parameters positively and significantly influence customer access to piped water and sanitation services in low-income areas of Meru town. The study deduced that most of the residents live in Majengo an area in Meru and that they have no access to public roads. It was further deduced that the terrain and site conditions affect pipe network in the area and the drainage pattern of the area are severe problems. It was also indicated that compatibility of service (Technology) delivery system used is a minor problem.

The study concluded that the influence of cost of water on customer access to piped water and sanitation services in low-income areas of Meru town is positive and significant. The study deduced that the slowing down of commercial & domestic activities and high water price from vendors/wsp are severe problems. They also indicated that cost of one $M^3$ billed by MEWASS is a minor problem while time wasted fetching water is not a problem. The study further deduced that there are competitors involved in the provision of water to Meru town area, that they need water supply provision from any alternative providers to supplement your efforts in water supply, operation and maintenance should be handled by a Private company Tuberculosis.

The study further concluded that institutional constraints positively and significantly influence customer access to piped water and sanitation services in low-income areas of Meru town. The study deduced that the stakeholder's consultation in water service provision is a severe problem. It was also indicated that corruption and politicization of water service in the area used is a minor problem and that there have been a problem with the water supply and delivery. The study further indicated that that insecurity, that land with no distinct boundaries, that lack technical knowhow, that frequent breakdown of infrastructure, that illegal connections, that unplanned housing for community, people built on pipeline and that lack of adequate water resources are major problems. It was also indicated that land owner do not want pipelines to pass through their land and that lack of financial support are minor problems. The respondents further indicated that inaccessibility, that vandalism and that that difficulty landscape. The study also deduced that

carrying out sensitization and talking to stakeholders will be helpful in solving some of your water supply problems .The study also deduced that water bills should not be increased in order to recover the cost and delivery service. It was also indicated that that there is a pro-poor policy in the organization as a service provider.

The study further concluded that influence of structural constraints on customer access to piped water and sanitation services in low-income areas of Meru town is significant. The study deduced that the population growth and water connection, that the privatization of water provision effect service delivery in the area that high prices from vendors are major water problem issues. It was also deduced that it is not a problem to supply water 24/7 in the supply area, that risk of getting untreated water from unknown source is not a problem and that a lot of time wasted searching for water is a not a problem.

### 5.5 Recommendations

The study recommends that water, sanitation and hygiene education programmes should be in place. The education given to the community should focus on attitudinal changes towards water treatment using water treatment tablets and building their own toilets, and there should also be a focus on creating awareness concerning consequences of using poor quality water.

The study also recommends that community should be sensitized to participate in water supply development needs to be fostered through expression of the demand, the selection of technology and its sitting, the provision of labour and local materials, cash contribution towards project costs and the selection of the management type.

The study further recommends that the Meru residents should focus on building the capacity of the community on the maintenance of existing water sources. This can be achieved through training and strengthening of the water user's committee. From the study, the water users committees were found to be inactive in water resource management.

The study also recommends the residents to demand for more water sources especially boreholes and tap water is high as they were the main source of clean and safe water and also reliable during the dry economic factors that were seen to affect accessibility to portable water supply included low household income which hindered the ability of the community to purchase clean

50 seasons. The Government, NGOs and donors should help in the construction and the community members contribute towards maintenance.

The study recommends that for MEWASS to satisfy its customers it should improve on customers complains to lack of water, do regular line inspection and attend to reported leak and bursts within the shortest practicable time and on the illegal water connection, the study recommends that MEWASS improve on field surveillance to detect, disconnect and monitor all re-connections to minimize loss of water through illegal connections.

The study also recommends that revenue base should be improved by dispatching the bills in time and all money due collected in time. The study further recommends that bills to be paid through other institutions such as banks and other money transfer systems. The study in particular recommends that the Meru officials should focus more on loss of water through storage and conveyance, illegal water connection, efficiency in revenue collection and increased demand for water to ensure provision of water to its customers.

### 5.6 Recommendations for Further Studies

Since this study was limited to Meru County the study recommends that the same study should done in all other counties especially in the counties with inadequate water.

The study also recommends another study on effects of commercialization on provision for water as well as influence of source of water on effective provision of water to be done

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## APPENDICES

### Appendix I Letter of Transmittal

Richard Mwirigi

University of Nairobi

Meru Extra Mural Centre

Dear Sir/Madam,

Re: Data Collection

This is kindly to inform you that I am carrying out an academic research in Majengo, Mjini and shauriyako estates of Meru town for the purpose of examination leading to the award of a degree of Masters of Arts in Project Planning and Management of University of Nairobi. The study focuses on factors influencing accessibility and affordability of piped water and Sanitation services in low-income areas of Meru town.

The purpose of this letter therefore is to request you to provide the required information as per the questionnaire provided. Kindly be honest and thorough as possible. The information you will provide will be considered as confidential and will only be used for the purpose of my examination only. Confidentiality of the collected data and anonymity of the respondent will be assured, and time taken to fill the questionnaire will highly be appreciated.

Thanking you in advance for your cooperation.

Yours Faithfully

Richard Mwirigi

**Appendix II Questionnaire for households**

**UNIVERSITY OF NAIROBI**

**INVESTIGATION INTO FACTORS INFLUENCING CUSTOMER ACCESS TO PIPED WATER AND SANITATION SERVICES IN LOW INCOME URBAN AREAS;**

**A CASE OF MERU TOWN, MERU COUNTY, KENYA.**

**QUESTIONNAIRE FOR THE GENERAL PUBLIC**

The questionnaire is intended for a research onto factors influencing customer access to piped water and sewerage services in low income urban areas; A case of Meru town, meru county, Kenya.

The question below is part of a project being conducted in connection with the above-stated topic at University of Nairobi by the student. I shall be most grateful if you answer them to the best of your ability. This is a purely academic exercise and every information provided will be treated confidential. Moreover, your anonymity is guaranteed. Thank you.

Please, tick √ or ***circle*** your answer as appropriate mark,

**Personal Data**

Q1. Sex: (1) Male (2) Female

Q2. Age: (A) 10 - 20 (B) 21 - 30 (C) 31 - 40 (D) 40 - 50 (E) 50+

Q3. Marital Status: (1) Married (2) Single (3) Divorced/ Separated (4) Widowed

Q4. What is your household size?

(A) 1-3 (B) 4- 6 (C) 7- 10 (D) 11 - 13

Q5. What is your level of education?

(A) No education (B) Primary

(C) Secondary School / Tech/Vocational Institute (D) University

Q6. What do you do for a living or what is your occupation? ……...

Q7. Which part or area of Meru town do you stay? (Your area of residence in Town):

……

**Economic/Financial Activities**

Q1. For how long have you been living in this house?

(A) Less than one year (B) One year (C) More than a year

Q2. Who own the house you live?

(A) Family (B) Personal (C) Rented (D) Other, (specify)……..

Q3. What was your reason to move to this house?

(A) Look for employment (B) Join parents/relatives (C) Join couple

(D) Previous rent expired (E) others (specify) …….

Q4.How do you access your house/compound

(A) Public road (B) Neighbours plot (C) Others (specify)

Q5. What is your household's total income per month? Kshs……..

**Access to Water Supply**

Q1. (i) What is the main type of water source used by household?

(A) Piped (b) Borehole installed with pump (c) Protected Hand-dug well

(d) Unprotected well (e) Surface water/spring (f) Covered rainwater tank

(g) Uncovered rainwater tank (h) other (specify)……

(ii) Is the water point (A) Private (B) Public……..?

Q2. Where is the location of the water point used by your household?

(A) In own house (B) In neighbors' house/yard (C) Public place

(D) At an institution (mosque, church, school, etc.) (E) Water vendor

(f) Other (specify)

…….

Q3 (i). Does your main water source last throughout the year? (A) Yes (B) No

(ii) If No, how often does it run out? ……

Q4. (i) Do you pay for water used? (1) Yes (2) No

(ii) If yes, what is the cost of a 20 litrejerrycan of water……

Q5. How much do you spend on water? Per day…… Kshs.

Per month …….. Kshs.

Q6 On average, how many jerrycans of water do your house-hold use every day? …….

Q7. What is the maximum time spending for collecting water? ……hr(s)……min(s)

Q8 How far does it take you to walk to where you draw or fetch water?

(A) Less 50m (B) 50 – 100m (C) 101 – 200m (D) over 201m

Q9. Do you think there are problems with water supply and delivery in your areas?

(A) Yes (B) No (C) Don't know

Q10.What reasons can you say are preventing wsp from installing water line in the area……..(specify)

Q10 Are you connected to MEWASS water supply? Yes……..NO…….If No why…….

Q11. What will you say about the issues of MEWASS water supply in your area?

……

Q12 How are the bills delivered to you…… (state)

Q13 Are there public roads/path to access your area? Yes…….No…..

Tick (√) as appropriate in the columns below as follows:

| Cost of water | Severe Problem | Minor Problem | Not a problem | Don't Know |
|---|---|---|---|---|
| (a)Slowing down of commercial & domestic activities | | | | |
| (b)High water price from vendors/wsp | | | | |
| (c)What do you say about cost of one $M^3$ billed by MEWASS. | | | | |
| (c) Too much time wasted fetching water | | | | |
| Topographical issues | | | | |
| (a) How is terrain and site conditions affect pipe network in the area | | | | |
| (b)How is drainage pattern of this area | | | | |

| | | | | |
|---|---|---|---|---|
| (c)How is compatibility of service (Technology) delivery system used in the | | | | |
| Institution Constraints | | | | |
| (a)Corruption and politicization of water service in the area. | | | | |
| (b)Stakeholder's consultation in water service provision. | | | | |
| Structural Constraints | | | | |
| (a)How does ownership affect connection to water supply? | | | | |
| (b)Population growth and water connection. | | | | |
| (c) Do you think privatization of water provision will affect service delivery in | | | | |

**Appendix III Questionnaire for Officials:**

Master'sprogramme in Project Planning and Management.

Master's Thesis Topic: Investigation onto Factors influencing customer access to piped water and sanitation services in low income urban areas: The case of Meru Town.

All information provided will be treated as strictly confidential and for academic purpose only.

Questionnaire for Water suppliers (MEWASS)

Department (i)……

Positions in company (ii)..……

**Section A: Economical/Financial Constraints**

Q1. What is the current official tariff /price per $M^3$ (1000 LITRES) of water supply services in the low income urban of Merukshs…… ..?

Q2. Is the current tariff/price enough to recover costs on operation, maintenance costs? (1) Yes (2) No

Q3. Does this level of tariff / price discourage or encourage the MEWASS in its efforts to improve services to the urban poor?

(1) Discourages (2) Encourages (3) Don't Know

Q4. How much do you think an average urban dweller in Meru town should pay for one cubic $m^3$ of water? Kshs.....

Q5. Is there a pro-poor policy in the organization as a service provider (1)Yes.. (2)No.. (3) Don't know-

**Section B:**

Q6. Can you say that there are problems with water supply and delivery services to the Meru town's suburb area? (1) Yes, there are problems (2) No, no problems

Q6 what type of problem do you think they are……. (Specify)

(7) .What will you say about the following issues of water supply and delivery in the Meru suburb area? Tick (√) as appropriate in the columns under: Severe problem, Minor problem, not a problem and don't know in the table below.

| Water Issues | Severe problem | Minor problem | Not a problem | I don't know |
|---|---|---|---|---|
| i) Slowing down of both commercial and domestic activities? | | | | |
| ii)A lot of time wasted searching for water? | | | | |
| iii) High prices from vendors? | | | | |
| iv) Risk of getting untreated water from unknown source? | | | | |
| v) Children fail/late to go school because they fetch water far? | | | | |
| vi) Risk of getting hurt while drawing water in difficult terrain/source. | | | | |
| (vii)Is it a problem to supply water 24/7 in the supply area | | | | |
| (viii)Levels of infrastructure security | | | | |
| (ix) specify others(if any) | | | | |

7. What do you think are the possible causes of the water problems in Meru Town-low income areas? Tick (√) as appropriate in the columns under: Major cause, Minor cause, Not a cause and don't know in the table below.

| Causes of water problem | Major cause | Minor cause | Not a cause | Don't know |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| i) Illegal connections? | | | | |
| ii)Inaccessibility | | | | |
| Iii) Insecurity? | | | | |
| iv) Land owner do not want pipelines to pass through their land. | | | | |
| V) Vandalism? | | | | |
| vi) Unplanned housing for community, people built on pipeline? | | | | |
| vii) Frequent breakdown of infrastructure | | | | |
| viii)Land with no distinct boundaries | | | | |
| ix)lack technical knowhow | | | | |
| x) Lack of financial support. | | | | |
| xi) lack of adequate water resources | | | | |
| (x)Difficulty landscape | | | | |

Section C:

Q8. Has MEWASS ever involved chiefs & elders/ residents/ other stake holders in Meru town area in discussing water supply and delivery issues? (1) Yes (2) No (3) Don't Know

Q9. If yes, how many meetings have been held since the last 2 years? (1)1 (2) 2 (3) 3 (4) 4 (5) 5 (6) 6 (7) 7 (8) 8 (9) 9 +

Q10. Do you think carrying out sensitization and talking to stakeholders will be helpful in solving some of your water supply problems?

(1) Yes (2) No (3) Don't Know

Q11. Do you think water bills should be increased in order to recover the cost and delivery services? (1) Yes (2) No (3) Don't Know

**Section D:**

Q12. Are there competitors involved in the provision of water to Meru town area (1) Yes (2) No (State the names if there is/are any)

Q13. Do you need water supply provision from any alternative providers to supplement your efforts? (1) Yes (2) No

Q14. Do you think water supply, operation and maintenance should be handled by a Private company? (1) Yes (2) No (3) Don't Know

Q15. What do you think are the benefits of water privatization, if any?.....

……

**Section E:**

1. What problems do you face with tariff collection? (Please List them)

……

Q2. Who finances MEWASS for the capital investments?(i) National (ii)county government? (iii) Donor (iv) self

Q3. Does MEWASS receive financial support from any other organisation?

(1) Yes (2) No

Q4. State if any

……

Q5. What should the Water Services Regulatory Board (WASREB) do to help the MEWASS to overcome its problems or improve its services?

……

Q6. What are the key challenges facing the water supply system in urban Meru?

……..

Q7. What do you think can be done to overcome water supply problems or to improve water supply services in the urban areas of Meru

……

**THANK YOU FOR YOUR ASSISTANCE**