UNIVERSITY OF NAIROBI
DEPARTMENT OF ARCHITECTURE AND BUILDING SCIENECE

A MULTI-ACTOR OPERATIONAL FRAMEWORK FOR ALTERNATIVE WATER SUPPLIERS IN MUKURU, NAIROBI:

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A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILMENT FOR THE AWARD OF THE DEGREE OF MASTER OF URBAN MANAGEMENT IN THE UNIVERSITY OF NAIROBI

2009

DECLARATION

This research report is my original work and has not been presented for a degree in any other University.

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DEDICATION

TO MY FAMILY KODHEK, BEVERLY, MITCHELL AND RUSSELL AND TO MY EMPLOYER CORDAID WHOSE PATIENCE, ENCOURAGEMENT AND LOVE OFFERED SUPPORT DURING THE PERIOD.

ACKNOWLEDGEMENT

This is to register my appreciation and gratitude to all those whose assistance, cooperation and support aided me to complete this work.

Iam greatly indebted to Catholic Organization For Relief and Development Aid (Cordaid) for their generosity and financial support without which I would not have taken up this course. I appreciate the time given to carry out the research within tight work schedules and the patience that Cordaid accorded to me.

Iam Immensely indebted to my supervisors Mr. Oyugi and Mr. K'Akumu for their valuable criticism, guidance, patience and indispensable suggestions during the writing of this research. Many thanks to the entire staff at the department of Architecture and building science, the research centre, Jane, Lydia who showed a lot of concern and support whenever the going could get tough.

I appreciate and thank my spouse Argwings Kodhek for his encouragement, guidance, financial support, continuous prayers and love. This helped me to be patience, persevere and see light at the end of the tunnel when all seemed dark and uncertain during my field work. I am especially thankful to my children Beverly, Mitchell, Russell for the understanding and continuous prayers.

Iam also sincerely thankful to Sophie, Grace, Jane George, Orege and Julie for the assistance they offered during the typing of the work.

I must also extend my gratitude to colleagues at Cordaid, Civil society we partner with working in Mukuru and all my friends for their continuous support, guidance during my field work and guidance. I greatly thank Nairobi water and sewerage Company; informal settlement project office for their insight and to the organized community groups in Mukuru I appreciate the knowledge shared.

ABSTRACT

Water and sanitation management is one of the major responsibilities of local authority world over. The responsibility is both simple and complex. Simple as the goal is to ensure adequate water and sanitation provision for all. Complex as it requires construction of expensive infrastructure which needs a financial system from which to draw funds for investment and coordination across many actors, cooperation from users and the willingness to pay. Alternative water actors' cooperation and coordination is an important.aspect that requires an operational framework with institutions capable of encouraging their involvement, setting appropriate conditions and regulating their performance.

Successful operations of alternative water actors depends on an integrated water resource management where partnerships and coordination frameworks are organized, formalized and the role of multiplayers recognized as significant in water supplies in informal settlement. The ultimate goal of water supplies is to promote sustainable use and development of water resources. The second principle aims at promoting participatory approaches involving users, planners, and policy makers at all level. Third principle recognizes that water has an economic value with competing uses and finally women play a central role part in the provision, management and safeguarding. In Informal settlements within Nairobi, water supply is inadequate as alternative water actors are not working in partnership leading to wastage, duplication, high water cost in delivering the water supplies. This reduces the water quantities consumed posing a risk to human health in these settlements.

The study was set to develop a conceptual model for the promotion of partnership and good governance towards sustainable utilization of water supplies in informal settlements, with Mukuru as a case study. The study utilized both primary and secondary sources of data. Methodological approach adopted for primary data collection involved the administration of questionnaires to sampled household, business operators in Mukuru as well as Key informant discussion such as Water Company officials among others.

To find out the conceptual model for the promotion of partnership and good governance towards sustainability of water supplies in informal settlements, the study began by determining the various actors and their level of involvement in water and sanitation provision in informal settlements. It equally established the level of accessibility and cost of water and sanitation in the informal settlement and examined the levels of collaboration and bottleneck/challenges experienced by the various actors.

The study found out that the gap between the demand and supply of water and sanitation is rapidly widening as a result of rapid population growth in Informal settlements which strained the ability of local authority to supply the service. The single most important actor in the provision of water and sanitation services in Mukuru was found to be Nairobi water and sewerage Company who had a high level of involvement. There was limited participation and involvement of the community groups in the management of water

leading to alternative water providers offering the service at commercial rates in depressed areas. Similarly it was noted that alternative water actors played a significant role in water supplies though their relationship with water utility was not formalized and they operated purely as commercial enterprises. The study established that the level of collaboration among the various water actors in water supplies and management was limited with community not involvement in the water provision as active participants.

In view of the major findings, the study concluded that limited accessibility and high cost of water in Mukuru is as a result of poor collaboration and partnership among the alternative water actors in the provision of water supply and that a multi-actor operational framework for alternative water supplies is unsatisfactory. It hence settled down on key policy recommendations that include institutional, operational and participatory planning approaches. These are envisioned as the most critical components for an integrated water service management and planning strategy for water supplies in the informal settlements.

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CHAPTER ONE

INTRODUCTION

1.0: General Overview

More than a decade after the UN Conference on Sustainable Development in Rio de Janeiro in Brazil, the world is still scrambling to meet its ambitious targets in water and sanitation. An estimated 1.5 billion people remain without safe drinking water and about 2.5 billion have no access to adequate sanitation (Dubreuil and Hofwegen, 2006). In 2004 about 1 billion people, most of them in developing countries, lived in slums, a figure expected to double over the next 30 years (Mutume, 2004). Mutume further indicates that the figures for Africa are discouraging as more than 300 million people lack access to safe drinking water especially the low-income urban residents. Borgoyary (2002) argues that growing population in urban areas and economic development has led to an increase in water demand while supplies are not adequate. This has become a challenge for sustainable development, especially in developing countries. The main problem facing urban areas in developing countries is the rapid increase of population in cities and towns. The population increase is beyond the ability of local authorities to provide the much required basic services that support life in cities like water, sanitation and housing in a sustainable way (Gilbert, 1992).

This has characteristically brought forth a phenomenon in urbanization widely referred to as urbanization of poverty (Payne and Majale, 2004). Provision of water services is one of the basic needs that support human existence in informal settlement and its management strategies need to be well organized. This scenario is more pronounced and urgent in the informal settlement as residents need increased supply of water and sanitation while the cost of providing the same is also on the increase. This necessitates an understanding of the interrelationship between the water utility, alternative actors in the urban water service delivery, taking cognizance of affordability and efficient management of the same alongside recognizing the opportunities and constraints in the service delivery (Cities Alliance, 2005).

Water is a basic need and a right while sanitation is dignity. The Dublin principles identifies that water has an economic value in all its competing uses and should be recognized as an economic good (Bauer, 1996). Water is crucial in the realization of quality life and increased productivity which is significant in support of urban life and ecological sustenance. In the urban set up, water as a scarce commodity has competing uses; which necessitates its sustainable utilization.

Oenga and Kuria, (2006) in their study of Maili Saba in Nairobi, argue that informal settlements offer a huge potential market for the utilities. With an average monthly incomes of US$70 per household, water expenditure averages US$ 7 a month for a household of five people and with an estimated population of 1.8 million the size of the market is approximately US$2,500,000 per month for current small water enterprises in

Maili Saba. Further Dubreuil and Hofwegen, (2006) argues that water should be affordable and must not affect a person's ability to buy other essential goods. The World Water Council argues the case for the Human Right to Water (HRTW) by stating that it is necessary to guarantee an absolute minimum of 20 litres of clean and safely accessible water per person per day (WHO, 1990). Therefore lack of access to water which is fundamental for life and health reduces the universal human rights to good health, education, nutrition and an adequate standard of living.

Despite the international recognition of water as a basic human right to human, lack of political goodwill has continued to hinder the progress of realizing sustainable supply to residents living in informal settlements. This should infact be a great concern for many countries of the World. Experience has amply demonstrated that water management is complex and requires a comprehensive framework (World Water council, 2000).

Most of the cities of developing countries have public programs intended to increase accessibility and affordability of water and sanitation in informal settlements. However only a limited number of such programs have been successful mainly in the Philippines (Jennings *et al* 2000). The provision of water and sanitation has been slow and experiencing difficulties and constraints in management due to lack of active participation by the informal settlements residents and security of tenure in informal settlements. This has made cost of water and sanitation infrastructure development expensive, consequently leading to escalating prices of the water and sanitation provision beyond the ability of informal settlements residents. The causal effects of this is glaringly

demonstrated by increased illegal water connection, use of substandard pipes leading to water contamination and frequent occurrence of water borne diseases.

Indications in other countries show that within the framework of community participation, alternative actors have been enabled by the water utility to play a key role in delivering urban services within the Informal settlements. Yeung and McGee (1986) reported that in Philippines only 16.7 per cent had piped water in informal settlements which is provided by the public utility. While up to 70 per cent of water in the slums was provided by approximately other service providers. Nairobi has also experienced the same trend with alternative actors accounting for 86 per cent of water and sanitation delivery in informal settlement. The growth of alternative actors in uncoordinated environment has led to further complications such as inefficiencies, high costs and unreliability of the service provision hence the emergent of inefficient water and sanitation management systems. The traditional strategy of responding to water shortages in informal settlement by increasing water supplies through capital intensive water transfer or diversion projects has clearly reached its financial, legal, and environmental limits. What is therefore required at present is a multidisciplinary approach to water resource management that incorporate sustainable water use and management in developing countries (Borgoyary, 2002). The challenge still exists in getting water to where it is needed most in a coordinated, affordable and efficient way while ensuring the right quantity and quality.

1.1: Statement of the Problem

The millennium development goals have brought into sharp focus the scale and nature of the challenges that need to be overcome in order to achieve basic levels of human dignity. Ability of local city managers to provide water and sanitation services to the majority of people living in the informal settlements has been progressively worsening as the situation is made complex by the rapid population growth and sprawl (Khroda, 2002). Statistics available indicates that the world population in 1990 grew by 1.6 billion between 1970 and 1990, of which 90 percent of the growth was in Less Developed Countries (LDCs). As from 1990, it is projected that another 1.7 billion people will be added, and the world population will stand at 7 billion by the year 2010 (UNEP, 1992).

Hutton (1970), Mobogunje (1990), Kessidas (2006) and Obudho (1988) all allude to the fact that rapid population growth greatly constrains the delivery of water and sanitation services in the cities and towns of developing countries. Informal settlement population has been on the increase with close to 900 million people living in urban slums world wide (UN Habitat, 2003). Latin America accommodates 50 percent of its urban population in informal settlement while in Africa 90 percent of the urban population live in informal settlements. In the Cities Alliance Annual Report 2005, an estimated 1 billion lack access to adequate water supply, 2 billion do not have access to adequate sanitation and 4 billion live without adequate waste water disposal. Currently more than half of the population in Nairobi lives in the more than 123 informal settlements near the city, which have inadequate supply of water and sanitation facilities (Weru 2000). It is projected that

by 2020 Nairobi will host 5 million people; of which 3 million will reside in informal settlements (UN-Habitat 2001, Kessidas 2006 and Obudho, 1988).

The Kenya Government through the local government is charged with responsibility of providing water and sanitation services. The delivery of these services has faced a number of challenges and bottlenecks prompting the introduction of commercialization which was expected to do away with the problems related to water and sanitation. However like any other developing country, supply of water to informal settlement still face a number of problems. As indicated by Collignon and Vezina (2002), a number of factors have contributed to the difficulty in providing the necessary infrastructure for water and sanitation in Informal settlements in Kenya as most of the problems are due to spontaneous urban development patterns which are unplanned. Since the 1990s, development control, planning and projection in Nairobi have not been reinforced as most sections of the city are built without any anticipation for growth. Official land records do not exist for informal settlements and majority of urban residents lack legal documents for their plots (K'Akumu, 2004). These conditions discourage water and sanitation service providers from investing in these areas. Towards this end, water and sanitation provision framework has recently undergone major changes as the government implemented the water sector reforms contained in the water Act 2002. The reforms have led to the establishment of various players at different levels with specific roles given that include policy formulation, regulation and water services provision. In Nairobi, the Athi water services Board is operating and has licensed the Nairobi water and sewerage Company limited (NWSC) as the main water and sanitation utility in Nairobi. The

company is 100 percent owned by Nairobi City council and was created from the Council's former water and sewerage department.

Nairobi Water Company mainly distributes water services to formal and planned settlements in Nairobi through individual connections. The informal settlements with an approximate 60 percent of the city population are not directly connected to NWSC water services (Oenga and Kuria, 2006). Water service in informal settlements is delivered by alternative water actors who are mainly connected to the NWSC water services or source their water from boreholes, wells located in the areas. NWSC has experienced challenges in water connections made to alternative water actors in the informal settlements, with an estimated 50 percent of water pumped by NWSC into their pipeline going unaccounted mainly caused by illegal connection, leakages this leads to water shortages and huge revenue losses for the Water company (NWSC report, 2007).

NWSC has taken bold steps to recognize and regularize the illegal water connections in informal settlement leading to development of a pilot Bulk metering project in Mukuru. Experiences of the pilot project has not been very successful as informal settlement residents still pay high costs for water provided by the multi actors with connection from NWSC. The Intermediate Technology Development Group (2005) in a study of Maili Saba settlement located in Nairobi established that 70 percentage of water provided in informal settlement is from vendor Kiosks who have meter connection from NWSC. The vendors supply the commodity as a business to the end users, limited control on prices is given by the NWSC leading to residents paying up to 20 times more, the cost of supplier

rate. Consequently the Utility pilot project has not succeeded in increasing water coverage, and bringing down cost of water in informal settlements.

The capacity to provide water and sanitation by the various actors is already in place as established in the study of (Oenga and Kuria, 2006). Where up to 86 percent of water in informal settlements is provided by the small water vendors and other alternative water actors. However challenges still exist in partnership, co-ordination and participation. When water and sanitation service delivery are not well coordinated in informal settlement, accessibility and cost remain high. A need therefore arises on the importance of recognizing the alternative actors, coordination of their efforts and establishment of a collaborative, participation framework for the promotion of partnership, good governance that enhances the deliver of water and sanitation to the residents of informal settlements. Increase in the actors providing water and sanitation in informal settlements does not necessarily lead to increased coverage, competitive prices, good quality services, however increased community participation in the management of water and sanitation services would yield higher benefits for the slum dwellers.

This study therefore seeks to find out the possibility of developing a conceptual framework that promotes partnership and good governance in the provision of water and sanitation with specific reference to Mukuru Informal settlement of Nairobi; Kenya. The study evaluates, describes and analysis the role of the utility, alterative actors in the area in relation to the provision of water and sanitation services. This is indeed a formulation

of a conceptual framework for sustainable provision of water and sanitation with a Multi-actor approach to informal settlements.

1.2: Objectives of the Study

1.2.1: General Objective

There is no adequate institutional framework to enhance participatory approach which involves users, planners, service providers and policy makers at all level. The study's broad objective was a development of a conceptual model for the promotion of partnership and good governance towards sustainability of water supplies in informal settlements.

1.2.2: Specific Objectives

The specific objectives of the study were:

i. To determine the various actors and their level of involvement in water and sanitation provision in informal settlements.

ii. To establish the level of accessibility and cost of water and sanitation in the informal settlement.

iii. To examine the levels of collaboration and bottleneck/challenges experienced by the various actors.

iv. To suggest a broad based policy framework as a strategy towards developing partnership among the Alternative-actors and active participation in the management, provision of water and sanitation in the informal settlement.

1.3: Assumptions of the Study

The problem of water stems from the high urbanization rate causing a rapid population growth resulting in a transfer of rural poverty to city faster than the city can accommodate its migrants. This has led to high concentration of people which overstretch the existing water facilities and are not sufficient to meet the ever rising demand. High Urbanization rate is inevitable hence the problem of water and sanitation is yet to manifest in severe manner. This study therefore assumes the following:

i. If the urbanization is not controlled the management and supply of water and sanitation services will manifest in a severe manner.

ii. The multi players in the provision of water and sanitation are not working in partnership hence create duplication, wastage and conflict of interest. Hence it is imperative that the multi players are brought in a framework to enable pulling of resources, harmonization, co-ordination and building of partnership to efficiently and effectively provide water and sanitation.

iii. The government through its allied parastatals shall not provide water and sanitation services in the near future due to lack of capacity therefore the essence of multi players are key in the provision.

1.4: Justification of the Study

An effective operational framework that promotes partnership, good governance of water and sanitation provision are critical components of sustainable service delivery in the Informal settlement, yet urbanization in cities has constrained the ability of local authorities to provide the much required basic services like water and sanitation. Towards this end, the water and sanitation coverage is very low in informal settlements estimated at 19 per cent for water access and 71 people using one sanitation facility (UNDP, 1997). This has occasioned the need for Alternative actors in the provision of water and sanitation to collaborate and design a sustainable model of accessing water in the informal settlement.

There are several water providers in the informal settlements whose efforts are not well coordinated leading to challenges and bottleneck in terms of duplication, wastage and inadequate access to the water services. Community participation in the management and delivery of water is also limited. There is no broad based policy framework that coordinates, enhances partnerships of the various actors in the service delivery.

Mukuru informal settlement has recently been served with piped water by the City Council of Nairobi through the newly formed water service provider in Nairobi under the 2002 water Act, Nairobi Water and Sewerage Company which has laid in place a pilot project for water provision in informal settlement. The company has constructed 69 bulk water meters chambers in 15 Mukuru informal settlement villages with anticipation that

people, alternative water actors living in the informal settlement would make applications for individual connections and increase the coverage of water services in Mukuru. The pilot project success was to be replicated in other informal settlement areas. However the situation has been different with only 1000 individual connections realized in Mukuru way below the expectation of increased application for individual connection now that bulk metering has been brought closer into the village.

The poor living in informal settlements pay high costs for water services therefore it is important to analyze the water utility, alternative water providers in terms of their level of involvement, collaboration, bottlenecks, challenges experienced, accessibility and cost of water. This has been a glaring gap which has made service delivery partnership unsustainable. This study attempts to fill the gap so as to add to the documented information on water utility operator and alternative water actors in provision of water services in informal settlement.

1.5: Scope of the Study

The study covered Mukuru informal settlement in Nairobi that neighbours the industrial area with a total of 15 villages classified into 4 main villages of Mukuru Kwanjenga, Mukuru Kayaba, Mukuru Sinai and Mukuru Careen with an estimated population of 400,000 people. The study area has both residential and business premises. The research focuses on the role of alternative actors in the provision of water services and how accessible and affordable the services are to the informal settlement residents.

The Research attempts to understand the phenomenon of urbanization and its effects as relate to the provision of water and sanitation services in the informal settlements. It looks into the pattern of urbanization, development of informal settlements in developing countries and narrows down to Mukuru: Nairobi. The problem of water and sanitation provision in informal settlements is looked into as a contributing factor to inhuman conditions, physical environment and health of the residents.

The evolution of Mukuru as a slum is traced and the role of the Utility operator, alternative water actors in the provision of waters services brought out. The study indicates the growth of Mukuru into a full fledged informal settlement; slum and the ever increasing needs of water and sanitation. The government policies on water and sanitation as stipulated in the Water Act 2002 in relation to provision of these services in informal settlements are assessed and appraised.

The social-economic attributes of Mukuru informal settlement residents are analyzed so as to give a clearer perspective of the context in which the study has been undertaken, giving the environmental conditions of the Slum and the associated infrastructures that support the provision of water and sanitation in the areas. The research mapped the alternative water providers, their level of involvement in provision of water and sanitation, establishing the availability, accessibility, affordability of water and sanitation services. The study examined the comprehensive institutional water reforms, levels of collaboration, bottlenecks/challenges experienced by the various actors leading to

development of proposal and recommendations on conceptual model for the promotion of partnership and governance towards the enhancement of water and sanitation provision in informal settlement.

1.6: Limitations of the Study

While undertaking the study the researcher was faced with challenges in terms of sampling, data collection and analysis as informal settlements are not formally recognized and little research and documentation has been done in the settlements. Further this research approach necessitates more finances, human resources and time to study the entire settlement. Finally, there was suspicion in the settlement when researcher visited the area to collect primary data; as residents were not fully convinced that the information gathered was to be used for research purpose only. This made it difficult to access some personal information on water and sanitation from the residents of Mukuru. Co-operation among the various actors in water and sanitation was quite low and in some instances operated in complete isolation, suspicious of others service providers.

1.7: Operational Definitions of terms Used in the Study

The following are some of the terms used in the study which requires some definition.

Informal settlements and slums: For the purpose of the study, Lamba (1993) states that informal settlements, slums are seen as the neglected parts of cities where housing and

living conditions are appalling poor. Mitullah (2003) indicates that the settlements range from high density, squalid central city tenement to spontaneous settlement without legal recognition or rights. They are unplanned and unapproved development structures with low quality or illegal structure in an urban context and not falling within the mainstream formal living environments in Cities. Adler (1995) argues that informal settlement are further characterized by lack of basic services, substandard housing or illegal and inadequate building structures, overcrowding and high density, unhealthy living conditions and hazardous locations, insecure tenure, irregular or informal settlements which culminate into poverty and social exclusion. These attributes are associated or linked with ill-health.

Sustainability in water: Refers to the discussion of how to make water systems last longer and have less impact on ecological system while keeping its prices affordable to the end users. Bartoszczuk and Nakamori (2008) argue that sustainability of water refers to the harmony between environment, society and economy. The Brundtland report (1997) identifies sustainability as the activities which meet present water needs without compromising the ability of future generations to meet their future needs (WCED, 1997). According to OECD (1998) water sustainability should "ensure that current generations meet basic needs for water servicing without jeopardizing the ability of future generation to meet their water needs and while protecting the water needs of the environment". Ring *et al.* (1999) claims that sustainability of water does not present a fixed state but rather a process of change towards a more environmentally sound and socially equitable way of life. Helm (2000), argues that sustainability is a recognition that without intervention on

management of water resources the global environment will not be able to provide a reasonable standard of living for the future generations.

Partnership: World Bank (2007) argues that there is still a debate on collaboration and partnership. For the purpose of this study Partnership refers to a group of actors working together through a common framework that makes it possible to conduct a more comprehensive "gap analysis" identifying those needs that might need particular intervention, something a single organization may find hard to achieve. The water operator approach enables providers to achieve results and measure broader progress (World Bank, 2007).

Collaboration: In the study collaboration refers to a structured method or process of defining functions where two or more people, actors work together towards a common goal, typically in a creative nature by sharing knowledge, learning and building consensus in a competitive environment with limited resources (World Bank, 2007).

Institutional arrangements: Refer to agreements and organizational structures in an agreed working relationship among various actors. Institutional arrangement in the study refers to the participatory approach involving users, planners, policy makers at all level in the provision of water. Munkonge and Harvey (2008) argues that the Dublin principle is important in setting up an institutional framework for water development, management based on participatory approach involving users, planners and policy makers at all levels. They further argue that for the institutional arrangement to work decentralization,

accountability, full consultation, stakeholders' coordination and collaboration, common platform for decision making are key components.

The Utility: refers to the Nairobi water and sewerage company which is the main water source in the study area. The alternative water actors make metered connection to the company on commercial basis (NWSC report, 2007). Oenga and Kuria (2006) argues that the activities of the utility benefit the alternative water actors as they are seen to work formally with the utility however there is need to achieve full recognition of alternative actors as agents of the utility.

Alternative water Providers/Actors: Refers to the other multi-actor water operators involved in water supplies in the settlement. The multi actors are small water enterprises that are private operators providing water services in the informal settlements. Oenga and Kuria (2006), argues that alternative water actors would continue to play a significant role in immediate and long term water services in the settlements.

1.8: Organization of the Project Report

This section summarizes the format of presentation of the research work. Chapter one introduces the research work and highlights the research objectives, assumptions, justification of the study, scope of the study, limitation of the study and the research methodology. Chapter two lays down the literature review for the study. It starts by outlining the general water situation in the world and in developing countries. It narrows down to the Kenya context and winds it up with Mukuru context. The interrelationship

between the water utility, alternative water actors, active participation of the informal settlement residents as a core factor in ensuring affordable, efficient and management of water provision to informal settlement residents is discussed. Chapter three presents the background to the study area. The historically development of Mukuru informal settlement, its evolution and growth is traced. Provision of water and sanitation in Mukuru is discussed with assessment of recent pilot projects of providing piped water to informal settlements. The historical background of Mukuru slum is traced and the need to provide adequate water and sanitation in Mukuru addressed. Finally the government policy on water and sanitation is highlighted. Chapter four analyses the collected data to realize the role of multi-actors involved in the provision of water and sanitation in Mukuru informal settlement. It analyses the accessibility and cost of water while assessing the challenges multi-actors face in collaboration and partnerships. Chapter five summarizes the major findings of the research and on the basis of these make recommendations and conclusions.

CHAPTER TWO

LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK FOR THE STUDY

2.0: Introduction

The role of the literature review is to give highlights of what other scholars have said in the provision and management of water and sanitation in informal settlements. Review the multi players involved in providing water services in settlements indicating some of the challenges they experience and examine the institutional framework which involves users, planners, service providers and policy makers at all level. Rapid population growth in cities and the inability of local authority to meet the ever rising water demands will be appraised. Sustainability will be examined as the theoretical concept with participatory approach playing a significant role in water supplies. Institutional framework that promotes partnership, good governance of water supplies will be discussed and participatory approach, a critical component of sustainable water delivery will be examined. The chapter also highlights best practices and the repercussions of worst scenarios which consequently enables the researcher to build a case on theoretical and conceptual basis for the management of the same facilities in Mukuru.

From Chapter one the objective, assumptions, justification indicates that there is an institutional framework though it is not functioning well to enhance participatory

approaches in the deliver of water supplies. To go ahead in this chapter literature review is conducted to examine what other authors have said about sustainable water supplies and the chapter contributes towards suggesting a conceptual framework for water management in informal settlements.

2.1: Water a global scenario

Water is recognized internationally as a basic need and a right. Munkonge and Harvey (2008) argues that there exists a common global understanding that acknowledges integrated water resources management as the most appropriate concept and approach to manage water resources in the world today. GWP (2000) has defined global water partnership as a process that promotes the coordinated development and management of water in order to maximize economic and social welfare without compromising sustainability of vital ecosystems. GWP further argue that this consensus was attained in January 1992 at meeting (The international Conference on Water and Environment) held in Dublin which gave rise to the four Dublin principles. Bauer (1996) indicates that the dubling principles recognizes that water is a finite and vulnerable resource essential to sustain life development and environment, identifies that water has an economic value in all its competing uses and should be recognized as an economic good. Women play a central part in management of water and that water management should be based on participatory approach (Munkonge and Harvey, 2008).

Water is crucial in the realization of quality life and increased productivity which is significant in support of urban life and ecological sustenance. In the urban set up, water as a scarce commodity has competing uses; which necessitates its sustainable utilization. The World Water Council (2006) report suggests that in future wars may be fought over water which is the lifeline of humanity. Cairncross *et al* (1992) argues that lack of access to water reduces the universal human rights to good health, education, nutrition and adequate standard of living. Water and sanitation supplies not only improve health, but also releases time and energy for other activities. Despite the international recognition of water as a basic right, limited accessibility, affordable cost of the facility has continued to hinder the progress of realizing sustainable supply to majority of residents living in informal settlements (UNDP, 1990). Dwindling water resources is a great concern for many countries of the world especially for water scarce countries which have to make rational choices. Experience has amply demonstrated that water management is complex and requires a comprehensive institutional framework (World Bank, 2007)

The increasing gap in demand and supply of water in the face of growing population and economic development has become a challenge for sustainable development in developing countries (Borgoyary, 2002). More than a decade after the United Nation conference on sustainable development in 1992, the world is still scrambling to meet its ambitious target on water and sanitation. An estimated 1.5 billion people remain without safe drinking water and about 2.5 billion have no access to adequate sanitation (UN Habitat, 2003). About 50 percent of persons without safe drinking water and sanitation are found in developing countries, residing in informal settlements. In 2004 1 billion

people lived in slums, the figure was expected to double in the next 30 years (Mutume, 2004). Not only are large areas of Asia and Africa experiencing droughts and floods, but they are also facing the implications of inefficient water management systems. What therefore is required at present is a multidisciplinary approach to water resource management as factors to be incorporated for sustainable water use in developing countries (Borgoyary, 2002).

2.1.1: Water an Urban scenario

Cairncross (1992) argues that the urban population when not served with piped water or cost of the piped water remaining high is left with no option but to use water from streams, shallow wells, unsanitary vendors supplies or other surface sources whose quality are often not assured. Children from these areas suffer from water borne diseases. Ciarncross adds that the quantity of water available to a household and the price paid can be as important to a family health as its quality. The cost of water and the time needed to collect it influences the quantity used. In Mukuru, various actors provide water and sanitation as is the case in other informal settlement where individual connection to public utility is low, the slum dwellers inhabitants often pay 10 to 20 times the cost per litre paid by other utility clients with piped water connection (Oenga and Kuria, 2006).

Rapid urban growth in Kenya, like in other developing countries, has outpaced the capacity of urban authorities to provide and maintain basic services. The result is a lowering of the quality of life, reduced urban productivity, and increased burden of health care and unmitigated environmental pollution. Syagga *et al* (2001) estimates that 1.5

million people in Nairobi, roughly 60 percent of the city's official total population of 2.5 million, live in informal settlements. The majority of the inhabitants have low and very low incomes. Syagga *et al* (2001: 1) continues to argue that "When 400 people are confined to share one toilet; basic standards of hygiene fall rapidly, to say nothing of dignity and self-respect." In such conditions, women and children suffer most. Syagga adds that Kenya's urban water situation is not good either as only 11.7 percent of Nairobi households have water connections. Hardoy *et al* (1992) states that in some slums there are more churches than there are toilets. The low-income households inhabiting informal settlements are forced to pay exorbitant prices for water delivered by street vendors. Street water vendors charge between 10 and 20 Kenya shillings for a 20 litre jerrican while those who operate community water points charge 2 to 5 shillings for the same amount of water. (Lamba 1994,; Mitullah and Kibwana, 1998).

According to Scheteingart (1988), statistics on domestic water consumption in the metropolitan Zone of Mexico reveal the consumption among the poor and rich, with the rich zone consuming 450 litres per person daily while the poor in the low income zone consuming an average of 50 litres per person daily. Scheteingart concludes that 19 per cent of the domestic consumers in Mexico City account for 75 per cent of all consumption and that more than 2 million have limited access to reliable supplies.

Lamba (1994) notes that water and sanitation services in Nairobi are minimal and expensive in informal settlements leading to lower consumption of water services, while socio-economic groups remain a factor that influences the health standards of households arising from environmental conditions. High income residential areas in Nairobi

represent 11 to 12 per cent of city population but consume 30 per cent of domestic water while low income areas, with 64 per cent of population consume only 35 per cent of domestic water supply (Lamba, 1994). In informal settlement the poor consume an average of 76 litres per household per day (Oenga and Kuria, 2006). This average falls far below the World Health Organization recommended figure of 200 litres per person per day (WHO, 1990). Satterthwaite (1987) noted that more than three quarters of the entire urban population in Kenya lack adequate water supply, further indicating that a family of six needs at least 300 to 400 litres of water a day to meet all its needs. In the Mukuru situation a family of four depends on about 4 jerrican of 20 litres of water per day. This falls below the recommended requirement.

Briscoe (1986) observed that water vendors serve between 20 and 30 per cent of the developing countries urban population while The Intermediate Technology Development Group (2005) established that 86 per cent of water provided in informal settlement is from privately owned vendor Kiosks who have meter connection from Nairobi Water and Sewerage Company (NWSC). The vendors supply the commodity as a business to the end users and limited control on prices is given by the NWSC leading to residents paying up to 20 times more, the cost of supplier rates. This implies that NWSC pilot project has not succeeded in increasing water coverage, and bringing down cost of water in informal settlements.

There are limited sewerage systems in informal settlements and communal pit latrines are used. The pit latrines are rarely emptied or drained when full. Open fields are often

used as human waste disposal sites by both children and adults (Shihembetsa, 1988). The management of human excreta and its disposal usually presents a big challenge in informal settlement as high densities make it difficult to protect people from contact with excreta. In Mukuru the density is 12.486 persons per square kilometer (GOK, 1999). This is far much higher than the recommended densities for low income high density residential developments of 450 persons per square kilometer GOK, 1971). Intermediate Technology Development Group (2005) argues in its report that high density in informal settlements makes it difficult to drain the filled pit latrines while unpaved roads make accessibility harder. Inadequate sanitation facilities and waste disposal systems have negative impacts on public health and environmental sanitation in informal settlements (Sinnatambly, 1992). Water supply and infrastructures still lag far behind with current utilization of sanitation facilities exceeding their intended capacities. In addition to developing new and alternative systems, most of the existing sanitary infrastructures need major rehabilitation (UNDP, 1997). The UNDP report further indicates that the poor state of sanitary facilities and the lack of pollution regulation have resulted in raw discharges into rivers, open grounds leading to environmental degradation.

2.1.2: Water in Informal settlement

Informal settlements are located in hazardous sites like river banks, quarries which present engineering difficulties and increase the unit cost of providing water and sanitation. Combined with limited capacity of population to pay for the initial cost of water connection, water services leading to such areas often seen as non profitable (UN

Habitat, 2003). The price of land near central business districts which have water and sanitation is far above the ability of the urban poor to afford leading to the urban poor settling in hazardous areas in the city (Syagga *et al*, 2001). Using the economies of scale, informal settlement with its high population densities, are viable areas to provide water services at a cheaper price (Oenga and Kuria, 2006). Lamba, (1994) argues further that payment for the water used is not the main issue as the current situation in settlements is that residents pay much more for water than other middle, high income areas. An active participation of settlement residents in the management of the water distribution, patrol of water lines, collection of water bills with residents yielding benefits through increased accessibility, affordable prices is the way to increase provision of water services in settlements (Jennings and Rosenweig 2000).

According to Oenga and Kuria (2006) approximately 16 per cent of Maili Saba informal settlement in Nairobi, rely on water from vendors. The vended water is often contaminated, posing a great health risk to the water consumers. In the informal settlements most people are served by the commercial low-performing water utility of the local authority which has failed to expand water supply systems in settlements and maintain existing infrastructure leading to large volumes of water lost through leaks and illegal connection (K'Akumu, 2004). The management of the water utility has often not been transparent, subject to political interference, encourages corruption at all levels. Staff have been recruited based on political connection with overstaffing common at lower levels, while technical and management levels have often faced shortage of qualified personnel as remuneration are either unreliable or inadequate. The water utility

is not able to access finances to develop its infrastructure and increase supplies as the responsibility lies with the waters services board.

A large number of urban dwellers get unsatisfactory, unreliable service from the utility, a number of alternative water suppliers have developed to address these shortfall they include community based water providers, individual Kiosk operators, well owners, cart pushers among others. The alternative water actors have the ability to supply water in difficult informal areas however their interventions are not well coordinated leading to a vicious spiral of weak performance, limited coordination, duplication wastage, conflict of interest and insufficient funding for maintenance, deterioration of assets, lack of accessibility hence an increase in water costs.

Rapidly growing urban population has complicated the urban water supply in formal settlements as there is an increase demand in water services beyond the ability of the local authority to provide due to dwindling revenue base, obsolete technology for service providers translating into inadequate services in the water sector (K'Akumu, 2004). The poor often access water from water Kiosks or venders which is often expensive and the quality of water is often in doubt.

The local alternative water actors in settlements are not just passive institutions, however in most instances they are solving their own problems and only require governments to recognize their efforts, harness their energy and encourage the poor to participate in the improvement of their own living conditions and provision of water supplies. Towards this end water service development should entail partnership among the public, private sector

and civil society as water, sanitation and human settlements create opportunities for many other creative forms of partnerships. In this endeavor communal action should not be substituted for effective public policy; governments need to take the lead in achieving the commitments that they have pledged to undertake in water supplies.

World Bank (2007) considers that sustainability of water in settlements can only be achieved through decentralizing management to the lowest appropriate level, coupled with close community involvement in planning, financing, implementation, and operations to provide a solid foundation for sustainable services in a multi lateral framework. In this framework poor people and their institutions, alternative water actors should be seen as assets and partners in the development process while giving communities, local institutions responsibility for managing water supplies investments. Suitable management of water provision requires that community management is implemented by a broad base of stakeholders, multi actors working within the Community Driven Development agenda.

Implementing water services within a broad development framework and context in informal settlements allows institutions to respond to and support a range of community needs in a cost-effective and holistic manner. Integrating sanitation and hygiene in water delivery projects ensures that health benefits occurring from increasing water supply coverage are realized while addressing post construction continuity ensures that institutions, funds, and expertise are available to keep water supply systems viable and functional.

The challenge facing the water supplies today is how to scale up these experiences in order to meet the ever increasing demand of WATSAN in informal settlements. Increased financing is clearly needed, but that will not meet the challenge alone. Client capacity to ensure the sustainability of investments is equally important. One thing everyone can agree on is that the poor do not have sufficient access to water and sanitation services (World Bank (2007). Schwartz and Kariuki (2005) indicates that Small scale private providers of water play a vital role in low coverage areas, especially in difficult-to-access informal settlements which deserve greater attention in terms of regulation and financing.

Reforms in the water supply and sanitation sector is underway in many countries but different philosophies on water sector reform exist within these countries and among donors. For example; In Kenya Water Act (2002) gives increased attention to water, sanitation and environmental issues but there is inadequate attention to the effect of reform on the less advantaged populations of informal settlements. The trend is to ask the local authorities to assume responsibility for service delivery while a number of other actors operate in the same areas who may require a well coordinated legislative framework in which to operate and efficiently provide the services. Towards this end, the envisaged policy framework should consider decentralization, issues of cost recovery, cost effectiveness, regulation, sector planning, environmental management and health promotion. The existing institutional structure is not well structured to support informal settlement communities, who have fewer resources, unclear land tenure and with less capability of alternative water actors to deliver services since the local authority, water utility has not fully involved key stakeholders in discussions of decentralization.

Decentralization of water services is seen as sustainable, collaborative and participatory framework model. This gives a strategic intervention which can be approached through separation of functions. The functions are provision of services, policy making, and regulation. These functions need to be delegated to different organizations since decentralization of services delivery is a tactical decision that varies according to each country's size and needs (Jennings and Rosenweig 2000).

2.2: The Concept of sustainability in Water Supplies

Sutton (2000) defines sustainability as the ability to maintain or sustain something with limited exhaustion of Natural resources. Towards this end the concept can be applied to partnership - building, the environment (ecological sustainability), society (social sustainability), the economy (economic sustainability), an organisation (organizational sustainability) and people within an organisation (human sustainability - in a corporate context) among others. Sustainability is achieved if something is being managed so that it is indeed restored and maintained over time. Heintz (2004) describes sustainability as an expression of people's basic values and concerns which reflects people's desires for the good life and their hope that it will endure for future generations. It entails our pursuit of material well-being, our enjoyment of and connection to the environment and recognition of the value of our relationships with each other. Water for informal settlements is essential for meeting human needs and wants. It is used by residents for drinking, sanitation, cleaning and food preparation. Towards this end water services remain the main component that would sustain city population for generations to come. Consequently it's the bottom-up water delivery approach which involves active

participation of the residents that has the ability to deliver water services to informal settlement in a sustainable way.

The widely accepted statement of sustainable development was set forth by the Brundtland Commission of 1987 (commonly known as our *Common Future*) which states that, sustainable water development is water development that meets the needs of the current generation without compromising the opportunities of future generations to meet their needs (WCED, 1987). The commission goes further to argue that Sustainability of water and sanitation can be achieved over the long run by strengthening our capacities for making continuous improvement in the way we use water and adopting them to fit the scarce resource. Sustainability Concept has to be applied to something before its meaning can become clear. Sustainability of water and sanitation follow the following concepts or dimensions.

According to Heintz (2004) sustainability is measured as the ability to identify what is working or not working in Water provision in order to repeat, extend success and solve problems through effective feedback. In addition Heintz states that feedback contributes in measuring the sustainability of water and sanitation services using statistical indicators. To identify appropriate indicators one need to translate general concepts of sustainability into categories of measurable phenomena. Atkinson *et al* (1997) identifies capital maintenance approach as a concept that can be applied in water and sanitation sustainability. A set of manageable indicators of sustainability based on broad guidelines and principles are necessary to detect problems as they arise and to provide an early

warning system for decision makers. The indicators should be monitored and measured on the basis of the performance of natural systems, regulatory framework set and action taken once specified thresholds are passed. In particular, the indicators should be helpful in tracing long-term cumulative environmental changes which can potentially create irreversible problems. Towards this end working approaches are those that reinforce participatory management in the delivery of water services to the urban poor. In this approach both the water utility, alternative water actors and the community commit their resources and efforts to make services delivery possible in settlements. In Kenya the water Act (2002) policy indicates that consumers have to pay commercial rates for the water used in order to make water provision self sustaining. Towards this end water sustainability in settlements mainly depend on community involvement in its management and potential benefits expected out of their participation in water delivery.

2.2.1: Ecological Sustainability

Sutton (2000) states that ecological sustainability applies to the human situation as relate to the notion of carrying capacity. In this relation a given population normally lives within the carrying capacity according to the ecosystem of which it is a part. That carrying capacity results from the flows of food, water, light and shelter needed by the individuals of the species. These flows are provided by processes that are cyclical and renewable. Sutton adds that if the population exceeds the carrying capacity of its environment in some way, the resulting degradation in the flows of food, water or shelter eventually cause sufficient declines in the population to bring it back within the limits of

the environment's carrying capacity. A population thus keeps its use of food, water, light and shelter within the renewable flows made possible by its environment. The carrying capacity concept makes it necessary that every species experiences limits in its relationship with its environment. Towards this end ecology sustainability applies to living in a way that renewable resources are used no faster than they are able to be renewed. Non-renewable resources should only be used within the rate of substitution by alternatives and wastes should only be produced within the ability to process or assimilate them. Pugh (1996:4) indicates that ecological sustainability reinforces the preservation, the resilience and adaptation of the physical and biological systems.

Informal settlements are densely populated beyond the carrying capacity of its ecosystem, consequently leading to difficulty in the management of water services. Water delivery and distribution are a challenge as all spaces are occupied with little room for laying of pipes. Contamination of water often occurs as there exists limited distances between water points and sanitary facilities. Towards this end water service is often not sufficient as demand exceeds the supply, residents end up paying more for the water services and its quality is often not assured (Lamba, 1994), consequently leading to limited use of the commodity which falls far below the World Health recommended quantities of 200 litres per person per day. (WHO, 1990). The failure to integrate environmental management in settlements has also resulted in low quality which is magnified by lack of water services necessary for a healthy environment. To address some of these challenges it is becoming apparent that number of persons residing in an area has to be limited within the capacity of the ecology to accommodate and for ease of water services management. A

decentralized management only functions well where numbers are manageable to allow for meaningful participation by the residents.

2.2.2: Economic Sustainability

Osberg (1990) refers to economic sustainability as the ability to generate maximum flow of economic welfare while maintaining the stocks of assets including environmental assets. Economic instruments that encourage water conservation have included, water pricing which puts a dollar value on an amount of water. Most people currently pay a price, based on volume, for having water treated and delivered to their homes, but not for the actual water itself. Water meters are used to measure consumption, and charging people for delivery of water based on the amount of water used this also encourages conservation and use of water as an economic good. In addition, cities that have implemented a water meter system and charge people according to the amount of water used utilize less water than those cities that charge a flat rate for water. Tradable water rights have implied that people who have been allocated the right to a certain amount of water and can sell have ended up conserving portions of their allocations. This has provided an incentive for those rights holders to conserve and use less than their allocation in order to make sales. Towards this end fines, punitive penalties for wasteful practices have reduced wasteful water practices. A number of municipalities in the United States have water hotlines which allow people to contact authorities under anonymity to report wasteful practices. The authority often follow-up with enforcement

when dealing with people that do not abide by the restrictions. Individuals can be subject to a verbal warning, followed by a ticket or in extreme cases court action (Osberg, 1990).

2.2.3: Social Sustainability

In social sustainability the stability and cultural diversity of social systems is important in the provision of water and sanitation as the society make social investments and create a stock of social and human resources in the delivery of water services. Osberg (1990) argues that Economic development can either contribute to or deplete those social resources. He adds that economic development championed by Margaret Thatcher and Ronald Reagan has been socially unsustainable as it depletes human, social capital and resources in addition to the damage it has brought to the natural environment. The concept of socially sustainable urban development has received less attention than the concept of environmentally sustainable development. The social networks within informal settlements of interdependent, trust among the residents if well harnessed can lead to social sustainability in water delivery. Towards this end organized community groups can play a crucial role in mobilizing community to report cases of water vandalism, illegal connection and pipes leakages which are avenues through which water utilities loss water distributed into the settlements leading to high costs and insufficiencies. In addition the social networks in settlements that mainly operate on trust and good relationship can be good channels for payment of water bills when connections are made.

Intermediate Technology Development Group (2005) in their study report of Maili Saba in Nairobi indicates that informal settlements women are the main end users of water while they are not actively involved in its management. In instances where organized community groups are active in the delivery of water services representation of women is normally limited. It can be said at this point that if women actively participated in the management of water services, there would be reduction of chores that take up their productive time and consequently lead to reduction in urban poverty. Towards this end women involvement and participation need to be institutionalized in management processes that deliver water to residents.

2.2.4: Sustainability and Partnership

World Bank (2007) identifies partnership as a type of working relationship in which partners (owners) share with each other the benefits or challenges of the working arrangement. Partnership is an agreement between two or more parties who have mutually agreed to work together to define and address a development challenge. In addition, The World Bank identifies Partnerships as highly relevant to the promotion of human development since the Millennium Development Goals (MDGs) were adopted by the UN in September 2000. The goals became more firmly established in that role at the World Summit on Sustainable Development in Johannesburg in 2002 when over 200 partnerships were launched by national governments and other important actors in the international development sector.

A partnership is an agreement between two or more partners to share knowledge, skills and responsibilities in order to achieve, through synergy, a common objective, a better position and/or economies of scale. Synergy is the key component in partnership whose significant advantage is gained by several partners pulling their individual competencies, skills and resources to meet a common goal. A partnership does not in itself have to be sustainable but it is more likely to flourish and be productive during its intended working life if trust and respect are developed between the partners and if an even balance is maintained in the influence that individual partners have on the functioning of the group.

Partnerships can be formed, for example, between public or private bodies, NGOs or knowledge institutions, or combinations of any or all of these. There is an equally diverse range of possible objectives with different types of partnership tending to focus on specific areas of the 'objective spectrum.' North-South partnerships, for instance, tend to concentrate on capacity building with aid funding while public/private sector collaborations look more into service provision and networks typically aim to spread knowledge between partners in order to do something more effectively.

Partnership is important in delivery of water services in settlements as the areas are considered illegal and temporary while they do have great business potential for small water enterprises. In the case of Nairobi, small water enterprises are a major player as they complement the local authority in settlements by reaching up to 86 per cent of consumers not served by the water utility (Oenga and Kuria, 2006). Partnership reduces competition, encourages collaboration and development of a shared vision in meeting the water needs while accruing benefits to the water provider as well as to consumers. When

the community plays a central role in the management of water services, ownership is developed and responsibilities are shared by the various partners. Incidences of water theft, illegal connections consequently reduce with regular patrol of the water lines and timely reporting undertaken. This role is easily taken up by organized community groups in a partnership arrangement. Towards this end consumers are able to access water at affordable costs and in a sustainable manner as wastages and duplications are reduced.

Oenga and Kuria (2006) argues that partnership with CBOs, NGOs can identify pilot innovative approaches that would improve the status of small water enterprises and improve the level of service to the end users. Which include extending the pipe network and establishing meters chambers within the settlement, encouraging users to organize into water users association, providing micro-credit and linking water supply to adequate sanitation.

2.2.5: The Dublin Principles

In 1992 at meeting (The international Conference on Water and Environment) held in Dublin, the discussions gave rise to the four Dublin principles. Bauer (1996) indicates that the Dublin principles recognizes that water is a finite and vulnerable resource essential to sustain life development and environment, identifies that water has an economic value in all its competing uses and should be recognized as an economic good. Women play a central part in management of water and that water management should be based on participatory approach (Munkonge and Harvey, 2008).

Water is a Finite and Vulnerable Resource Principle: This principle has been interpreted as a requirement for integrated management, responsive to the characteristics of water resources. Integrated includes technically appropriate water management (surface and groundwater, quality and quantity, water and soil). Consideration of social needs, economic soundness and environmental requirements are implied. The ultimate goal is sustainable use and development of water resources (GWP, 2000). It is noted that there are water policies and legislation concerned with integrated water management; water quality protection; flow and landscape considerations; ecological requirements; rational and guided water use; protection of water supplies; water planning and mandatory assessment of water related subsidies.

GWP (2000) goes further to specify that there are examples of legislation specifically concerned with the needs of all citizens, the common interest, benefits of individual users and the livelihood of population. Concrete examples are often found in water supplies and that there is a concrete link of water with development

Water Development and Management principle: is analyzed under the assumption that water related activities are not confined to the interests of limited groups of users and that water supplies should be based on a Participatory Approach involving users, planners and policy makers at all level. Meaningful participation is associated to well defined national policies for which water is either a main component or a relevant input (GWP, 2000). The review of experiences strongly suggests that the institutional dimension of water management is a system, where relatively successful water management experiences have included a balance of government institutions, policies and stakeholders'

participation where a certain degree of government and occasional support is expected (Villarreal and Solanes, 1999).

Water as an Economic Good Principle: It is recognized that water has an economic value in all its competing uses. Water legislation recognizes and protects the property aspects of rights to use water, which is the manner in which law reacts to the economic concept of scarcity. Water law systems acknowledge the social and environmental dimensions of water through norms intended to protect third parties, the environment, and the resource base. There is a definite intent in most water legislation to prevent water hoarding, speculation, monopolies and waste in order to safeguard social dimension of water rights closely associated with the economic dimension. (Villarreal and Solanes, 1999). They further indicate that the economic character of water is the existence of water markets where water is charged according to its opportunity cost.

The Gender Principle: Women play a central part in the provision, management and safeguarding of water. The principle emphasizes the important link between gender equity and sustainable water management which challenges the status quo as women play a key role in water collection, for domestic use though they are still excluded from water management decision making processes (Mei Xie, 2006). This principle requires that women are involved in at planning, decision making and user levels for water management. Women ability to influence decision making is further affected by the fact that even fewer number of woman area political councilors residing at local authority where decisions are made (Munkonge and Harvey, 2008).

2.2.6: Water supplies

Rogers and Hall (2003) indicates that effective water managements require that the approaches are open and transparent; inclusive and communicative; coherent and integrative; equitable and ethical. While the performance and operation ought to be accountable, efficient, responsive and sustainable. Consequently the key principles in meeting the water needs of the poor implies that support is given in improving livelihoods, health, welfare, production, food security and reducing vulnerability to disasters. Rogers and Hall adds that pro poor water policies need to focus on listening to the poor about their priority water security needs and being accountable to them. UN-Habitat (2003) states that service delivery to poor people can be improved by putting poor people at the centre of service provision. Enabling them to monitor and discipline service providers, institutionalizing their voice in policymaking and strengthening the incentives for providers to serve the poor. Consequently this can be achieved through partnership and collaboration of various actors through an institutional framework that is responsive.

World Bank (2007) indicates that decentralization is the local level where national policy meets community needs and it requires reinforcement. World Bank adds that when local authorities are given delegated power, the means and supported to build their capacities, these institutions have the potential to provide for increased responsiveness, accessibility, affordability and transparency in water provision and management which consequently

lead to an increased participation of women, men, young people living in informal settlements in water delivery.

Oenga and Kuria (2006) notes that increased water outreach for people living in the informal settlement is mainly through new partnerships, sharing in accessing the limited water resource. This has demonstrated that water management is complex and requires a comprehensive framework with new coalitions to reach communities in informal settlements. There is need for energized, organized communities, other actors to find innovative solutions to settlements water and sanitation needs. Towards this end an informed citizenry is the frontline person to reinforce water management and conservation for supply delivery in settlement. New technologies, policy framework can increase collaboration, reduce bottlenecks; challenges experienced by various actors while traditional techniques and indigenous knowledge contributes towards enhanced partnerships and governance of water services.

UN Habitat (2003) emphasizes that the key to long-term harmony in the use of water; is cooperative and corporation arrangements of the various water actors. There is need for an integrated broad based policy framework for the provision of water and sanitation in the informal settlement that brings all water resource users, actors to share information and jointly take decision that promote partnership, governance and enhance provision of the same. In additional to that stronger, better performing governance arrangements development of conceptual models management and partnership strategies are needed to

address the fundamental responsibilities of various actors of water and sanitation in the informal settlement.

Bakker (2003) states that Governance procedures in form of laws, rules, standard setting and an effective legal and regulatory framework are important as the problem of water and sanitation is yet to manifest itself in a severe manner in rapidly growing population. To this end there is need for effective regulatory arrangements that are transparent and can be monitored in order to provide affordable water services. It is necessary that water actors work in collaboration to ensure accessibility of water services which are cost effective for people living in informal settlements. Bakker (2003) says that water governance is a process whereby stakeholders articulate their interests, input are absorbed, decisions taken and implemented while decision makers are held accountable. It may also be described as the exercise of economic, political and administrative authority to manage a water supply at all levels. Governance is understood to include not only the political and administrative institutions of local government their organisation and interrelationships but also the relationships between local government, community and civil society. McCarney (1996) notes that governance comprises the mechanisms, processes and institutions through which citizens and groups articulate their interests, exercise their legal rights, meet their obligations and mediate their differences.

According to Yeung and McGee (1986) there is need for appropriate institutional mechanism to implement reforms in water resources in order to supply the majority poor. The economic approach to water valuation would remain a challenge unless a strong

institutional framework that enables a successful transition from the prevailing situation where water delivery services are centralized to a decentralized system. Water allocation mechanisms, water user rights, and strong regulatory agencies remain part of the institutional structure to be put in place before water delivery functions well. In addition conditions required for successful water marketing are said to be in a well-defined water rights so that there is no possibility of dispute over ownership issues; Efficient administrative and management processes to offset abuses of the system and disputes over transfer of water rights and also to ensure the rights of use. While infrastructure requirements establishment allow the easy delivery of water to the end users. Towards this end the framework need to involve all users and stakeholders in the reform process and implementation. Instead of a centralized approach, where the state or agency is mainly responsible for the management and planning of water resources policies; a new institutional set up that is decentralized and community driven is essential and where all stakeholders are involved as relate to the water users, the legal entities as well as the local authority in management and planning aspects of the service delivery.

2.3: Institutional Arrangement In Water Management

The present institutional arrangements for the management of the water sector in Kenya can be traced to the launch in 1974 of the National Water Master Plan whose primary aim was to ensure availability of potable water, at reasonable distance to all households by the year 2000 (GOK, 1974). This master plan was to be achieved by the government actively developing water systems supply and providing water services to the consumers (GOK,

1999). In addition to providing water supplies, the government other roles were in making policy, regulating the use of water resources and financing activities in water sector (GOK, 1974).

In 1988 National water Conservation and pipeline Corporation was established as a state Corporation to take over management of Government operated water supply systems in 21 urban centres. The Government upgraded Department of Water Development of the Ministry of Agriculture into a full Ministry of Water and embarked on the ambitious water supply development program. Large municipalities were licensed to supply water within their areas and by 2000; ten municipalities supplied 3.9 million urban dwellers, with only two thirds of urban population having access to potable and reliable water supplies. Informal settlements water supply was much lower. This was the prevailing water law before the water Act 2002, Chapter 372 of the Kenya laws.

In the 1980s Government began experiencing budgetary constraints and it became clear that on its own it cannot deliver water to all Kenyans by 2000. Efforts were placed on finding other ways of involving others in the provision of water services other that the Government. A process that came to be known popularly as the "Handing over" which only focused on management, revenue collection but not full asset transfer. Experiences of the Government in the "handing over" led to development of a full fledged policy, the National water Policy was adopted by parliament as sessional paper No. 1 in 1999. This policy justified handing over, arguing that ownership of water facility encourages proper operations and maintenance hence water facility assets should be handed over to those

responsible for operation and maintenance. In urban centres the water systems was to be handed over to autonomous departments within local authorities. A National Task Force was established to review the Water Act, Chapter 372 and a bill prepared which was passed by Parliament in 2002 commonly referred to as the Water Act 2002. Even with the current water Act 2002 water service delivery is still characterized by inadequate access to safe, reliable drinking water and basic sanitation (K'Akumu, 2006).

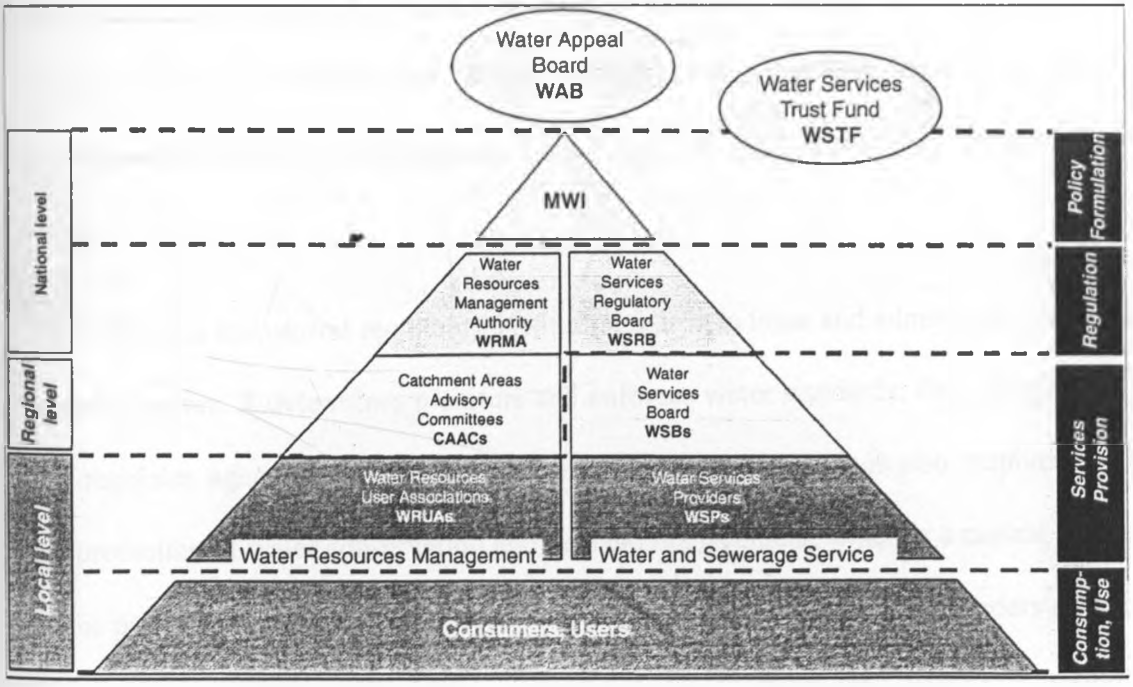
In response to the dwindling water resources in the country the government has evolved and placed water under the mechanism of market allocation where water is considered as an economic commodity that is subject to the effect of supply and demand with emphasis laid on demand oriented management. Water act 2002 water sector reforms are aimed at conserving the scarce water resources and improving the management and delivery of water services within an institutional framework. The Act makes far reaching recommendations on the management of the water and sanitation services in the country. It creates a water market where private players are expected to transact business (K'Akumu, 2006).

The Water Act 2002 has introduced comprehensive and, in many instances, radical, changes to the legal framework for the management of the water sector in Kenya. These reforms revolve around the following four themes: The separation of the management of water resources from the provision of water services; The separation of policy making from day to day administration and regulation; decentralization of functions to lower level state organs; and the involvement of Non-government entities in the management of

water resources and in the provision of water services. The institutional framework resulting from these reforms is represented diagrammatically in Figure 2.1 below.

Ministry's role on policy formulation, implementation and monitoring is enhanced leaving the detailed regulation to a number of parastatal bodies who report to boards that represent different stakeholders' interests. The provision of water services, by water service providers, both from the private and NGO sectors, is to be market driven. (GOK, 2007)

Figure 2.1: Representation of New Institutional structure for management of water Affairs in Kenya



Source: (Water Policy 2007, pg 12)

2.3.1: Roles and Responsibilities of institutions in the Water Act 2002.

In the GOK (2002), there is a separation of water resources management from water and sewerage services. It establishes two autonomous public agencies: the one to regulate the management of water resources called Water Resources Management Authority (WRMA) and the other to regulate the provision of water and sewerage services known as Water Services Regulatory Board (WSRB). The Act divests the Minister in-charge water affairs of regulatory functions over the management of water resources. This becomes the mandate of a new institution, the Water Resources Management Authority (the Authority), established in section 7 of the Act. GOK (2002) indicates that the Authority is responsible, among other things, for the allocation of water resources through a permit system. The statute also established a new institutional framework in the water economy, including a new set of organizations, namely the Water Services Regulatory Board (WSRB), the Water Services Boards (WSBs), the Water Service Providers (WSPs), the Water Services Trust Fund (WSTF) and the Water Appeal Board (WAB).

The WSRB is the central regulating institution that is to issue and administer licenses to water operators. It determines monitors and enforces water standards; fixes water tariffs; and regulates agency relationships between WSBs and WSPs. It is also responsible for the promotion of water conservation and demand management, which is a central concern of the policy reform. The Regulatory Board is mandated to license all providers of water and sewerage services who supply water services to more than twenty households. Community managed water systems therefore need to obtain a license from the Regulatory Board to continue providing water to their members. This is a departure from

the practice previously prevailing under which community water systems, unlike the other systems, operated without a license. This is created in section 46 of the water Act to regulate the water market.

The WSBs, on the other hand, are local/regional state institutions that are responsible for the ownership of water infrastructure. The law gives them monopoly as licensees for water service provision. However, the law does not allow them to operate water infrastructure. This right is reserved for the WSPs as their agents. The WSBs are also responsible for the conservation of water resources at local/regional levels. The law defines a WSP as a company, non-governmental or quasigovernmental organization or other actors like local governmental institutions that play active role in the provision of water services in a specific license area. It is an agent of the WSB to whom the latter would delegate its license for provision of water services There is an express rule that water services must be provided by an agent (referred to as water Utility) except in circumstances where the Water Service Regulatory Board is satisfied that contracting such an agent is not possible. (Republic of Kenya, 2002: 983)

WSTF is a public welfare body that takes care of those who are not covered by the mainstream water service. These would include those who are not financially or geographically favored by water distribution networks in a commercialized environment. WSTF is constituted and mandated to support the financing of water services from both public and non public sources for the underserved rural, urban areas while the Water Appeal Board is expected to handle disputes in the water sector. WAB takes care of those

who feel aggrieved as a result of the functioning of a commercialized water economy. However, instead of administering equity by distributing physical resources to the deprived as the WSTF would, WAB would administer equity as adjudicator, hearing and deciding on appeals of all those aggrieved by the decisions of various actors in the water economy.

Table 2.1: Gazetted Water Service Boards

Name of WSB	Number of districts	Area (km sq)	1999 population
Coast	7	82,816	2,487,000
Nairobi	6	40,130	5,617,000
Central	13	52,777	5,032,000
Rift valley	8	113,771	2,999,000
Northern	9	244,864	1,703,000
Lake. Victoria North	11	16,977	5,135,000
Lake. Victoria South	16	20,340	5,730,000
Total	70	571,675	28,703,000

Source: (Water sector Reform Secretariat, 2003: 6)

2.4: Implications of the Institutional Structures

2.4.1: Decentralization of Functions

The Water Act 2002 decentralizes functions to lower level public institutions. It however does not go further to devolve these functions to the lower level entities: ultimate

decision making remains centralized. The right to use water is subjected to a permit requirement. Water Act 2002 is based on a notion of law which is unitary and state-centered. Its design and operation are premised on the centrality (indeed monopoly) of central state organs and state systems in the management of water resources as well as in the provision of water and sewerage services. It makes only limited provision for reliance on non-state based systems, institutions and mechanisms. The line of management for water utilities are confused with decision making authority spread across various organizations. Municipalities which are principal water providers are answerable to the local authority ministry while on water issues they are answerable to the ministry of water. This arrangement is not effective and has given rise to conflict in management of water services and is subject to political inference, mismanagement of water utilities, services, corruption and irregular practices (K'Akumu, 2006).

More fundamentally, the new law continues the tradition of the law which it replaces of not recognizing the existence in Kenya of a pluralistic legal framework. It assumes that the legal framework in Kenya is comprised of a monolithic and uniform legal system which is essentially state centric in nature. The continued denial of the existence in Kenya of a pluralistic legal framework is in my view limiting to the success of the new law in meeting the needs of the urban poor in informal settlements who live within a legally pluralistic environment. For this purpose legal pluralism is understood as referring to a situation characterized by the co-existence of multiple normative systems all experiencing validity, (Von Benda-Beckman et al, 1997). Kenya's urban poor typically live within normative frameworks in which state based law is no more applicable and

effective than customary and traditional norms, social networks. The new water law, however, ignores this reality.

The Water Act of 2002 transferred the right to provide water from the municipalities to local/regional state enterprises (WSBs). This represents a significant change of policy as municipal governments were elected into office by the local people to manage local resources and provide local services, thus enhancing the empowerment of local communities. The state enterprises, on the other hand, have no local representation; they are just handpicked by the Minister on behalf of the state and do not feel obligated to provide the service. This has reduced community participation and involvement in the management of the water supplies in informal settlements as they are not represented in the WSB.

Water and sewerage services planning and provision is to be done through seven water services board established at Regional level as shown in table 2. Direct provision of water and sewerage is to be carried out by water service providers who are to serve as agents of the water services board. This negates pluralism and provision of water and sanitation by locally organized groups that have grassroots networks. Section 51 of the Act establishes water services boards whose area of service may encompass the area of jurisdiction of one or more local authorities. A water services board is responsible for the provision of water and sewerage services within its area of coverage and for this purpose; it must obtain a license from the Regulatory Board. The water services board is prohibited by the

Act from engaging in direct service provision. The board must identify another entity, a water service provider, to provide water services as its agent.

The Water Act has made provision for public participation. These include the National Water Services Strategy (NWSS), National Monitoring and Information Systems (NMIS) and public consultation. The NWSS (is a participatory planning unit that) aims to ensure that at all time there is water supply to all areas and to design a programme for provision of sewerage services to urban areas. This is not the case as the participatory provisions have remained a policy statement which is not known or implemented. No provision is made for its implementation in the context of commercialization operations. Public consultation at the local level are rarely held, no community representation in the planning units, boards to influence the water service development strategy. The water development does not take into consideration the existing water services; the number and location of people who are not being provided with basic water supply and sanitation; plans for the extension of water services to underserved areas. The boards are centralized and do not provide the poor with a local forum through which they can lobby and push for their right to access water supply.

The water Act 2002 does not specify how Water services Trust Fund trustees are to be appointed, making it possible to appointments serving political interests and locking out poor communities with little influence. This has made it difficult for development partners, NGOs to make contributions to the funds in joint endeavors to provide water to the poor. In paper the water Act 2002 framework is quite explicit however it still remains

centralized and does not take cognizance of local/community infrastructure already existing. There is no much effort put in sensitizing and making community aware of the new implementation framework in water services delivery.

2.4.2: The role of Non-government Entities in Water Provision

The Act envisages the appointment of private individuals to the boards of both the Authority and the Regulatory Board (GOK, 2002). Rule 2 of the First Schedule to the Act, which deals with the qualification of members for appointment to the boards of the two public bodies' states that, in making appointments, regard shall be made to, among other factors, the degree to which water users are represented on the board. More specifically, subsection 3 of section 16 states that the members of the water services boards shall be chosen from among, *inter alia*, representatives of non-governmental organizations, private individuals as well as other competent persons. With regard to water services, section 53(2) stipulates that water services shall only be provided by a water service provider, which is defined as "a company, non-governmental organization or other person providing water services under and in accordance with an agreement with a licensee [the water services board]." Community self-help groups providing water services may therefore qualify as water services providers. In the informal settlement where organized private Sector water service providers are likely to be few, the role of alternative water actors in the provision of water services are likely to remain significant, despite the new legal framework. The role of Non-Government entities in the management and provision of water services is thus clearly recognized. However, given

the state centric premise of the Water Act 2002, the role assigned to Non-government entities, particularly self-help community groups, is rather marginal.

2.4.3: The Acquisition and Operation of a Water Supply License

The right to provide water services is also subject to licensing requirements. Section 56 states that no person shall provide water services to more than twenty households or supply more than twenty five thousand litres of water a day for domestic purposes or more than one hundred thousand litres of water a day for any purpose except under the authority of a license. Indeed subsection (2) stipulates that it is an offence to provide water services in contravention of the license requirement. Consequently, community groups, alternative actors must obtain a license in order to be able to continue or commence supplying water to their members. This is likely to have far reaching implications for member based informal settlement water supplies, given the requirement for technical and financial competence, which are a precondition to obtaining a license.

Many such groups will likely have great difficulty demonstrating such competence and this may result in water service agreements being granted only to well established community groups and other organizations which have access to technical and financial resources to the detriment of local community self help initiatives. Section 57 provides that an application for a license may be made only by a water services board, which therefore has a monopoly over the provision of water services within its area of supply. As earlier indicated however the water services board can only provide the licensed

services through an agent known as a water services provider, which can be a community group, a private company or a state corporation which is in the business of providing water services.

2.5: The Main Water Actor and Alternative Suppliers in Mukuru.

The current local situation in Mukuru settlement is that Nairobi water and Sewerage Company, one of the water services providers in Nairobi under the water Act, 2002 has started a pilot project for water provision in informal settlement. The intension is to extend water supply to Mukuru Informal settlement in order to improve the living conditions and health status of the urban poor. The company has constructed 60 bulk water meters in Mukuru informal settlement with anticipation that people living in informal settlement would make applications for individual connections and increase the coverage of water and sewerage services in Mukuru. This is an attempt by the Nairobi City Council to provide an adequate reliable and cost effective water supply system within an informal settlement.

Implementation of the project was expected to improve the availability of water within the settlement, leading to better access and reduced prices for water sold at kiosks or other such outlets while providing a new pool of revenue collection for the water utility. The project has not been successful as only 1000 individual connections have been realized in Mukuru, way below the expectation of increased application for individual, alternative actors connection with bulk metering brought closer into the village. In Nairobi it is estimated that 50 per cent of the water pumped into NWSC distribution

network cannot be accounted for (K'Akumu, 2004). Water revenues from the settlements are still low due to illegal connection, burst pipes (NWSC, 2007). This pilot project success was to be replicated in other informal settlement areas in Nairobi. However the situation has been different as the pilot project in Mukuru faced challenges.

It was realized that Nairobi water and Sewerage Company the main water utility did not have the institutional and behavioral capacity to handle a project aimed at accessing water into complex informal settlements setup. There was unclear involvement of local community groups, alternative water actors in the water company's operations of bulk metering. In addition, it was not clear whether the water company and local authority were committed to the innovative approach adopted for this project which had principles of active participation of local groups. It is important to note that the price of water after partial completion of the project has remained high and during shortages water prices are almost 10 to 20 times more. This implies that the new institutional structure has not functioned well as the water cost per litre paid by other utility client with piped connection is lower than what consumers pay in informal settlements (Oenga and Kuria, 2006).

In Mukuru water was and is still accessed through two types of official water outlet namely water kiosks and individual connections. An assessment conducted before the start of the pilot project by NWSC confirmed that an estimated 85 per cent of Mukuru residents obtained their water supplies through water Kiosks and individual connections. The vital roles played by the small-scale alternative actors was not fully appreciated prior

to the initiation of the project, however the attitude and behavior of local authority is considered by many to be the greatest hindrance to private sector participation in Mukuru. It has been difficult to pass decisions aimed at improving distribution networks, billing, metering and putting together a coherent and sustainable system involving the various interested parties (Weru, 2000).

It is alleged that City Council workers collude with unscrupulous persons to frustrate officially recognized connections. The lack of an agreed tariff has also been a major stumbling block to a more constructive involvement of alternative water actors as the water services provider have to refer to other institutions like the water services board to agree on pro poor water tariffs. This reinforces the centralized systems in the current water Act 2002 structure leading to delay in decision making. The new water structure has ignored pre-existing systems of alternative water actors, multi players used in supply of water in complex informal settlements. It is important to build on experiences of alternative water actors and institutions rather than replacing them with new structures that are much more unlikely to be successful than the case is now.

Suggestions put forward in an effort to resolve some of these problems were that connection would be implemented through a community based vetting system. Such a move would ensure that the responsibility for policing the lines was vested in the community. Furthermore, this procedure was intended to ensure that no illegal connections would be tolerated, as the people would have information on designated areas for public standpipes or connections. It was suggested that in order to play this vital

role the community would need education on a whole range of issues and aspects pertaining to the new procedures and structures for water management. A more transparent organization and operation at the grassroots level was viewed as the first of a series of necessary steps to curtail the underhand dealings at higher levels. However this action has not been comprehensively put into practice.

In Mukuru there are power structures within the community that benefit from the opportunities for rent-seeking associated with the existing water supply system. There are vested interests within the local administration, to some extent embodied in the positions of the village elders. Therefore any new entrant who does not recognize the role played by these leaders is likely to have a difficult time, as the leaders may have the power to incite the residents to go against the new investors. The new water management structure is not cognizance of such informal social structures at community level.

Both the control and use of land are critical to the welfare of local residents. Land allocation has been a contentious and politically *'hot'* issue in Mukuru, often accompanied by accusations of *"land grabbing."* The water Act 2002 management structure does not consider the irregular land issues in informal settlements as open for negotiation. However, for the residents, water provision in itself is seen as increasing their security of tenure. While tenure insecurity inhibits local infrastructure investment, external investments in infrastructure is taken to signal greater security of tenure in Mukuru.

In Mukuru the water Act 2002 is not clear on roles of the various water and sanitation actors/ stakeholders as detailed implementation policy framework is not in existence. This leads to limited promotion of partnership, governance in enhancing water and sanitation in informal settlements. The NGOs and CBOs operating in Mukuru informal settlement have not found clear roles to play and are obviously frustrated. The Water Act 2002 structure is not very explicit in transparent control or regulation in the provision of water and sanitation and the competition that was expected has not materialized, there is a likelihood that services will deteriorate, water distribution will be poor and the price of water will remain high. The structure has virtually not facilitated improvement in the distribution of water and sanitation or water prices reduction in Mukuru.

The structure does not take great exception on the community perception of partnership and privatization of water and sanitation services where the efficiency of the private sector can be combined with the responsibility of the public sector leading to good public-private partnership. It is important to have an accurate and sensitive understanding of the local situation, and a clear commitment to creating a responsible and efficient partnership, to make public-private partnerships work for low-income communities.

2.5.1: Chamber Water System in Mukuru

According to Nairobi Water and Sewerage Company (NWSC) a total of 67 meter chambers have been established in the 12 villages of Mukuru apart from tetra pack village a newly established village in Mukuru. The chamber system is a process where

NWSC takes water to a specific location using a main water pipe which is teed and several meters located in a single Bulk chamber which is locked and secured with NWSC keeping the keys. A chamber may have about 20 to 25 meters which belongs to individuals able to enter into contract with the water company.

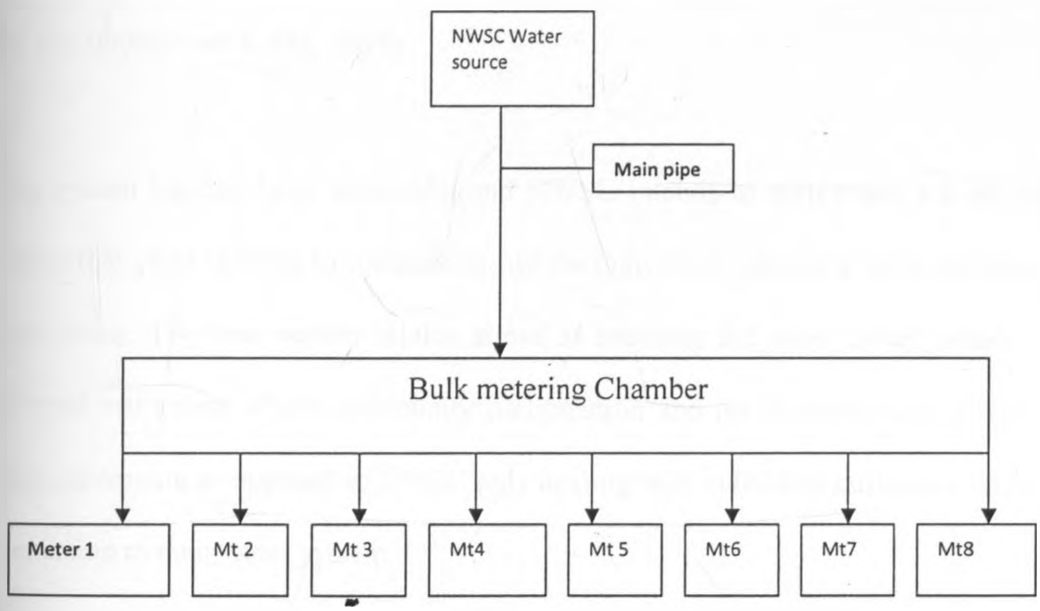
The meters in the chambers are for individual connections and apart from NWSC taking charge of securing the meters in the chamber the alternative water actors do not receive any water subsidy in distributing water to complex and constrained informal settlements. Alternative water actors are not recognized as significant actors in the delivery of the service. All other customer relation, water prices, mode of payments are similar to what other individual water connections in other neighborhoods experience.

This system has experienced some challenges during its implementation. Billing of the water used per water meter in the chambers takes several months to prepare and when bills are delivered it normally find when customers have no funds to pay the accrued bills as informal settlements operate on a cash money economy and payments of utilities are done on a daily, monthly basis. This has led to frequent water disconnection to the customers who consequently do not pay the bill to warrant reconnection hence most of the individual metered connections remain disconnected (NWSC report, 2007)

In some instances the locked chambers are tampered with by the individual customers who open the chamber turn off some meter leading to unfair competition where only a few individual are able to provide water in the settlement. This easily pushes the cost of water as the demand becomes higher than the available supply. Occasionally some

collusion occurs between employees of the water company and some customers who ensure the water is turned off leading to unfair competition by limiting the water supplies. The NWSC water chamber is indicated in figure 2 below.

Figure 2.2: NWSC Water Chamber



Source: (NWSC report, 2007)

Participation of the community is limited on the management of water and its supply in Mukuru as the relationship is purely on individual relationship between NWSC and the customer connected. Vendors, alternative water actors with metered connection to NWCS water source often increase the price of water they sell to inhabitants of Mukuru. NWSC

does not control the price of water distributed in Mukuru as long as their billed water is paid by individuals customers all is expected to be okay however there exists a gap in the Water Company connecting to its end users who are the poor communities in Mukuru (NWSC, 2007). The Mukuru residents are not able to access water at affordable rates as water price fluctuations remain a regular occurrence and water cartels easily take precedence in the settlement. Mukuru residents as the case is in most slums pays as much as 10 to 20 times the cost paid by other customers having individual water connection in the city (Oenga and Kuria, 2006).

This system has not been successful and NWSC intends to review and set up a better system that yield benefits to community and the individual customers while driving water costs down. The new system is also aimed at breaking the water cartel system in the informal settlement where community participation and involvement is expected to be made paramount as opposed to NWSC only dealing with individual customers with direct connection to their water system.

NWSC proposed new model of Delegated management/ Bulk Kiosk model in Mukuru is a combination of individual connection and an introduction of delegated management whereby Bulk metering will be made to a single entity commonly known as bulk Kiosk with a single meter after which the single entity will make connection to individual who will also be metered however the Kiosk owner will be responsible for collecting the water bills utilized by individuals at individual connection and make single payment to NWSC at the bulk metering. NWSC would be dealing with fewer entities as opposed to the

situation now where they have several individual customer relationships which also lead to delay in the billing system.

In the proposed system the water company would sell the water to the delegated Kiosk owner who then connects other individual customers and if the individual customers in the current Chambers system (individual connection with NWSC) are disconnected they have an opportunity to get water from the delegated manager at Kiosk point and pay the operator directly. NWSC will also regulate the prices at which the Kiosk owner (on delegated responsibility) would be selling the water to slum dwellers. There is proposed increased participation of community members in order to ensure that the water provides benefits to both NWSC and the slum dwellers. In the current model there is no much provision for community benefit but pure customer-supplier relationship at market operations while the desirable model is one where active community participation and involvement is envisaged (NWSC, 2007).

The proposed delegated system in settlement is not adequate and there is still need to modify the proposal to a desired system where, provision of water to an informal settlement like Mukuru would take cognizance of pro poor facility. The water Act 2002 legal framework of water provision need to conceptualize and develop with the goal of providing essential water services to poor communities as well as other able community groups. The poor residents need to be involved at all phases of the practice and policy implementation. This is not the case in the current water Act and no much clarity on pro poor tariffs given. The water consumers need to be the decision-makers in the process

since they will choose what appropriate Water connection scheme to be applied to their community as the case is in Philippines where poor communities actively participate in organizing and mobilizing the community and in structuring the collection arrangement for the area. They also assign or elect representatives or officials who are responsible for the supervision of the communal water system (Jennings and Rosenweign, 2000).

2.6: A Case Study on Water Provision for the Poor Communities in Philippines

UN-HABITAT (2003) report indicates that there is a growing consensus that in order to achieve delivery of water services to the poor, water service providers need to be more accountable to low-income dwellers otherwise pro-poor measures are unlikely to be implemented or sustained. Service delivery to poor people can be improved by putting poor people at the centre of service provision, enabling them to monitor and discipline service providers while amplifying their voice in policymaking and strengthening the incentives for providers to serve the poor (World Bank, 2003).

Jennings and Rosenweign (2000) indicates that practices from other countries on how Community systems are integrated into official wider systems are analyzed giving the case of water for the poor communities in Philippines. In this system there is water for poor communities (WFPC) program that supplies water to the poor areas of Manila (Philippines) through Manilla Water Company (MWCI) which is a private concessionaire that operates, manages and maintains the waterworks and sewerage facilities for the East area of Manilla. The water for poor communities program in Manilla launched in 1998

has since implemented 438 projects, benefiting more than 700,000 urban poor residents. Of the total 218,000 households connected by MWCI within its service territory, from 1997 up to July of 2004, almost half fall under the Water for poor communities (WFPC) programme. The WFPC has allowed MWCI to comply with its service obligations under the Concession Agreement, and gain the general public's support for its participation in the delivery of water services.

In Mukuru it would be important to formalize relationship between alternative water actors and the water utility as this would give the utility more power to monitor operations of the multi players, enhance partnership and collaboration hence improvement in the management of water supply in settlements.

The WFPC programme has enabled poor households to easily connect to a piped-in water supply by easing land title requirements. It has relied on the strength and enthusiasm of community-based organizations and local government units to provide water services to depressed areas. The practice also introduced flexible financing schemes and water pricing which stagger payment of connection fees, allow cost sharing among residents and give average water rates for bulk connections among other incentives (Jennings and Rosenweign, 2000). For Mukuru a flexible financing scheme needs to be established in order to enable multi players meet the cost of initial network construction and important that the alternative actors are given incentives like concession agreement in order to provide water in the settlement. The activation of the water services Trust Fund that is responsible to the local residents is desirable in order to provide water to the poor.

To make the water Act 2002 function well in informal settlement and address needs of the poor, certain policy changes need to be adopted by the Nairobi water company in implementing the pro poor water programme where social tariffs are charged rather than commercial tariffs. This social tariff may be used to ensure the poor get water in instances where charges based on full cost recovery may be too expensive as low income households generally consume low volumes of water (K'Akumu, 2004). The social tariff can price the first block of consumption cheaply with consequent blocks becoming progressively expensive. The poor can only benefit from this policy instrument if they can command influence in the Water Services Regulatory board where tariffs are determined but as the current situation is these appointments are open to political manipulation.

The connection application requirements (land title, plot number requirements) need to be waived since most of the alternative water actors live in the informal settlement which lack ownership title, plot numbers to the land or permission from public and private owners of the land. In the MWCI situation Connection fees were allowed to be paid in installments, enabling poor customers to easily connect to the piped water service with the local government providing subsidies (Jennings and Rosenweign, 2000). This is a framework that can also be applied in the case of Mukuru in supporting new entry of alternative water actors seeking connection to the water utility.

The WFPC program in Manilla has shown that active involvement and cooperation of community-based organizations and local government units can bring basic services to

the consumers, particularly the poor people. The programme has also illustrated that there is no single model that will be effective in all settings. Flexibility and innovation are hence important factors to consider. Moreover, the programme has demonstrated that better access to potable water services results in increased water consumption, translating not only in better return for the concessionaire but also in improved public sanitation and hygiene. It has also proven that the willingness-to-pay of low-income households for essential public services is high and that flexible financing schemes for water multi players will enhance access to piped water supply in settlements. Through the WFPC, it was also realized that profit making companies could derive financial benefits from socially oriented endeavors which keep operating costs low. It was also noted that direct revenues may not necessarily be substantial but savings in terms of improvement in non-revenue water levels are quite significant (Jennings and Rosenweign, 2000).

One problem encountered in the Philippines case, however, is the tendency of community leaders or representatives to overcharge residents in collecting individual water payments. The MWCI is now exploring the possibility of recommending a cap on water rates chargeable to MWCI consumers, taking into consideration their actual water consumption. Relaxing technical and institutional requirements such as the waiving of land title requirements and allowing installments in connection fee payments has been very helpful to reduce connection costs and pave the way for regularizing illegal connections, particularly in informal settler communities which, in turn, resulted in reduced non-revenue water.

2.7: Conceptual Framework for the Provision and Management of Water and Sanitation in Mukuru

The foregoing literature review has revealed that rapid urbanization in Africa, Asia tend to be characterized by sprawl of informal settlements as well as the problem of water and sanitation management which is beyond the ability of the local authority to provide. In the context of this study and by drawing experience from the pertinent literature already reviewed, it is noted that rapid urbanization, a weak local authority, poor planning and uncoordinated interrelationship between multi-players in the urban water supply in the informal settlement, is occasioned by inadequate community participation. These are among the notable factors undermining promotion of partnership and good governance towards enhancement of water service delivery in Mukuru. This equally reveals the research gap that this study seeks to address. The demand and supply of water services is influenced by various factors that are intertwined and sometimes difficult to isolate.

The philosophical concern is that increased demand for urban water services arising from increased population, their levels of affluence and effect of water demand and increasing scarce resources form the bedrock of any efforts to deliver and manage water services. There is need to adopt a holistic approach in planning policy concerning water and sanitation management in the study area. Therefore the framework seeks to incorporate the strengthens of the traditional approach of water delivery by alternative water actors, water service deficit in settlements as well as those of demand side management which address the promotion of partnership and good governance towards enhancement of

water service delivery. Water governance provides the framework within which water service management is carried out and harnessing local and external partnerships in delivery of water services. To attain efficiency in water management, it is conceptualized that all round policies that would encompass community participation, multi-actors partnerships, information sharing, sound legal framework and adequate operational capacity among others should form the basis of water delivery management by the multi-actors within the study areas.

Effective pro poor water legislation would allow for increased accessibility of water in settlements while flexible financing schemes for alternative water actors willing to apply for metered connection would make the process easier. There should be in place policy that is people oriented, inter agency approach in planning, implementation and management of water supplies. The principles of multi actor partnership, ownership responsibility, transparency and accountability are crucial in water supplies. To manifest these principles the focus need to focus on development of integrated capacities of all actors through resource mobilization, recovery and effective operational capacity through devolution of management responsibilities to the lowest level. Community participation, improvement of decision making and general capacity building for local groups and alternative actors are policy areas to be included.

The community would show interest to participate in management of water supplies when they are able to access water and at affordable price. Consequently leading to public health safety, cleanliness and environmental safety. Flexible operation schemes

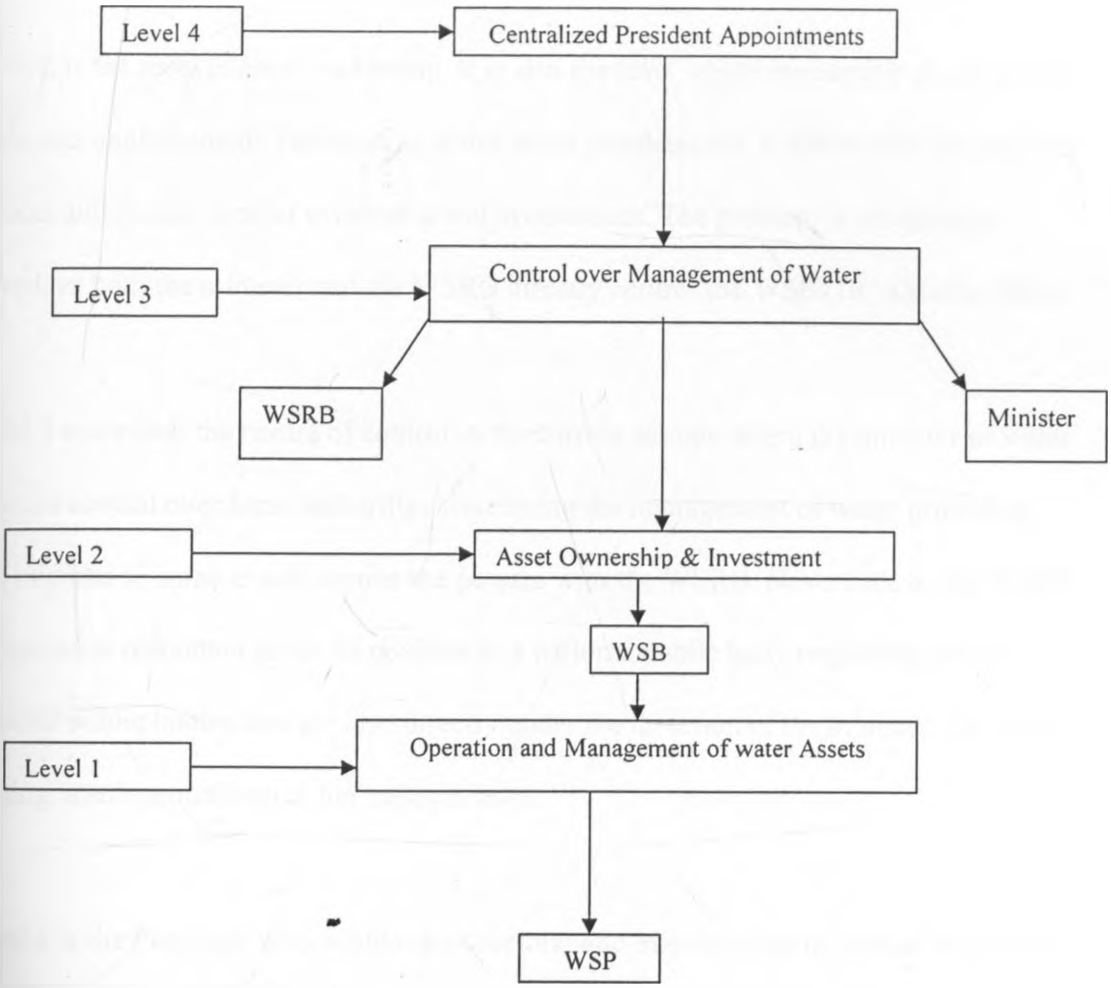
would ensure alternative water actors are able to have easy entry into metered water utility connection. Further leading to income earning opportunities for the alternative actors, employment opportunities for residents and open up discussion on regularization of informal settlement.

Institutional aspect of integrated water services management and planning should be based on a participatory approach involving users, planners and policy makers at all levels. Institutional planning approaches should have in place legal and restructuring plan, water utility, alternative water actors involvement plan, financial plan, public participation plan and capacity building in urban water services. Planning need to start at community level where local water plans are discussed compiled and shared with water utility, alternative water actors. End users of water services, alternative actors in the framework would need to play a significant role in the planning, implementation, and operations of water supplies through the public, private participation plan.

Operational planning approaches would lead to increased water connection to alternative water actors, establishment of planning information systems that integrate slum upgrading to water services. Active community participation would create a working partnership between alternative water actors, water utility leading to reduction in water loss, illegal connection, hence ensuring accurate and effective billing systems. The implication of such an institutional framework would imply increased accessibility of water, affordable water costs and development of a model for promotion of partnership and good governance towards enhancement of water services in informal settlements.

A combination of these policies in the context of the aforementioned elements of public interest should be carefully inculcated and entrenched into the water services management process. The product of this synthesis should be an integrated water services management and planning strategy, which strategically envisions two broad planning approaches namely institutional and operational planning approaches. The focus should be to keep the management and operationalization of water service delivery within the sink capacity of the study area. This would require concrete set of policies and strategies that are not only socially inclusive but also capable of ensuring that the benefits of better water services in informal settlements will be sustainable in the near and long future through the priority areas for action. Figure 4 attempts to dramatically show the policy areas, elements of public interest, institutional and operational planning approaches.

Figure 2.3: Existing Institutional set-up for water supply management in Kenya.



Source: (Researcher, 2008)

2.7.1: Existing institutional structure

Figure 2.3 is a schematic presentation of the existing institutional structures of the water sector. Level 1 is the point of service provision (i.e. operation and management of water

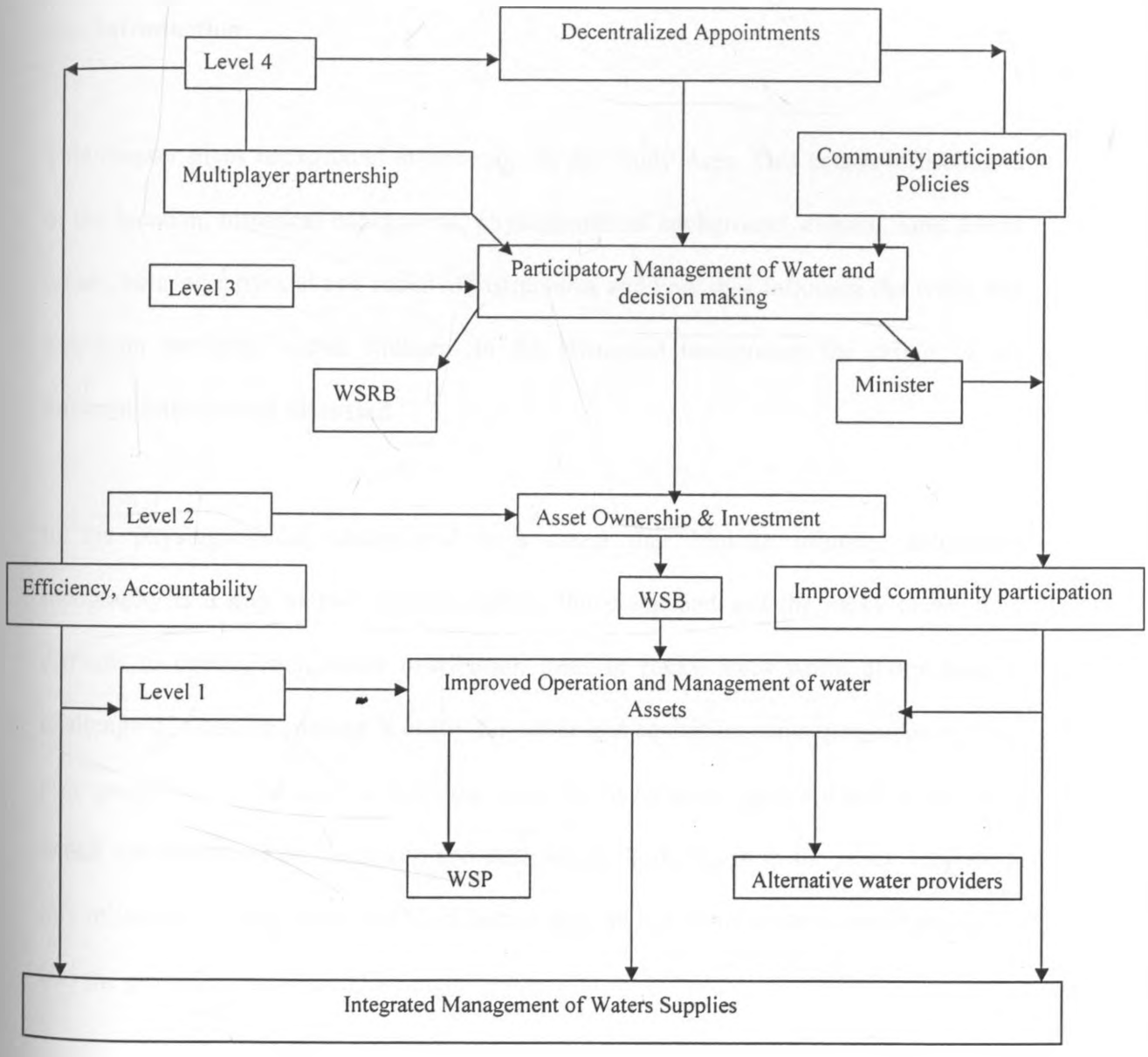
assets). This responsibility is taken over by WSPs, which are public owned limited companies or utilities.

Level 2 is the level of asset ownership. It is also the level where investment decisions are made and implemented. The existing water setup mandates the WSBs to take the position of local authorities in asset ownership and investments. The problem is not clearly solved, as both the minister and the WSRB directly control the WSBs (K'Akumu, 2006).

Level 3 represents the centre of control in the current set-ups where the minister of water exercise control over local authorities concerning the management of water provision. The minister to some extent, shares the powers with the WSRB. Nevertheless, the WSRB is somewhat redundant given its position as a national public body regulating seven regional public bodies that are also directly under the direction of the minister. Decision making is still centralized at the national level.

Level 4 is the President who wields inter-sectoral and inter-ministerial executive powers and could have overall say, directly or indirectly, over matters of water management. Unlike the minister, the President has a limited direct the WSRB apart from appointing its chairman. The minister on the other hand singly appoints its twelve board members and gives it directions.

Figure 2.4: Suggested policy framework



Source (Researcher, 2008)

CHAPTER THREE

BACKGROUND INFORMATION ON THE STUDY AREA

3.0: Introduction

This chapter gives background information on the Study Area. This entails a discussion of the location, historical background, physiographical background, climate, land tenure issues, housing, physical and social infrastructures and how they influence the water and sanitation provision within Mukuru. In the Historical background the origin of the informal settlement is discussed.

In the physiographical background it is noted that Mukuru informal settlement topography is a mix of two features namely the plain land and the rocky areas. It is difficult to construction water distribution lines in rocky areas while plains have a challenge of flooding making it costly for water and sanitation constructions as heavier pipe gauge have to be used to distribute water. In rocky areas pipes are laid on surfaces which are vulnerable to vandalism and destruction. Soils found in the study area are a mix of volcanic, rocky areas and black cotton soils do not allow water to percolate easily into the ground (Obudho and Onyango, 1990).

The black cotton soils soaks in water during the rainy seasons making the area inaccessible. Some parts of Mukuru have well drained soils which are conducive for

water piping and the area is served with water from the city Council. The water table is high leading to pollution of water sources; this is mainly caused by the high population and latrines which are constructed very close to water sources like the hand dug well and water pipes laid next to pit latrines. Much of the original vegetation has long disappeared due to long history of settlement with trees cut down to make space for buildings, construction and fuel among others (NWSC, 2007)

Nairobi generally receives a maximum of 1570mm rainfall in a year (Ojany and Ogendo, 1988) with moderate humidity and a good flow of air in the higher grounds. The plain where part of Mukuru is located has higher temperatures and humidity as there is limited vegetation cover to offer cool air. In settlement houses are built of corrugated iron sheets and are too close to each other. This limits the amount of Air flow in the settlement, reduces air speed as there are building in every space and air ways blocked (Obudho, 1987).

3.1: The Study Setting

Nairobi which is the capital city of Kenya extends from the foothills of the Aberdares in the north, to Ngong Hills in the south and from the Embakasi plains in the east, up to the slopes of the Great Rift Valley wall in the west. Four main rivers flow from west to east through the centre of Nairobi. The Mathare River lies furthest to the north, and enters the Nairobi River just downstream of the City Centre. The Motoine River lies to the south of Nairobi River, and becomes the Ngong River downstream of Nairobi Dam where

Mukuru informal settlement is found. The Ngong River flows into the Nairobi River east of the city (Hide et al, 2001). Nairobi lies at the southern end of Kenya's central agricultural/highland heartland; the city lies on the Nairobi River in the south of the nation, and has an elevation of 5450 feet (1661meter) above sea level. The city is located at the coordinates 1°16′S 36°48′E and occupies around 694 km² (Foeken and Mwangi, 1996).

Mukuru informal settlement covers 38.8 km² which is approximately 17.6 per cent of the total surface area of Nairobi. It is one of the informal settlements that have limited data as minimal research has been conducted in the area. Mukuru informal settlement is situated about 10km outside the City of Nairobi on the Southern part adjacent at the heart of Nairobi's largest industrial zone. Administratively Mukuru informal settlement transverses two constituencies, Embakasi and Makadara constituency, located in the Industrial Area Sub-Location, Mukuru Location, South of Nairobi (GOK, 2003). The total estimated population is 600,000 with a population density of 12.486 persons per square kilometer (GOK, 1999). The main ethnic groups in Mukuru are Kamba, Kikuyu, Luyia, Kisii, Luo, Masai, and Somalis/Borana making the community a cosmopolitan community.

There are 4 main villages named after persons who first settled in the area namely Mukuru Kwa Njenga, Mukuru Kayaba and Mukuru Fuata Nyayo and Mukuru Kiwi Reuben. Others include Mukuru Sinai, Kings tone, Kwa Rhoda, Mukuru Kware, Commercial, Lunga Lunga, Marigoini and Uchumi. Mukuru informal settlement is

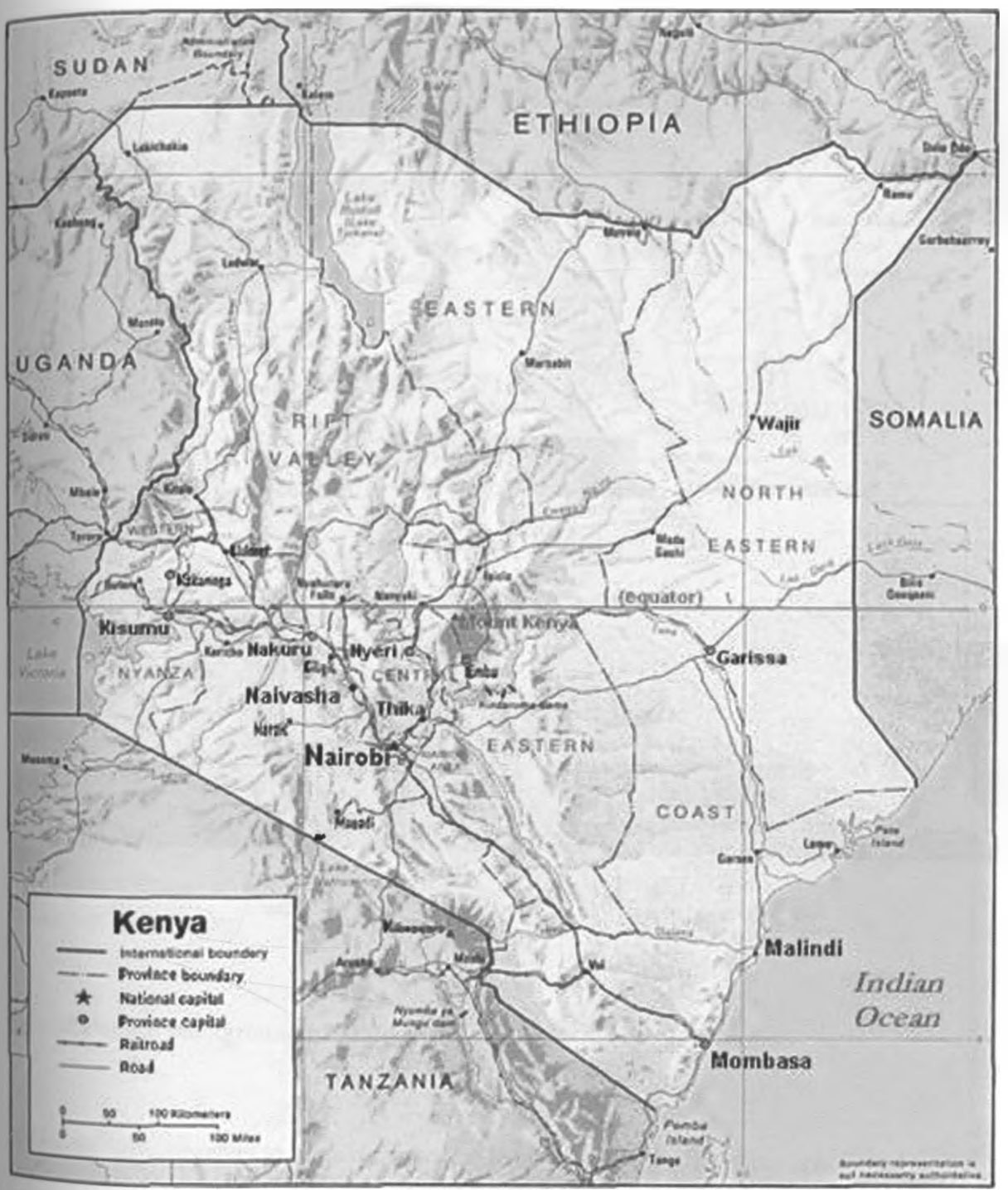
sandwiched between the industrial area and middle level residential area of South B in Makadara division and Fedha Estate in Embakasi division. The informal settlement can be assessed from South B shopping centre on the East; the roads in Mukuru are narrow following encroachment of structures into roads and the roads are not paved. There is an open drainage that was designed to collects runoff water from the upper part of the informal settlement in South B into River Ngong next to industrial area. To the west Mukuru informal settlement is bordering the industrial area and is accessed by Enterprise Road through a foot path in Mukuru Sinai. Roads are narrow not paved and only accessible on foot. A foot Bridge links industrial area to the western part of the informal settlement (GOK, 2003)

Mukuru informal settlement developed as the case is with other settlements, without urban planning taking place or infrastructural facilities of water and sanitation provided for (Nzioki, 1988). The informal settlement sprawled out of a need to secure resident next to the industrial zone for casual laborers seeking employment. Individuals built temporary structures and rent the units without necessarily providing water and sanitation. The local authority reinforcement of city by laws has also been weak leading to unplanned structures with no water and sanitation to support their existence (Obudho, 1987).

Mukuru informal settlement has a generally poor living and environmental standards coupled by lack of proper education, poor sanitation and housing system, immorality, low economic power and unemployment. The local authority does not recognize this area as a

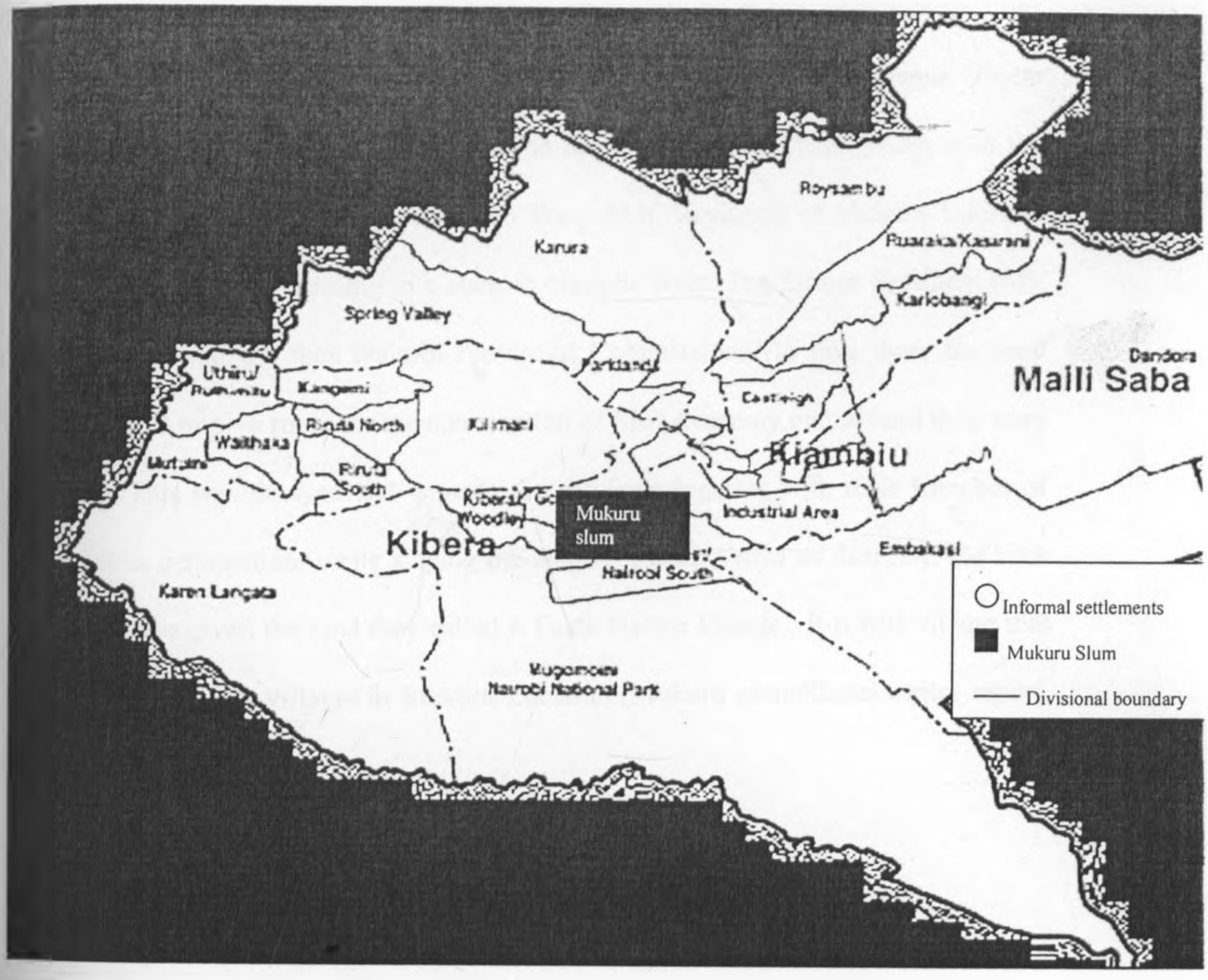
formal settlement and therefore, does not feel obligated to supply water, electricity and other basic amenities such as health care centers and schools. The settlement is characterized by poor housing which are built of sub-standards materials, the houses are one roomed mud or galvanized iron sheet dwelling (GOK, 2003)

Map 3.1: Nairobi in the National Context



Source: (Survey of Kenya 2005)

Map 3.2: Mukuru informal settlement in the Regional context



Source: (Survey of Kenya, 2005)

3.2: Historical background of Mukuru

The term Mukuru refers to "an old person" in Kikuyu language. The name is believed to have been derived from an old man who used to cultivate around Makadara Division now known as Mukuru Fuata Nyayo in the late 1974 to1976 and people used to call him

'Mukuru', thus the origin of the settlement name. Mukuru slums started in the late seventies at Mukuru Fuata Nyayo with most settlers working at the industries/factories within industrial area and residing in the area. The name Fuata Nyayo means '*Fuata Nyayo za Moi'* "Following the footsteps". The name Nyayo was synonymous with the former president of Kenya Daniel Toroitich Wrap Moi. Residents of Mukuru Informal settlement were initially residing in a slum in Nairobi West. The former President (Mr. Arap Moi), ordered the then Nairobi Provincial Commissioner to give them the land behind South B to give room for the construction of Moi Academy on the land they were occupying. This was delayed and it made the residents together with their Member of Parliament to demonstrate while singing the slogan '*Fuata Nyayo za Moi'*. At the time when they were given the land they called it Fuata Nyayo Village. It is this village that gave birth to all other villages in Mukuru Location (Mukuru promotional centre report, 2005)

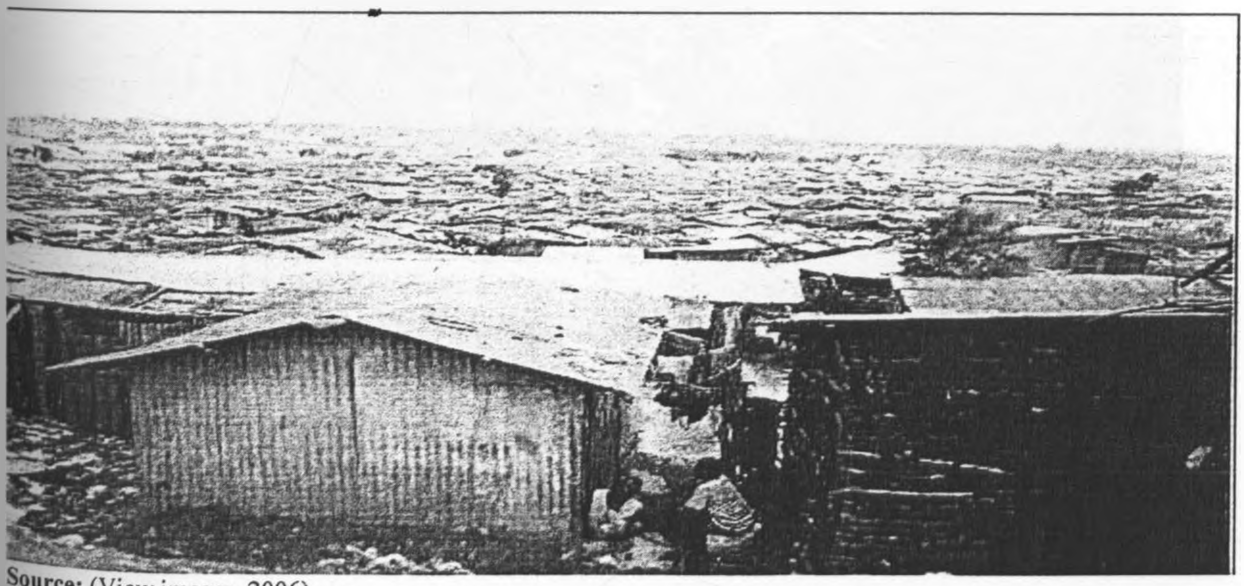
3.3 Housing in Mukuru

The settlement experience extreme poverty, disease, low literacy and high rate of crime. Families live in corrugated iron shacks measuring 10' by 10'. Large families are crammed into this tiny space to survive (Adler, 1995). The structures have an average of five people in each unit. The lay out of the buildings is disorderly and buildings are constructed of scrap material, corrugated iron sheet, mud and wattle (GOK, 2003). The people residing in Mukuru are landless, some were pushed from their rural homes by famine, tribal and land clashes. Others are refugees driven out their countries by civil

war, while others were former street families. There are also unemployed graduates who seek cheap housing as they struggle to look for employment. Apparently, these houses belong to people who the informal settlement dwellers refer to as landlords. The landlords own the structures on the land and which they put up using cheap materials for the housing and commercial occupation. The landlords do not live within the slums and only send their agents to collect the rent on their behalf. They are only seen when there is a fire outbreak as they evaluate the damage and put up new structures immediately (Weru 2000).

The basic and essential infrastructure and facilities like water, health-care that support the housing unit are either lacking or inadequate due to poor planning and maintenance. The informal settlement experience flooding when Ngong River overflows during periods of high rainfall consequently leading to destruction of housing units and outbreak of diseases (GOK, 2003). The housing units are represented in plate 3.1, 3.2 below

Plate 3.1: Aerial picture of Mukuru informal settlement



Source: (View images, 2006)

The structure owners are only interested in optimizing the income from their structures and hence construct as many rooms for rent as possible. This is clear from the settlement patterns shown in plate 3.2 below, where there is virtually no open space, very few roads and large-scale structures encroach on the roads and footpaths. Compounds consist of barrack-like structures with small rooms of ten square meters each under a common roof.

Plate 3.2: Structures and alleys in Mukuru

Source: (CHILDAID international, 2006)

3.4: Land tenure in Mukuru

The tenure system in Mukuru as is the case in most slums is shaky and volatile with the land occupied either belonging to the government, private individuals, dumpsites, unused quarries, water ways and buffer zones (GOK, 2003). According to the GOK report (2003) land-ownership is a complex issue in Mukuru with no legal system of permanent allocation of land. The chiefs (appointed by the government administration) issue temporary occupation licenses which can be revoked at any time by the government. The chiefs determine, at their discretion who may have a temporary occupation license and at what price, thereby establishing a system of patronage (Weru 2000). Because of the informality, one is prohibited to build anything other than temporary structures. This usually means mud-and-wattle houses with galvanized iron roofing at best. The most common form of tenancy is illegal room rental from (illegal) landlords/structure owners. Over 80 percent of informal settlements are tenants; owner-occupiers are minimal at less than 10 per cent (Weru, 2000).

3.5: Water Pollution.

Mukuru Kayaba, Mukuru Kwa Njenga like all slums in the city is located on the riparian reserve land along the Banks of Ngong River. One very negative impact of the open access to the riparian reserve is that the river becomes the recipient of refuse form both people and industries (Khroda, 2002). Ngong River is subjected to extreme levels of pollution ranging from raw domestic sewage, to industrial waste. Ngong River that flows

between the Industrial Area of Nairobi and South B is heavily polluted as houses are built up to the river banks with solid and liquid waste directed into the river (UNDP, 1997). In most cases, solid and liquid waste are discharged directly into the river system having undergone no treatment whatsoever, thereby severely damaging the river ecology as well as posing serious risks to human health. The river is considered an environmental health hazard due to the high discharge pollutants in vast quantities and high concentrations directly into the river water. This may be done intentionally or as a result of faulty sewer lines, which require unblocking or upgrading. The pollutants produced here are usually rich in toxic chemicals and heavy metals, as well as high concentration of organic and human waste (Khroda, 2002).

The size and growth rate of unplanned settlements along the river; Lack of sustainable support from the Local and National Government to curb pollution of water bodies, Lack of coordination between the different actors of water and sanitation, (Olago & Aketch 2001, Issaias 2000, Krhoda 2002). This has led to increased pollution of ground and surface water pollution and a major contribution to water related illness in the informal settlement.

Water supply to the settlement is inadequate, limited, not reliable and costly. The type of water provided in the area varies from stand piped water, shallow well. The average cost of water is Kshs 5 to Ksh 10 per 20 litre Jerrican and the average distance to water point is approximately 100 meters (GOK, 2003).

3.6: Economic and demographic profile

Today Nairobi has a population of about 3.5 million people, Mukuru with an estimated population of 600,000 and population density of 12.486 persons per square kilometer. Sixty percent of Mukuru population is below 16 years of age (GOK, 1999). Mukuru is a densely populated informal settlement that is fast growing. Space is valuable that landlords prefer to maximize rents by building rooms rather than provide water to tenants. The Tenants have little incentives to invest their own resources and are often not permitted to modify any infrastructure or construct facilitates without the approval of the structure owners. Those who do invest may forfeit any compensation should they relocate or be evicted. This has made it much more difficult for individual connection of water to informal settlements (Mitullah and Kibwana, 1998).

There is a strong correlation between amount of water used and the economic ability of the residents. Informal settlement residents mainly dependent on public water kiosks, water vendors, alternative water actors to deliver water supplies. Therefore residents restrict their water purchases to levels that are barely adequate. There is currently little regulation on water delivery services with water quality, availability and price varying substantially (Lamba 1994).

The city has a growing problem of water supply which has its roots in the original choice of the site. Nairobi was not originally planned to be a large conurbation and the available water resource was sufficient only for a smaller population. To meet the growing

demand, water has to be pumped from locations outside the city. However, apart from occasional water shortages, especially during the dry seasons, the basic problem has been one of distribution which has its own cost implications (Syagga et al, 2001)

Table 3.1 population 1999 -Mukuru area

	MALE	FEMALE	TOTAL	NO.OF HHLD	AREA SQ.KM	DENSITY
Mukuru Viwandani	36,501	22,796	59,297	22,158	11.4	5,201
Viwandani	20,473	12,552	33,030	13,075	5.8	5,695
Mukuru Nyayo	18,936	17,296	36,232	10,224	2.3	15,753
Kwa Njenga	36,165	25,791	61,956	22,328	14.4	4,303
Kwa Reuben	26,214	18,490	44,704	16,139	8.5	5,259

Source: (GOK Census, 1999)

Implication of this demographic profile on water delivery is that water requirements are expected to increase substantially and if the population growth is not controlled, more investments injected in water provision or supply well coordinated the problem of water and sanitation management will manifest in severe manner. Water infrastructure development is an expensive venture beyond the ability of fragile local authority to provide and external financing is necessary to meet the ever increasing demand (WWP, 2002).

It is projected that the number of people with access to water supplies will decline while quality of water and sanitation is likely to reduce as the increased population, congestion

in the informal settlement will put more pressure on the already constraint water service delivery. Inhabitants of Mukuru informal settlements will have to pay more for water and sanitation (between 3 and 30 times) than the average city citizen and the rest of the city residents while expounded by, the health hazard of having to use insufficient and unhygienic sanitation facilities unless the multi players, alternative water actors in the provision of water and sanitation work in partnership to reduce duplication, wastage and conflict of interest brought in a framework to enable pulling of resources, harmonization, coordination and building of partnerships which leads to increased water accessibility and affordable prices (Oenga and Kuria, 2006). The urban informal settlements will not be abolished in the foreseeable future; hence the need for policy makers, professional and development partners to introduce permanent reforms that meaningfully respond to the water and sanitation needs of the poor people living in these areas still remain necessary and important (Weru, 2000) .

3.6.1: Livelihood Systems and Economic activities:

Mukuru has turned into a high density slum with increased unemployment rates. The neighborhood houses mostly lower income citizens (factory casual labourers) living on less than or US dollar $1 per day (GOK, 2003). The majority of the slum residents are either unemployed or employed in the informal sector. Other residents depend on the adjacent factories and manufacturing industries, where they work as casual laborers. The casual laborers are relatively low paying jobs, earning between Ksh 50/= to Ksh 150/= per day, Others operate small-scale green grocery business selling vegetables and fruit or

hawking various items along the road, operate salons/barbershops, small kiosks or engage in washing clothes/housework at the neighbouring South B Estate while some engage themselves in informal and petty trade in fruits, vegetables and hawking cooked food stuff. Other economic activities are selling of second hand clothes (*Mitumba*) in Mukuru, small hotels, while women cook and sell food to the factory workers and road side hawkers (GOK, 2003). Earnings are low and inadequate to meet their families' basic needs

3.7: Consolidated issues

Issues affecting water and sanitation provision and delivery in Mukuru are the following; Historical growth of the settlement where the area is not recognized as a formal settlement, not planned and the local authority does not feel obligated to delivery water services to the area. The implication of the unplanned settlement is that water and sanitation infrastructure is not planned or constructed and water services are made available as a result of demand by human settlement. Land tenure is shaky making individuals fear to invest in water and sanitation services. The implications of the land use and tenure in Mukuru is that it does not encourage investment or improvement of water and sanitation facilities in the area

The topography of Mukuru which is a mix of rocky and plain lands affects the delivery of water services in the areas. The drainage is poor in areas covered by the black cotton soils. Drainage of storm water or household waste water is not adequate as limited

sewage network/system exists in the area mainly due to the unplanned nature of the settlements. Construction of sewage networks normally requires a straight stretch with limited bends. The unplanned settlements,

Mukuru has rivers passing along the settlement however the river waters are not of good quality for use by residents

Mukuru receives moderate rainfall and when it rains a lot of water goes to waste and rain water harvesting is an option to consider. Impact on Water and sanitation in Mukuru on climatology and vegetation implies that with limited vegetation the amount of rainfall is slowly declining, air flows for clouds formation is restricted and high pollution of the environment by hazardous gases is common.

CHAPTER FOUR

RESEARCH METHODOLOGY

4.0: Introduction

This chapter presents the methodological approaches used in conducting the study by detailing out the sampling design of the study, types and sources of data as well as data collection procedures, analysis and presentation. The field survey technique used in this study included questionnaires, photography, interviews and focus group discussion. Secondary data sources included the use of Kenya Slum upgrading project documents, National water Act, Nairobi water and sewerage company records, relevant maps and diagrams, published books and unpublished scholarly works, journal, papers from professional meetings.

4.1: Sampling Design

A detailed reconnaissance survey was conducted in August 2008, the period when questionnaires and interview schedules were also formulated, units of observation and analysis identified and sampling procedure designed.

The sampling design of the study was prepared to ensure that all units of the observation were adequately represented without any anticipated bias. Cluster sampling is known to increase precision and objectivity especially when the clustering factor is well defined

and can be applied when studying the role of the alternative actors in the provision of water and sanitation ((Mugenda and Mugenda, 1999).

In the context of this study the sample size was drawn from household and commercial water consumers which formed the main strata (role of the alternative actors in the provision of water and sanitation) in the 4 main villages in the study area namely Mukuru KwaNjenga, Mukuru Kayaba, Mukuru KwaReuben and Mukuru Sinai. Sample size of 200 target population was identified with each clustered village generating a sample size of 50. In the 4 villages of Mukuru there were more households water consumers than commercial water consumers as Mukuru is a predominantly residential settlement with commercial business units also operating. In the clusters a simple random sampling of varying intervals was then applied to identify the unit of observation from each stratum as the houses, commercial units are not numbered or organized.

A total of 40 household water consumers were randomly selected (representing 80 per cent of sample size) from this strata to represent the household stratum. Through the guidance of roads of which some have been encroached by illegal structures, the selected households were visited. On the other hand a total of 10 for commercial water consumers were randomly selected (representing 20 per cent of sample size) from the commercial consumers' stratum. The randomly selected commercial businesses were fairly easy to identify as they were mainly located along the main roads transversing the study area.

It was possible to find numerous structures within a parcel of land intended to accommodate one or two structures hence contributing to high population densities in the area. Given that most of the structures in the parcel of land/plot identified had certain similar attributes in terms of housing condition and that occupants were likely to be within the same income bracket, the researcher further randomly selected any household structure within the plot. Consequently 40 households were selected against 10 commercial units as Mukuru is predominantly a residential settlement. The sampled household and commercial water consumers were distributed per sampled areas as shown in table 4.1

Table 4.1: Sample size

Sampled Area	Household water Consumers	Commercial water Consumers
Mukuru KwaNjenga	40	10
Mukuru KwaReuben	40	10
Mukuru Kayaba	40	10
Mukuru Sinai	40	10
Total	**160**	**40**

Source: (Author, 2008)

Further Mukuru Kwanjenga had been chosen by Nairobi Water Company for a pilot project on bulk metering aimed at increasing the delivery of water services in informal settlements in Nairobi. The pilot project had not been very successful; therefore it was important to draw lessons from this exercise.

4.2: Types of data

The study used both primary and secondary data sources. These are briefly described in the following section.

4.2.1: Primary Data

Primary data collection method involved the use of questionnaires, photography, personal (oral) interviews, focus group discussion and Key informant interviews. Structured questionnaires were administered to the household and commercial water consumers. Non structured questionnaires were administered to interest groups interviewed in focus group discussions and key informants who comprised of chief, village elders, the main water provider, community based organizations and Non-Governmental organizations. The questionnaires were designed to understand the challenges and bottlenecks faced by the various actors in the provision of water and sanitation services in the study areas. On the other hand households and commercial water consumers' questionnaires aimed at finding out the level of involvement of the alternative actors, accessibility, cost of water services and finding out the extent of community participation in relation to the subject matter in the study areas.

A hand-held camera was used to collect and record data on the provision of water and sanitation services in Mukuru. In addition, Empirical observation made it easier to obtain data that was difficult to generate from the households. Focus group discussion with

water interest groups, CBOs were held to investigate some of the complaints raised on water services management by the residents of Mukuru. Key informant Nairobi water and Sewerage Company gave insights on the bulk metering project in Mukuru. This followed the written permission given by the head of the company to interview officer in charge of the project. The local opinion leaders, administrative chief gave insight on some of the challenges Mukuru residents face in water service delivery.

4.2.2: Secondary Data

Secondary data sources involved the identification, location of documents, maps, diagrams containing information related to the research problem being studied. Both published and unpublished scholarly works were reviewed. The aim of reviewing the secondary data was to get an overview of the theory on the principles of water and sanitation management in the context of informal settlements and eventually build a sound conceptual framework that would envision the way forward in the management of water and sanitation services in the study area.

4.3: Data Collection

4.3.1: Household Interview

Structured questionnaires were used to collect information on water and sanitation services in Mukuru. Some specific questions formulated in the questionnaires only

targeted the household or commercial water consumers, however majority of the questions applied to both groups.

4.3.2: Key Informants

Mukuru has a strong presence of central administration through the office of the chief. The opinion leaders comprised of the village elders, councilors, Nairobi water Company. The research had a session with the chief of Mukuru to investigate the challenges faced in the management of water services in the area. The local Chief of the area had in-depth information on all the villages in Mukuru and new water actors in the settlement often had to brief the chief's office on their activities and whenever disputes, conflicts occur in the management of water services the Chief's office was the first to address the concerns. The village elders are important opinion leaders as they have administration responsibility in specific villages and their insights on water services and management was quite updated. The councilors represented the political representation at the ward level which linked up to the local municipal level. Some wards extended beyond one village and cross cutting were easily identified in the clusters.

4.3.3: Focus Group discussion

Interest groups of water providers in the study area, Community based organizations, women groups, youth groups, NGOs; church representatives were interviewed in focus group discussion to have an insight on their understanding of water services and

management in Mukuru. In the focus groups discussions participants were able to give further information, give their perception on how the water management has been in Mukuru while also sharing the challenges and frustrations faced. The discussions were informal. This made the participants to open up and gave clear suggestions on how challenges faced could be resolved.

4.4: Data Analysis and Presentation

All completed questionnaires were edited to eliminate any error that might have occurred. Analysis of collected data was conducted with descriptive and inferential techniques. Cross tabulation was done to get a more detailed analysis between various variables. Data was presented using texts, charts, graphs, tables and plates.

CHAPTER FIVE

MULTI-ACTORS INVOLVEMENT, ACCESSIBILITY OF WATER AND SANITATION

5.0: Introduction

Before the objectives of the study are analyzed, it is necessary to highlight the socio-economic characteristics of the residents of Mukuru Informal settlement. This lays down the context in which the residents of the settlement operate. The chapter therefore sets off by analyzing socio-economic variables such us household size, income levels, occupation, education revel and whether business employ workers. The section following this is devoted to critical analysis of the formulated objectives and this is done in view of the findings of the field survey carried out in the study area.

5.1: Basic Determinants

5.1.1 Social, Demographic and Economic Characteristics of the Households

Household composition is an important variable as it indicates the various needs of household members. It also depicts the potential water and sanitation requirements of the members. In this study, the average household size in Mukuru Informal Settlement was found to be 3.7 persons (approximately 4 persons per household).

The study established that 24.7 per cent of the household heads are on permanent employment, 47.5 per cent are employed as casual labourers mostly working in the

neighbouring industrial area, 22.2 per cent are self employed while 5.6 per cent were unemployed. *(See table 5.1 below)*. This depicts the high rates of involvement of residents in the *Jua Kali* sector.

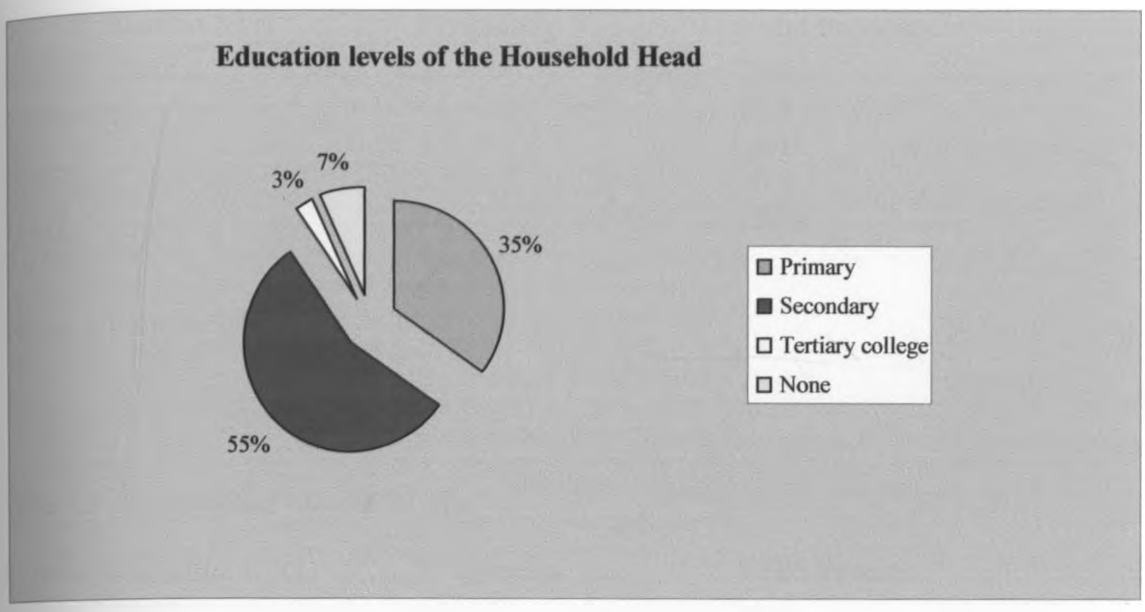
Table 5.1: Household Head Occupation

Type of Occupation	Frequency	Valid Percent
Permanent employee	39	24.7
Casual employee	75	47.5
Self employed	35	22.2
Unemployed	9	5.6
Total	**158**	**100.0**
No Response	2	
	160	

Source: (Fieldwork, 2008)

Educational level is a significant determinant of type of employment and incomes. While income is held as a major factor influencing the ability to select the housing unit to live in and eventually pay for water and sanitation services. In terms of highest level of education attained, the survey revealed that 55.0 per cent of the household head had accomplished secondary school education followed by primary school education at 35.0 per cent. Those with none are 7.0 per cent while those with Tertiary education being the least with only 3.0 per cent of the population. This reveals high rate of unskilled or low skilled man power which do not lead to good returns. The figure below shows the percentage of the residents who have attained a particular level of education. *(see figure 5.1 below)*.

Figure 5.1: Highest level of Education for Household Head



Source: (Fieldwork, 2008)

It was further revealed that 60.3 per cent of male have secondary as the highest educational level in comparison to 52.8 percent of female. This almost gives a ratio of one to one. This indicates the tendency to find households using more quantities of water since when female have a higher educational level of primary, secondary or tertiary the consumption of water and sanitation services also increases as higher educational level for female is associated with the need to keep high hygiene standards at the household level (Cities Alliance, 2005). During the survey it was observed that women were mainly involved in fetching water from water points with men participating in vending water within the village with majority of alternative water actors being men. This implies that women are still excluded in the management of water supplies yet they play a central part.

Table 5.2: Male highest educational level

Male Education level	Frequency	Valid Percent
Primary	21	28.8
Secondary	44	60.3
Tertiary	3	4.1
None	5	6.8
Total	**73**	**100.0**
No response	9	
	82	

Source: (Fieldwork, 2008)

Table 5.3: Female highest educational level

Female Education level	Frequency	Valid Percent
Primary	28	38.9
Secondary	38	52.8
Tertiary	1	1.4
None	5	6.9
Total	**72**	**100.0**
No response	6	
	78	

Source: (Fieldwork, 2008)

With the given educational level it was established that in terms of other income generating activities the household was engaged in on a monthly basis, 85 percent are engaged in small-scale businesses like selling *mitumba*, Kiosk business among others. Only 15 percent are not having an extra activity to generate more income to the family. The average collective family income of household in Mukuru was found to be Kshs. 6,700 per month. The residents revealed that even when a household head is on permanent, casual employment the incomes earned are often not sufficient and members of the household engage in other income generating activities in order to meet their basic needs that include the purchase of water and sanitation services.

5.1.2: Commercial: Social, Demographic and Economic Characteristics

The types of Commercial business undertaken is important as it indicates the various water needs the commercial actors have in relation to water consumption. The study also established that most of the commercial water consumers businesses are run by the owners and the following are the type of business they are involved in *(see table 5.4)*. 35.0 per cent are involved in food kiosk, 12.5% in salon bussiness12.5 percent in butchery and 12.5 per cent in vegetable vending. Businesses like salon, food kiosk mainly use water to offer their services.

Table 5.4: Type of business they do run

	Frequency	Valid Percent
Food kiosk	14	35.0
Salon	5	12.5
Vegetable vendor	5	12.5
Selling charcoal	3	7.5
Butchery	5	12.5
Barber	3	7.5
Kiosk/Shopkeeper	4	10.0
Electronics Repair	1	2.5
Total	**40**	**100.0**

Source: (Fieldwork, 2008)

In addition 33.3 percent of the commercial water users indicated that they have employed workers in their businesses with 53.8 percent of these having employed one employee, 30.8 percent having employed 2 persons while 15.4 percent having employed 3 or more persons. Most of the businesses (60.0 percent) have operated for between 2 to 5 years in this area, 17.5 percent (0 to 1 year) and 22.5 percent (For over 5 years).

The business owners highest level of education stand at 35 percent for primary, 55.0 percent for secondary, 7.5 percent for Tertiary and 2.5 percent having not gone to school which is almost a one to one ration between household highest educational level with commercial consumers. The total income from the commercial water users in a month is Kshs. 9,500.

5.1.3: Water as an Economic Good

NWSC (2006) report indicates that Mukuru informal settlement residents receive water supply of up to about 90 percent from NWSC (the main water source), whose main mandate is to provide water to the residents of the city and projects that can lead to increase in water coverage are mainly pursued. Mukuru is an enterprising settlement with many small businesses, enterprises that are constantly starting; growing and winding up. The enterprises are defined with alternative water actors as an enterprise taking up great prominence especially in Mukuru Kwa Njenga where small alternative water actors with individual connection to NWSC are very aggressive. In some instances the small alternative water actors have started to organize themselves and at a point the organization is taking the nature of water cartels in Mukuru. NWSC has realized this and is working on a better model for accessing water to informal settlements that would make community active participants for joint benefits on proceeds of the water sold as well as making accessible the water at reasonable prices to Mukuru residents.

5.2 Levels of Accessibility and Cost of Services

5.2.1: Accessibility and cost of Water at Household and Commercial level

The study investigated the main source of water supply, technology of harnessing water, major actors, distance to the nearest water point and cost of a 20 litre jerrican. The study revealed that 49.3 percent of households get water from the city council connection. This is followed closely by water kiosks at 28.8 percent, stand pipe 18.1 percent while borehole 1.9 percent and well 1.3 percent. The technology of harnessing is piping at 60.6 per cent, jerricans 38.8 percent and tank 0.6 percent *(see table 5.5 and table 5.6 below)*.

Table 5.5: Household Water sources

	Frequency	Valid Percent
City Council connection	79	49.3
Water Kiosk	46	28.8
Stand pipe	29	18.1
Borehole	3	1.9
Well	2	1.3
Total	**160**	**100.0**

Source: (Fieldwork, 2008)

Table 5.6: Household Technology of harnessing water

	Frequency	Valid Percent
Piping	97	60.6
Jerricans	62	38.8
Tank	1	0.6
Total	**160**	**100.0**

Source: (Fieldwork, 2008)

For the commercial consumers' category the study revealed that 57.5 percent get water supply from the city council connection, 22.5 percent get from the water kiosks and 20.0 percent get from public standpipe. For commercial users 62.5 per cent use water pipes as the technology of harnessing the water, 32.5 percent use jerricans, while the remaining 5.0 percent use tanks *(see table 5.7 and table 5.8 below)*.

Table 5.7: Commercial users water sources

	Frequency	Valid Percent
City Council connection	23	57.5
Water Kiosk	9	22.5
Stand pipe	8	20
Total	**40**	**100.0**

Source: (Fieldwork, 2008)

Table 5.8: Commercial users Technology of harnessing water

	Frequency	Valid Percent
Piping	25	62.5
Jerricans	13	32.5
Tank	2	5.0
Total	**40**	**100.0**

Source: (Fieldwork, 2008)

77.5 percent are satisfied that the major actors of water and sanitation have the ability to meet their water demand. This confirms that water delivery in Mukuru is mainly undertaken by the local authority through the contracted utility, Nairobi water and sewerage Company also make metered connection to water Kiosks and standpipes in Mukuru. 96.2 per cent of water used by households is delivered by city council

connection through the water company with only 3.2 per cent coming from borehole and well while commercial consumers sources of water provided by NWSC through water Kiosks, standpipe is 100.0 per cent. This underscores the important level of involvement of the water company in the provision of water services in the study area and any programs or legal frameworks that intend to increase accessibility of water in settlements will need to involve the mandated water provider; NWSC. Alternative water actors are also active in water supplies and increased coordination, partnership of the multiplayer need to be structured and formalized. NWSC, the main actor in water and sanitation in Mukuru is meeting a good percentage of water needs of the residents and underscores the importance of using the utility and alternative water actors as the main means of providing water in the settlements.

In terms of the distance to the nearest water source, 27.6 per cent of household cover 0 to 100 meters, 61.1 per cent cover 101 to 200 meters, 6.5 per cent cover 201 to 300 meters while 4.6 per cent cover 301 meters and above. 27.5 percent of commercial water users cover between 0 meters to 100 meters as the distance to the nearest water source, 60 per cent cover 101 to 200 meters, 7.5 per cent cover 201 to 300 meters while 5.0 percent cover 301 meters and above *(see table 5.9 and table 5.10 below*). This distance for 72.4 per cent of household and 72.5 per cent for commercial water users is longer than the recommended World Heath organization standards of approximately 100 meters. The implication is that households use limited number of water as the amount of water used in a household depends on the costs and distance covered. The longer the distance the less water quantities are used (WHO, 1990).

Table 5.9: Distance to the nearest water sources for Household

	Frequency	Valid Percent
0 to 100 meters	42	27.6
101 to 200 meters	93	61.1
201 to 300 meters	10	6.5
301 + above	7	4.6
Total	**152**	**100.0**
No response	**8**	
	160	

Source: (Fieldwork, 2008)

Table 5.10: Distance to the nearest water sources for commercial water users

	Frequency	Valid Percent
0 to 100 meters	11	27.5
101 to 200 meters	24	60.0
201 to 300	3	7.5
301 + above	2	5.0
Total	**40**	**100.0**

Source: (Fieldwork, 2008)

70 percent of household residents said that the quantity of water available was sufficient although residents had reservations about the quality of this water and therefore engaged in water treatment of which 21.9 percent boiled the water, 7.5 percent applied chemical treatment like water guard while 3.75 percent filtered the water before use, 66.9 per cent did not treat the water. 87.5 percent of commercial users indicated that the quantity of water available was sufficient. 32.5 percent of these commercials users had reservations about the quality of water and treated water before using it. *(see table 5.11 and 5.12 below).* The quality of water has led to various health related problems caused by water quality. For instance the citing of toilet facilities next to water points has led to increased cases of waterborne diseases in informal settlement (UN Habitat, 2003)

Table 5.11: Household treatment of water

	Frequency	Valid Percent
Boiled water	35	21.9
Applied Chemical	12	7.5
Filtered	6	3.75
Did not treat water	107	66.9
Total	160	100.0

Source: (Fieldwork, 2008)

93.5 percent of the households use water for domestic purposes. The remaining 6.5 percent use water in their business activities. They are charged for a 20-litre jerrican of water an average of Kshs. 4.81, although 79.9 percent of the households are charged between Ksh 2/= to Ksh. 6/=. The remaining 20.1 percent are charged between Ksh. 10/= and 30/= for a 20-litre jerrican. The households use an average of 3.83 of 20-litre jerricans in a day. This consequently leaves the residents with limited amount to meet other basic expenses. The study established that the residents devote about 10 per cent of their income for those charged Ksh. 6 per jericcan and about 18 per cent of their income for those charged Ksh. 10 per jerrican towards water services costs. This is quite high given that the household are using way below the recommended water quantities of 200 litres per person per day in a household while 3 per cent should be committed towards water. Any percentage above this depicts restrain in other family basic needs (WHO, 1990).

High water costs implies that quantities of water used per household is way below the recommended amounts as revealed in the amount of water used in Mukuru household of

4 jerrican of 20 litre per household of 4 people in a day. For commercial users water is mainly used to run their business. A 20-litre jerrican is sold at between 2/= and 20/=, with a total of 77.5 percent buying water at between Ksh 2/= and Ksh 5/= while the remaining 22.5 percent purchased this product at between Ksh. 5/= and less Ksh 20/=. They consume an average of 9.25 of 20-litres jerrican of water in a day. During peak period they use 185 litres and off-peak 18.2 litres are used respectively. This indicates that business in the settlement offer services that mostly use water as already revealed in the type of business commercial actors are involved in.

In terms of the frequency of water supply in Mukuru Informal settlement, 66.3 percent received water throughout the day, 21.3 percent at certain times while the remaining 12.5 percent receive water irregularly *(see table 5.12)*. This implies that there is water rationing in the area, with alternative actors experiencing problems of low water pressure. Water sources may also not be sustainable enough to allow regular flow without interruption.

Table 5.12: Frequency of receiving water supply from the providers by Households

Frequency	Frequency	Valid Percent
Throughout the day	106	66.3
At certain time	34	21.3
Irregularly	20	12.5
Total	**160**	**100.0**

Source: (Fieldwork, 2008)

Incase there was a breakdown in the household source of water supply, alternative water sources were used. 72.3 percent of the residents purchased their water from the water vendors, 13.8 percent got from friends while 13.9 percent got from churches, South C

Estate, Industrial area. The alternative water source was between 2 meters to 500 meters for 60.3 per cent of the households while for 39.7 per cent of households the alternative water source was between ≥ 500 meters but ≤ 5 kilometers.

In commercial user category 82.5 per cent received their water supply from the providers throughout the day. 12.5 per cent received at certain times and 5 per cent were unpredictable *(see table 5.13)*.

Table 5.13: Frequency of receiving water supply from the providers by Commercial users

Frequency	Frequency	Valid Percent
Throughout the day	33	82.5
At certain time	5	12.5
Irregularly	2	5.0
Total	**40**	**100.0**

Source: (Fieldwork, 2008)

When break-down occurred in the commercial user source of water supply, alternative water sources were used. 69.7 per cent of commercial users purchased water from the vendors, 9.1 per cent collected water from friends, 6.1 per cent from churches, 6.1 percent from commercial standpipe and 6.1 percent from the neighbours (South C Estate) while 3.0 percent from people who store their water in tanks. In terms of distance, the alternative water source for commercial users was between 10 meters to 100 meters for the 31.3 percent of this category, 100 meters to 500 metres for 37.5 percent of this category and 31.2 percent for distances of 500 meters to 3 kilometers. In case of breakdown of water systems alternative water points are about 5 times the recommended

WHO distance of 100 meters, this further worsens the quantity of water used in case of breakdown hence compromising on health status of the residents.

Plastic containers are used to store water in 99.3 percent households in Mukuru, with Plastic jerricans taking 71.2 percent, Plastic tanks taking 19.0 percent while Plastic drum takes the remaining 9.2 percent, its only 0.7 percent of the household in Mukuru who do not store water. The quantity of the storage facility varies with about 83.2 percent of the household keeping between 10 litres to 100 litres of water daily while the remaining keeping more than 100 litres but less than 1000 litres daily. 65.8 percent commercial water users stored their water in plastic jerricans, 13.2 percent in plastic tanks, 13.2 percent in plastic drums and 7.9 percent store their water in plastic buckets. 75.7 percent of the respondents store up to 100 litres while 24.3 per cent store between 100 litres to 500 litres.

This amount stored is enough to take care of their water needs until the water supply is back for 82.1 percent of the respondents. The 27.9 percent purchase water from alternative water actors, vendors or conserve water to supplement the supply. Residents reveal that they can only store limited amounts of water as space in housing units are small. While investigating whether this stored amount is enough to take care of their water needs until the water supply is back, 65.4 percent of them said Yes while 34.6 percent said No. for those who said No, they cited survival mechanisms to that effect *in* relation to purchasing water from alternative water actors, vendors, borrowing water from the neighbours, conserving the little that is there, fetching from the well, fetching on a

daily basis or simply reducing their consumption quantity. This implies that the interruptions in water supply take short periods before the supply resume as storage facilities are limited and only able to take them short period before the supply is back.

5.2.2: NWSC Policy on Water Access and Chamber System

The cost of a 20 litre jerrican purchased from the alternative water actor depends largely on where one *(i.e. the vendor)* gets that water from although the water that they sell is mainly from the Nairobi Water and Sewerage Company (NWSC). The study revealed that alternative water actors bought 1 unit of water at Ksh 34/= regardless of source of power, (NOTE: 1 unit = 20 number of 20-litres jerricans). Meaning that for every 20-litres jerrican, the vendors purchase it at Kshs 1.70 from the NWSC.

NWSC has specific rules and regulations for people who need to get water or be metered as follows.

i. The main purpose of metered water in Mukuru is to provide the water supplies to the residents of Mukuru but not for profit making entirely. Individuals are to adhere by the rules of joining a group around the chambers (however this is not the situation as it has become commercialized and people operate as individuals).
ii. Each chamber with meters is to register as a self help group to help make the distribution of water easier this is not the case as people with metered connection operate as individual alternative water providers aimed at making profits.

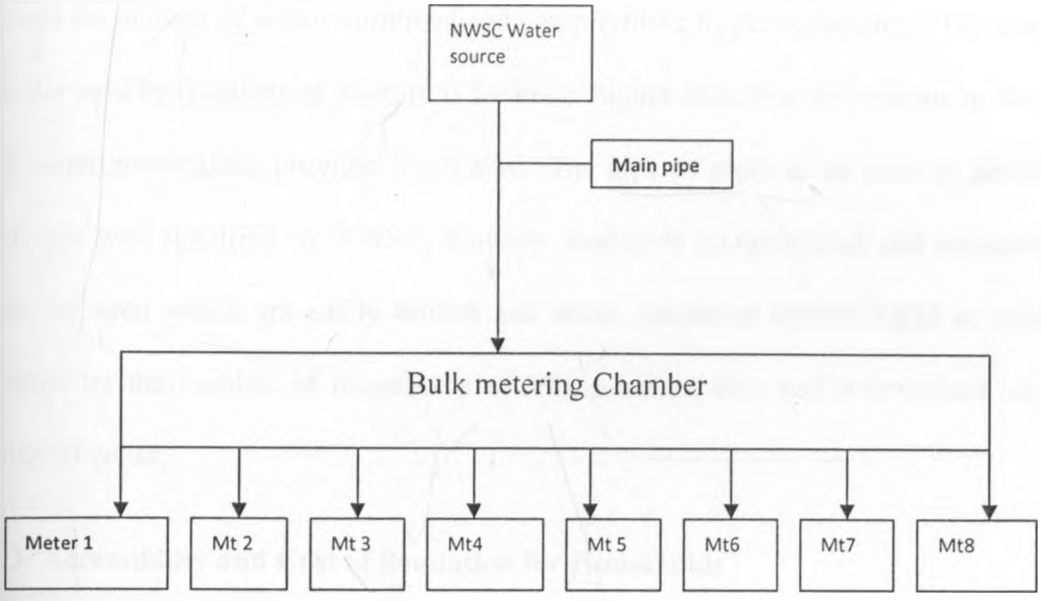
iii. Cost of water sold should be between sh.2 to sh. 3 and not exceed sh. 5 per 20 litre jerrican.

The water price put in place by the water company is not adhered to as already revealed in the price residents pay for a 20 litre jerrican of water. The survey revealed that the cost of water per 20 litre jerrican is 10 times the recommended price of Ksh 2 per 20 litre jerrican. This implies that water usage is reduced as costs curtail its consumption and consequently not accessible and affordable to Mukuru residents.

5.2.3: NWSC Chamber System

A total of 67 meter chambers have been established in the 12 villages of Mukuru apart from Tetra Pack village - a newly established village in Mukuru. The chamber system is a process where NWSC takes water to a specific location using a main water pipe which is "teed" and several meters located in a single chamber which is locked and secured with NWSC keeping the keys. A chamber may have about 20-25 meters which belongs to individuals able to enter into contract with the water company (*see figure 5.2 and plate 5.1 below).*

Figure 5.2: Meter Chamber



Source: (NWSC, 2006)

The meters in the chambers are for individual connections and apart from NWSC taking charge of securing the meters in the chamber the alternative water actors do not receive any water subsidy in distributing water to complex and constrained informal settlements. Alternative water actors are not formally recognized as significant actors in the delivery of the service. All other customer relation, water prices, mode of payment is similar to what other individual water connections in the city experience.

However the water cost was high as limited numbers of water meters were operational this was occasioned by vandalism of water pipes between the meter and the standpipes,

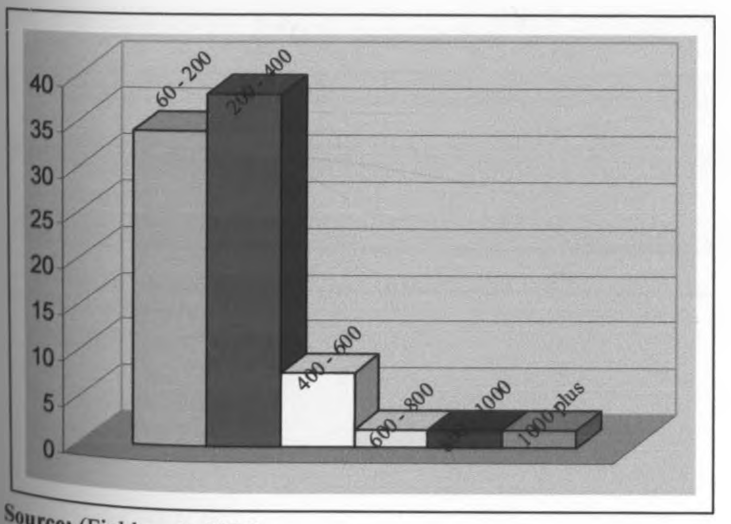
illegal connection, meters turned off, low pressure. This led to insufficient water distribution leading to increase in water prices. During scarcity of water the survey revealed that a 20 litre jerrican was sold for sh.20 which was expensive and generally reduced the amount of water consumed and compromised hygiene standards. The amount of water paid by residents of Mukuru is far much higher than other individuals in the city with water connections provided by NWSC. The type of pipes to be used to distribute water are well specified by NWSC, however quality is compromised and substandard pipes are used which are easily broken and water wasted or contaminated as already revealed by the number of households at 33.1 per cent who had reservations on the quality of water.

5.2.3: Accessibility and Cost of Sanitation for Households

35.6 percent use pit latrines as a toilet facility in Mukuru informal settlement, 10.6 percent are connected to sewerage line of NWSC, the remaining 6.8 percent either use open space or Polythene bag. 46.9 percent of the households never responded to this particular question-a show of stigma around sanitation within informal settlements. 59.4 percent were on the affirmative that the major actors of sanitation are able to meet their sanitation need. It was evidence during the survey that environmental sanitation in the settlement was low with human waste easily seen by the alleys and open spaces. This created unhealthy environmental conditions to the human sight and mental health. Majority of residents disliked the environmental sanitation and were keen to offer solutions to resolve the problems.

37.2 percent of the households goes for less than 100 meters to the nearest toilet facility they use, 69.2 percent walk for between 100 meters and 500 meters to access the nearest toilet facility while the remaining 3.6 percent goes for more than 500 meters. For the sanitary facilities available the respondents are charged Ksh1/= and Ksh5/= per visit. 81.8% of the respondents are charged between Ksh2/= and Ksh3/= per visit, 11.9% are charged Ksh5/= per visit. Most households who pay for toilet facility on monthly basis are charged between Kshs. 60 and Kshs. 400. *(See figure 5.3 below)*. Housing units in informal settlements are provided as single units without water and sanitation facilities. Where they exist, these facilities are separate and are shared by a number of households. The distance and cost of sanitary facilities usage reveals that good hygiene conditions are rarely upheld. Residents indicated that adults are the ones who pay for the sanitation use. Children are often found relieving themselves in the open. The residents confirmed that hygiene related diseases like typhoid, dysentery are common ailments suffered by people living in the village.

Figure 5.3: Monthly pay for toilet facility



Source: (Fieldwork, 2008)

The household sanitary facility is used mainly for domestic (95.2 percent) while the rest said it is used for business. The technology used by households to provide sanitation include mailt pit latrines at 78.4 percent, Eco sun at 2.2 percent, Open space at 1.4 percent and the rest are either Flush toilets or City council connection. When there is a breakdown to the facility, several factors are at play for it to be repaired. This forces the residents to seek for toilet services elsewhere, *(see tables 5.7 and 5.8 below).* This reveals that sewerage facility in Mukuru is limited as water supplies area necessary to offer this service. The main means of human waste disposal in Mukuru is pit latrines which easily fill up leading to overflowing faecal matter all over the place as the latrines are shared by several households. When they breakdown days are taken before they are repaired. This is not only a health hazard but has enormously polluted the settlement giving rise to uncomfortable and conducive surface environment.

Table 5.14: How long it takes before the sanitation facility is repaired

	Frequency	Valid Percent
Depends with the landowner	2	4.3
Immediately	8	17.4
3 days	14	30.4
A day	7	15.2
1 week	4	8.7
Depends with the season	1	2.2
Don't know	3	6.5
Several days	7	15.2
Total	**46**	**100.0**

Source: (Fieldwork, 2008)

Table 5.15: Alternative sanitation services when the facility has broken down

	Frequency	Valid Percent
From neighbors	21	41.2
Friends	8	15.7
We just use it	1	2.0
At work	1	2.0
Within the Estate	9	17.6
Open field	4	7.8
Pit latrine	4	7.8
River	3	5.9
Total	**51**	**100.0**

Source: (Fieldwork, 2008)

Distance to the alternative toilet facility also varies. 48 percent of the respondents access this within 100 meters, 38 percent access this between 100 metres and 500 metres while the remaining 14 percent seek facility more than 500 metres away.

5.2.4: Accessibility and Cost of Sanitation for Commercial

For the commercial category, pit latrines are mostly used as the toilet facility in their business. This is followed by City council connection at 28.6 percent, CDF toilet at 2.4 percent while the remaining 2.4 percent of the business premises do not have a toilet facility. 64.9 percent of the respondents are satisfied by the actors with regard to their ability to provide sanitation services to their businesses. The type of toilet facilities used in the area include Communal pit latrines 72.1 percent, Eco San 2.3 percent, Open space 7.0 percent, Flash toilet/City council connection 2.3 percent Private 14.0 percent and CDF 2.3 percent. When asked whether they do have toilet facility at their business premise, 35 percent said Yes while 65 percent said No. For those who said their business

do not have toilet facility, they gave the following responses in as far as how their customers access toilet facility, (see table 5.9).

Table 5.16: How customers access toilet facility

	Frequency	Valid Percent
I do not know	1	3.8
Go To church Compound	1	3.8
Pay at a certain fee at private ones	11	42.3
Open field	1	3.8
Use toilet built by CDF	4	15.4
Communal Pit Latrines	8	30.8
Total	**26**	**100.0**

Source: (Fieldwork, 2008)

53.3 percent said they pay Ksh2/= per visit into a toilet facility. 20 percent said they are charged Ksh 3/= while 23.3 percent are charged Ksh 5/=. The rest are charged Ksh 1/=. On monthly basis the cost of using toilet facility was categorized as follows; 85 percent are charged Ksh 60/= to Ksh200/=, 10 percent are charged between Ksh200/= to Ksh 400/= and 5% are charged above 400/= per month.

47.1 percent of the respondent said the distance of toilet facility to their business premises is within 100 metres. 38.2 percent said they facility is between 100 metres and 500 metres while 14.1 percent said the facility it situated beyond 500 meters. The respondents use the sanitation facility mostly as customer facility (30.6 percent), business (47.2 percent) and Domestic (22.2 percent). The technology used to provide sanitation varies as shown in table *5.10 below*.

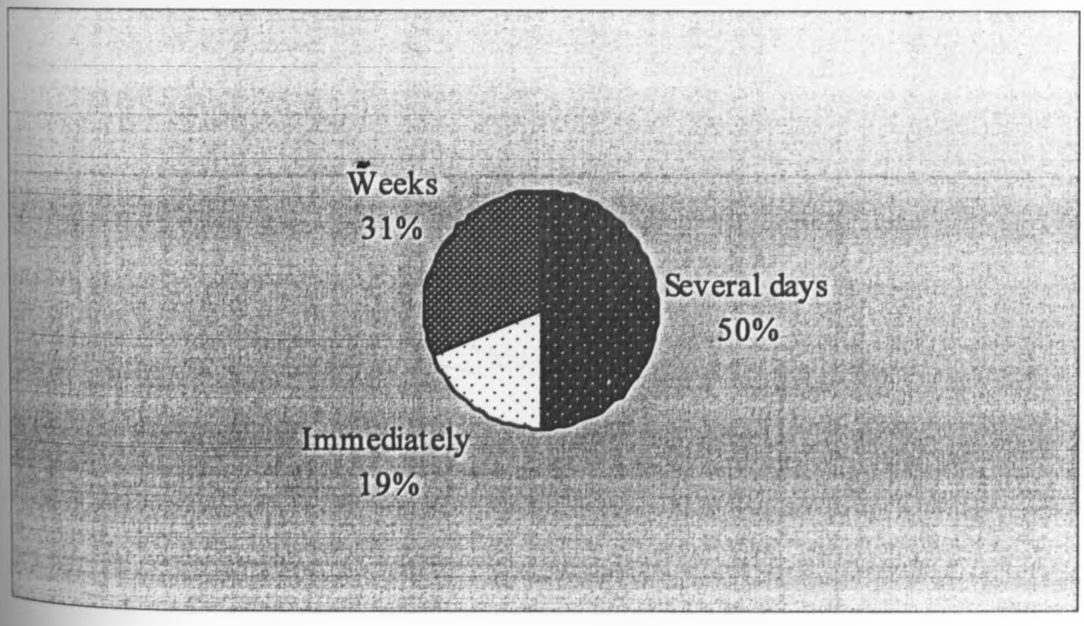
Table 5.17: Technology used to provide sanitation

	Frequency	Valid Percent
Flash(city council connection)	12	36.4
Pit latrines	12	36.4
Semi-permanent structures	5	15.2
Permanent structures	4	12.1
Total	**33**	**100.0**

Source: (Fieldwork, 2008)

Suppose there was a breakdown of the sanitation facility, only 19 percent of the respondents said it was repaired immediately compared to 50 percent who said it took several days and 31 percent said it took weeks before it was fixed. *(See figure 5.4 below).* But when there is a breakdown on the sanitation facility, the respondents have several options as shown in table 5.11.

Figure 5.4: Duration it takes before the sanitation facility is repaired



Source: (Fieldwork, 2008)

Table 5.18: Alternative sanitation facility when the facility has broken down

	Frequency	Valid Percent
Neighbors	8	50.0
Friends	1	6.3
We just use it	1	6.3
Individuals/private facilities	4	25.0
Open space next to the river	1	6.3
none	1	6.3
Total	**16**	**100.0**

Source: Fieldwork, 2008

The distance to the alternative sanitation facility is also a bit reasonable. 80 percent of the respondents walk within 100 metres while the remaining 20 percent are within 100 meters and 300 metres. This reveals that household and business units in Mukuru are offered on a unit by unit basis as the case is in other settlements in Nairobi. The landlords are not obliged to offer water or sanitation facility as part of the housing facility but residents have to pay for those services separately. With the low incomes earned by households this further strains their ability to meet their other basic needs and in most occasions water and sanitation services usage are reduced, consequently leading to poor hygiene at household or business premises a major cause of diseases in settlements. It is evidence that accessibility and cost of water services is high in Mukuru as compares to other middle level residents in the city. This reduces the quantities of water services used. And even when they pay higher costs for these facilities the services are not delivered in adequate quantities further pushing the demand and leading to higher prices. Quality of the water and sanitation services is also not assured as residents have to treat water before they drink to reduce chances of disease occurrence.

5.2.5: Disposal of Waste Water for Households

The table 5.12 below shows how respondent households dispose of their wastewater. About 90.9 per cent dispose waste water into open drain, open filed, next to house, along the road or in river with only 9.1 percent either using City sewer or septic tank. During the survey it was evidence that the environmental was ever wet, even when no rains were received as waste water was poured in any open space. Stagnant water was a good breeding ground for mosquitoes and waste water mixed with solid, human waste left a fouls smell in the environment.

Table 5.19: Disposal of waste water

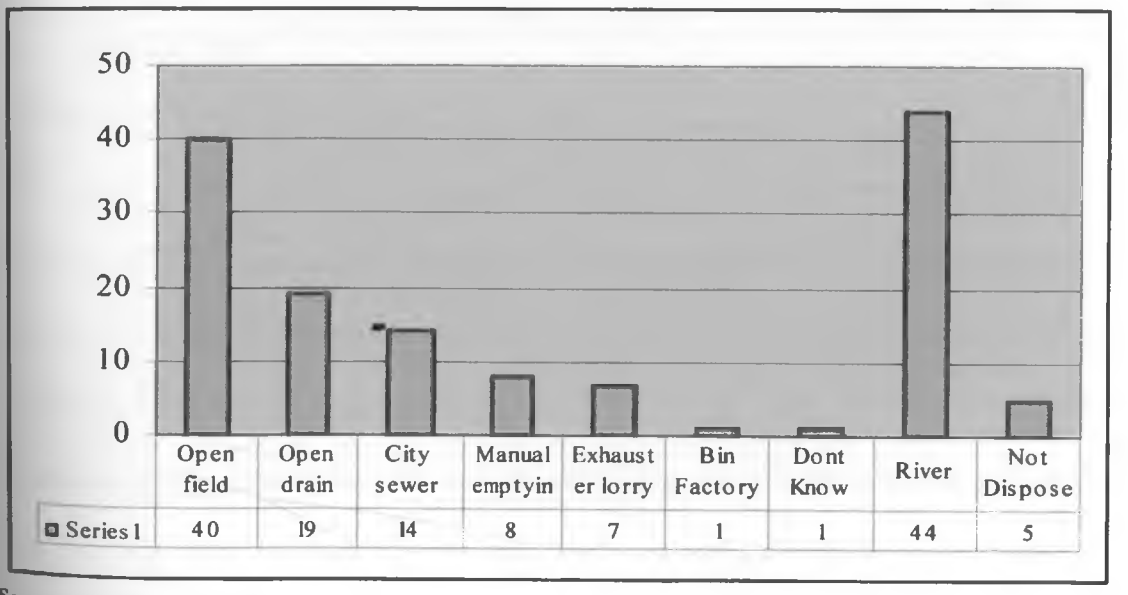
	N	Percent
City sewer	17	8.9
Open drain	60	31.4
Open field	39	20.4
Next to the house	65	34.0
Septic tank	2	1.0
Along the road	4	2.1
River	4	2.1
Total	**191**	**100.0**

Source: (Fieldwork, 2008)

Households use varied technologies to dispose human waste once the sanitation facility is full. These include the following as shown in the figure 5.13 below. It should be noted that 82.6 percent said the technology of disposing of human waste once the facility if full is not hygienic and safe. In figure 5.13, quite a number of the respondents use the river to do this and they are quite aware of the environmental harm they are posing to the *riverine* ecosystem however they indicate that there is no cheap alternative means of disposing the

human, solid waste. Some of the reasons they gave are as follows; that persons disposing human waste in the river do not care about the surrounding environment but are keen to cut down costs of hiring an exhauster, the local authority does not reinforce rules on water systems conservations. To dispose the waste people use containers which leave behind bad smell, People use jerricans which are again used for drawing water consumed in household or People use handcarts for transporting wastes littering everywhere. The method of waste disposal causes diseases transmission as the technology used leave behind waste which attracts vectors such as rats, mosquitoes. Youths groups are involved in waste collection in the villages and they do not put on protective gear.

Figure 5.5: Technologies of disposing human waste



Source: (Fieldwork, 2008)

5.2.6: Disposal of Waste Water for Commercial users

For the commercial category, they dispose waste water as shown in the table 5.13 below

Table 5.20: How they dispose of waste water

	N	Percent
City sewer	3	6.5
Open drain	26	56.5
Open field	10	21.7
Next to the house	3	6.5
Septic tank	1	2.2
Roadside	1	2.2
In the river	2	4.3
Total	**46**	**100.0**

Source: (Fieldwork, 2008)

With regard to the technology they use to dispose human waste once the sanitation facility is full, 37.1 percent use open drain, followed by river at 25.7 percent and city sewer at 22.9 percent. The rest use open field, Bin factory and sometimes not removed at all take the remaining percentage. As was the case with the household respondents, the commercial (64.7 percent) too feel that the technology used is not hygienic and safe. They cite the following reasons; that the people do not care about the surrounding environment /or pollutes the river, people use container leaving behind bad smell, the technology causes diseases and that it attracts vectors such as rats, mosquitoes.

5.3: Water Governance Issues:

Mukuru informal settlement has an average household size of 4 persons with housing units, commercial structures built at close proximity to each other. The local authority has not been able to provide water services for the growing population especially the low-income households in slums where expansion of water supply system has been limited. This has led to loss of large volumes of water by the water utility, leaks and illegal connection in slums. The income levels of people living in Mukuru show that there is need to provide water using the policy instrument of social tarification where social tariffs are used to ensure the poor get water without establishing water tariffs based on full cost-recovery which may be too expensive. Low-income households generally consume low volumes of water therefore the first block of consumption can be charged cheaply with progressive increase in prices for additional water consumption. This policy can benefit the poor if they can command influence in the Water Services Regulatory Board, where tariffs area established (K'Akumu, 2004).

Following the inability of water utility to satisfactorily supply water services, Alternative water suppliers have emerged and are playing a significant role in meeting the water demands of the poor. K'Akumu (2004) indicates that studies from other countries have shown that alternative low income suppliers can supply water at an acceptable standard and that they hold several advantages over official utility as relate to serving difficult, depressed areas in slums. There is great potential for alternative water suppliers to meet

the water needs of slum dwellers. It is suggested that the future supply of water in low income settlements lies with the small scale providers (Carpenter 2003).

The technology that is appropriate for supply of water in Mukuru is piping while there are problems with piped water management where there are no public rights to allow pipes to be laid. The utility operations have not been transparent, subject to political interference which encourages corruption with revenue diverted away from operations. The utility has also not recognised the role alternative water actors play in supplying water to informal settlements. The alternative water actors do not operate in partnership leading to wastage, duplication and limited benefits to residents in form of increased supply or better prices for water.

In the water Act 2002 there are instruments and institutions which the poor or civil society can use to advocate and ensure that the poor get their share of the water. However from the data analysis knowledge on the instruments and institutions that reinforce participatory management are not known or efforts put in place to make them operation and sensitive to the needs of the poor. Ability of slum residents to have a representation in the regulatory board, present the poor with a forum through which they can lobby and push for their rights to access water supply but this is not the case as appointments to the board are political and under the control of the minister. People with great political influence without much connection to the slums get to serve in these positions. Limited public consultation takes place in planning for water strategy as the poor or not aware of the planning instrument where discussion and decision are taken in areas of investment

and water development since the decision making platforms are not decentralized to appropriate levels. This implies that the water users in Mukuru are not informed of management issues or activities that may affect them

Contractual Clauses or conditionalities in service providers are not adhered to as the water utility require subsidies in order to extend water services to difficult areas of informal settlements or charge commercial tariffs in order to recover full costs in slums which is beyond the ability of slum dwellers to pay. To influence the policy of utility performance the poor would need to be represented in the board.

CHAPTER SIX

STAKEHOLDERS PARTICIPATION AND CHALLENGES ENCOUNTERED

6.1 Stakeholders involvement

6.1.1: Actors and their level of Involvement

Another objective which the study wanted to find out was the multi-players in water supplies and their level of involvement. To establish this, the households, commercial water users, community groups, local administration were interviewed. The study revealed that; For Households, private individuals were the main actors with regard to water provision in Mukuru at 75.6 percent. Other multi-players included Community based groups (4.5 percent), Women groups (9.7 percent), NWSC (2.8 percent), CDF (3.4 percent) and Church (4.0 percent). For sanitation provision individuals were ranked the first with 63.9%, followed by Community Based Organizations (12.4 percent); Women Groups (11.2 percent), while others like the church, NGOs, Government projects had 12.5 per cent. For the commercial category, the multi-players that provide water were as follows; Individuals (75.6 percent), Community based groups (4.9%), Women groups (4.9 percent), NGO (2.4 percent), NWSC (4.9 percent), Church (2.4 percent) and C.D.F (4.9 percent) while for sanitation provision, Individuals (61.0 percent), Community Based groups (12.2 percent), Women groups (7.3 percent), NWSC (2.4 percent), Church (2.4 percent) and CDF (12.2 percent). The private individual actors, community Based groups, women groups normally got their metered water from NWSC consequently

implying that NWSC was the main source of water for multi-players in the settlement and was a significant actor in water services. For sanitation, individual actors, local groups are involved in constructing pit latrines which was the main sanitation facility in the settlement.

6.1.2: Level of Involvement as per the Households

According to the household respondents, the following were viewed as the multi-players providing water in the area and were ranked as below based on their level of significance *(see table 6.1 below)*

Table 6.1: Household; level of multi-players involvement in water provision.

Water provider Actor Ranking	Percentage strength
1. Individual	68.3
2. Water kiosk	10.9
3. Women groups	5.4
4. Church	4.0
5. CDF	4.0
6. NWSC	2.0
7. Private services	1.5
8. CBOs	1.5
9. Water vendors searching for water using bicycles, handcarts and vehicle	1.5
10. Landlords	1.0

Source: (Fieldwork, 2008)

The Household ranked in their view the actors that provided sanitation in the area *(see table 6.2 below).*

Table 6.2: Household; level of multi-players involvement in sanitation provision.

Sanitation provider Actor Ranking	Percentage strength
1. Individual	72.2
2. CBOs	8.5
3. Women groups	8.0
4. NWSC	2.8
5. CDF	2.8
6. Church	2.3
7. Youths	1.7
8. Landlords	1.1
9. None	0.6

Source: (Fieldwork, 2008)

When asked whether they knew if the water providers have legal licenses to operate, 82.4 percent said No while 17.6 percent said Yes. This indicated that the main concern of the consumers is water accessibility and not necessarily whether water is licensed or not. This implies that participation of the residents in the water service delivery is limited

6.1.3: Level of Involvement as per the Commercial

For the commercial category, the following were viewed as multi-players providing water in the area and were ranked as below based on their level of significance (*see table 6.3 below)*

Table 6.3: Commercial users; level of multi-players involvement in water provision.

Water provider Actor Ranking	Percentage strength
1. Individual	79.7
2. Women groups	2.5
3. Church	7.7
4. Water kiosk	5.1
5. Landlords	1.2
6. NWSC	2.0
7. CBOs	1.6
8. Water vendors searching for water using bicycles, handcarts and vehicle	0.3

Source: (Fieldwork, 2008)

The commercial users ranked in their view the actors that provided sanitation in the area *(see table 6.4 below).*

Table 6.4: Commercial users; level of multi-players involvement in sanitation provision.

Sanitation provider Actor Ranking	Percentage strength
1. Individual	68.2
2. CBOs	9.1
3. Women groups	9.1
4. Youths	4.5
5. Landlords	2.3
6. NWSC	2.3
7. CDF	2.3
8. church	2.3

Source: (Fieldwork, 2008)

6.2: Collaboration, Participation and Challenges experienced

30 per cent of the respondents in commercial category do know that the water providers have legal licenses to operate. 92.1 percent of the respondents were not involved in the planning of water and sanitation services in the area, but for the ones involved, the local administration office (The area chief) do mobilize the villagers on matters to do with

water and sanitation. None of the respondents was involved in the management of water supply in the area. 6.1 percent said there were community meetings where water and sanitation issues were discussed. And when asked how often the meetings were held they said thrice a year and their concerns were taken up to help improve the service provision. 13.5 per cent of the household indicated that there was a contact office of presenting their concerns on the water and sanitation service. It was located at the Land agents office and in Industrial area at City water office. Only 2.6 percent of the commercial category respondents were aware of regulations that govern the water and sanitation providers in the area.

74.4 per cent of the household said they do not know whether the water supply they use is legal. On reliability of water supply, 65.6 per cent are assured of daily supply unless there is a breakdown, 18.8 percent are assured of 4 days a week. 9.4 percent are assured of 6 days a week, 3.1 percent are assured of once a month, 3.1 per cent are not sure. 62.9 percent of the respondents do undertake water conservation measures. Of which they mentioned storing in plastic tanks, control use, recycling water (Re-use water which is perceived not to be dirty yet).

99.4 percent of the household respondents said they were not involved in the planning of water and sanitation services in the area. But for the ones who said Yes; Involvement was in discussion about current water situation. When they were asked whether they are involved in the management of water supply in the area 100 per cent said they are not involved. There are no community meetings where water and sanitation issues were

discussed and if there were as alluded to by the 3.8 percent who said Yes, they were held 3 times a week (66.7 percent) or they are not sure how often they were held (33.3 percent).

For Monitoring and Reporting Systems; the respondents do not have a contact office of presenting their concerns on the water and sanitation service according to the 98.1 per cent who said No. For the ones who said Yes, the offices were located at the Chief's Office in Mukuru. In terms of Governance, only 3.2 percent of the respondents were aware of any regulations that govern the water and sanitation providers in the area of which they mentioned the city council by-laws and the Ministry of Health. When asked whether they knew if the water supply they received was adequate to meet future demands; 21.9 percent said yes. 81.6 percent of these said that the main source of water supply used at their household is from City Council, 7.9 percent said from Shallow well, 2.6 percent said from CDF water project while the remaining 7.9 percent said they did not know.

84.6 per cent of the households confessed not knowing whether the water supply they use was legal. They said they were assured of the water supply daily (39.8 percent), only when it is available (31.2 percent), once a week (19.4 percent), Unpredictable (8.6 percent) and 4 days a week (1.1 percent). 41.3 percent of the respondents said they do undertake any water conservation measures, of which they mentioned storing water in plastic tanks, control use, stop bathing everyday, wash clothes weekly and re-use water (use water more than once).

UN-HABITAT (2003) report indicates that there is a growing consensus that in order to achieve delivery of water services to the poor, water service providers need to be more accountable to low-income dwellers otherwise water services are unlikely to be implemented or sustained. The involvement of the poor themselves in service provision is an important aspect of water management. The Nairobi water company as the main source of water in Mukuru can increase coverage and accessibility by institutionalizing participation of residents in its water delivery structure hence gaining the public trust and support. The company can rely on the local community groups to provide water services to depressed areas as social networks in settlements are quite strong. With increased participation of residents the water company can enable poor households to easily connect to a piped-in water supply by easing land title requirements and introducing flexible schemes to allow for more individual connections.

When community members play a crucial role in the organization and management of the water services in the settlement billing and collection of water charges for members with individual connection can be made easier. Increased monitoring and maintenance of the water distribution network facilities can be enhanced when a contact office of the water company is established within the settlement or at close proximity. With more participation residents would have better access to potable water services which consequently lead to increased water consumption, translating not only in better return for the water company but also in improved public sanitation and hygiene for residents.

The level of collaboration among the various actors involved in water and sanitation services in Mukuru is limited as revealed by the low percentage of 3.2 percent of the respondents who are aware of any regulations that govern the water and sanitation providers in the area of which they mentioned the city council by-laws and the Ministry of Health while the water Act 2002 is the current legal framework within which management of water services is anchored. Most of the water actors though having Nairobi water and Sewerage Company as the main source of water operate as individual entrepreneurs whose main interest are profit maximization. Limited community participation has worsened the situation as the water consumers are passive consumers of the services which are controlled by the market operatives and individual small scale water providers leading to minimal benefits for the residents.

6.2.1: NGOs and CBOs Involvement

NGOs main role in Mukuru as relate to water and sanitation is to build the capacity of local organizations, CBOs, women groups among other organized groups. Few NGOs are directly involved in water and sanitation provision in the informal settlement but through their target groups which are mainly organized through CBOs and Women groups the services are provided. The capacities that CBOs, women groups acquire from the NGOs makes it easily possible for the local groups to apply for metered connections to Nairobi Water and Sewerage Company for water connection that is sold to individual residents of Mukuru. The NGO give capacity to CBO while the water company vends the water to organized local groups. In situations where an organized group exists in majority of cases

an NGO may be in the background involved in building their capacity while allowing the local groups to enter into negotiations with NWSC to provide water and sanitation in the Informal settlement. There is limited collaboration between the various NGOs that work with local groups involved in water services in Mukuru and the implication is that the residents do not get much benefit in terms of affordable costs and accessible water services. Duplication of services still exists where local groups may concentrate their water services in one area while other areas may lack the same service.

CBO Alliance is an upcoming umbrella organization of self Help group and was instrumental in discussion with NWSC towards starting the pilot water project as they were actively involved in negotiations. The Alliance has been in existence informally for a period however was officially registered 2 years ago. Its main aim is to empower people to know their rights and demand for better services however this umbrella organization is still at nascent stages and not vibrant enough to represent the community issues to the water company and other water actors in the area. This therefore implies that with limited community organization and mobilization, individual water providers would still continue offering water services at market rates without considering the end users of the service. The limited organization of community groups has led to reduced participation and inclusion with individual entrepreneurs taking advantage of the scarce supply of water and sanitation while demand for the service is high and keeps rising.

Mukuru resident comments: Cost of water sold should be between sh.2 and sh.3 and not exceed sh. 5 per 20 litre jerrican however the cost is higher as only limited number of meters are functioning, insufficient water distributed that leads to increase in prices. During scarcity of water a 20 litre jerrican is sold for as much as between sh.10 to sh.20 which is expensive and generally reduces the amount of water consumed and compromise hygiene standards. The amount of water paid by residents of Mukuru is far much higher than other individuals in the city with water connections provided by NWSC.

Implications of individuals topping the list of actors providing water in Mukuru is that Metered individuals in Mukuru have taken up the provision of water and sanitation in Mukuru as a pure business venture which is commercialized with limited control from NWSC on the prices charged to the end user. The rules earlier set that individual at the chambers were to form self help group have not been reinforced mainly because there is no strengthened and vibrant community groups that play a central role in the management of water services to ensure implementation of the water Company rules. It is therefore important that community organization and mobilization is nurtured where benefits associated with their participation in the management of the water services become a central principle of engagement. When settlement residents are clear that their participation would lead to better water prices and accessibility they would be keen to participate.

Another challenge experienced is that type of pipes used by individuals to distribute water are not those specified by NWSC, quality is compromised and substandard pipes are used which are easily broken and water wasted or contaminated leading to increased

operational costs and loss of water by the vendor NWSC. The cost of laying the distribution lines from the meter chambers is costly and with limited incentives or financing schemes for the poor fewer residents is able to have individual metered connection leading to emergent of individual small scale water providers. To secure a meter connection from NWSC one makes a payment of sh. 3500 with an additional sh. 15,000 used to lay down the pipes. The individual water providers are able to meet cost of distribution networks and sell water to residents at a fee.

Mukuru resident comments: In a chamber where there are 26-29 meters one may only find that 6 meters are functioning and the rest not working. This leads to reduction in the amount of water distributed and shots up prices of water per 20 litre jerrican leading to reduced amount of water consumed. During the period of increased prices Residents use less water which is unhygienic, while individuals providing water makes high profits.

Water theft still occurs where individual water providers with metered connection to NWSC may have no water in their distribution lines yet they receive bill indicating water has been consumed. This is a challenge experienced and has led to various complains on accuracy of water bills. This mainly occurs as quoted by a resident of Mukuru

Mukuru Resident comments: Unscrupulous individual water providers collude with water company officials or other actors to tap into metered water line and divert to other stand points where they sell water yet are not paying for any bills and the incomes are shared among themselves. There is corruption in the administration of water as even with a meter that is paid for water is not easily flowing yet bills are generated. The residents indicate that officials from NWSC are compromised to only provide water in meters or pipes to individuals who give them bribes leading to water shortage.

Rivalry among water providers is rife where an individual can get his water distribution line mixed with a sewerage line leading to contaminated water and other community members avoiding such taps. This leads to undue advantage taken by a few individual water providers using unfair means to keep supply limited consequently leading to increased water prices and unfamiliar competition. As observed during the study water distribution pipes were of low quality leading to frequent breakages. There is a lot of water wastage occasioned by pipe burst that take long before repairs are done and NWSC is losing quite an amount of revenue yet people do not have sufficient water in the area. The distribution of water in Mukuru is not quite efficient leading to increased demand, less supply and easy shot up of water and sanitation prices. This implies that the operational cost of delivering water to Mukuru is quite high for the water Company while the services are also not adequate to meet the needs of the residents and at affordable cost.

6.2.2: Partnership, Collaboration and Network

In focus group discussion held it became clear that there is no association of water vendors in Mukuru. This stifles any effort for collaboration with other water actors since they operate as individuals whose prime goal is making good profits from the water provided by the water company. CBO Alliance is making an attempt to strengthen local groups to demand that the providers collaborate and provide better service but this is not yet the case. Nairobi water and Sewerage Company (NWSC) remains the single most important actor as they provide the bulk of the water service estimated at 90 percent of the entire water in area which they sell to individual small water actors or end user consumers through metered connection. Initially the water provided in Mukuru was not metered and was illegally used. Other water providers are Mukuru community centre borehole started 3 years ago and mainly serves the school and church premises, the water is not accessible to the wider community and also considered to be an individual venture.

There is an individual borehole at Visions built by an Indian and used when NWSC is disrupted however when power fails the water cannot be accessed and water problem become a major issue in the village. Vision borehole provide water to Njenga primary which is a city council school at a cost sharing fee where the school administration makes part payment towards meeting the cost of electricity or repairs when the borehole breaks down. Our lady of Nazarete with the support of Mikato Safaris is constructing a borehole which is intended to be used for the 3 institution that is school, polytechnic, and Catholic Church St. Mary's. The Catholic Church has built some limited number of toilets in the

village. As per the Water Act 2002, NWSC has been mandated by Athi Water Services Board to provide water in Nairobi and its environs, while the Athi Water Services is mandated with development of infrastructure which the Nairobi water and sewerage company leases from the services board. There exist other actors like NGOs in the informal settlement of Mukuru for example Pamoja Trust, Practical Action, St Johns, Umande Trust and other collaborators like the European Union, World Bank are also in working relationship.

The implication of limited collaboration is that when various water actors do not coordinate their services and efforts, duplication easily occurs as actors end up being over concentrated in one area while other points receive limited service. Where there is no structured collaboration with organized community groups and when local groups are not actively involvement in the water management, accessibility of the water service to informal settlement is always limited while prices charged are always high. Sustainability of the water delivered is also curtailed as actors do not share information on how best to deliver the service or conserve the resource to enable them meet the ever rising demand in depressed areas. Without a structured collaboration and partnership with the water actors, the individual water actors, CBOs, NGOs remain unknown to the water company that providers most of the water in the settlements. This implies that the various water actors are not guided within a framework on what there responsibilities are, who is doing what where, maximum prices that they can charge, allocation of areas to supply water to and numbers to reach or rights that end users consumers have. This has led to no real

benefit of water services to the settlement resident as water is provided as a commercial good and individual water actor driven by the need to maximize on profits.

6.2.3: Water Problems as Identified by the Households and Commercial users

Another serious problem that affects water availability in the areas is its reliability, 69.8 percent of the household respondents were affirmative that there are water problems experienced by the major water actors which leads to disruption in supply. These problems were revealed to include Low water pressure at the stand pipes, Illegal connection of the water actors piping network, breakdown of the water supply occasioned by pipe breakages, Disconnection by NWSC when water bills are not paid in good time. Other problems were indicated as untreated water and Pipe bursts. 82.3 percent of the household respondents indicated that they also experience disruption in their water supply when water actors supply network breakdown. 34.7 percent indicate that the breakdown occur once a week, 8.9 percent in 2 weeks, 21 percent, once a month, 4 per cent twice a week, 12.9 per cent occasionally and 18.5 percent indicated that the breakdown can be unpredictable. For the commercial category, about 50 percent said there were problems experienced in providing water by the major actors. These include Low water pressure, Illegal connection, No collaboration among actors, Disconnection by NWSC, bursts pipes and Vandalism. In their business premises, the 75 percent of the respondents said they do experience breakdown in the water supply. These breakdowns occur once a month (30 percent), occasionally (20 percent), once a week (16.7 percent),

unpredictable (13.3 percent), once a fortnight (10 percent) thrice a week (3.3 percent) and twice a week (3.3 percent).

The implication is that water supply in the settlement is not reliable as disruptions are often experienced. When this occurs the demand exceeds the supply and in most occasions price of a 20 litre jerrican goes up.

6.2.4: Water Problems as Identified by Water Vendors

In a discussion, water vendors shared the problems they face in providing the service. They experienced problems in providing water as relate to; Labour charges in providing the service are high which take more than half the income generated, considering that on daily basis, they incur the following operation costs; Security- Kshs. 200/=, Pumping – Kshs 200/= and Salesperson – Kshs. 200/=. Insecurity, burglary from the slums, destruction of tanks and pumping machines increase their operating costs. The vendors have to set up pumping units as the water pressures received are not sufficient to meet the demand of water. Stand pipes that are near the main water pipes charge less compared to those a little bit far away, since they lose very little water in between the meter chamber and the water sale point and considering the cost of installation of the piping system due to short distances from the main water pipe they incur the least installation costs. Water rationing is a frequent occurrence as it is effected everyday as opposed to twice a week as was the case earlier. Vandalism; from Nairobi Water Company Security who take the water vendor pumps and other machineries. NWSC demands that water should flow with

gravity pressure and if pumping is done to increase the pressure other people are denied accessibility of the water, while the situation is that water pressure is too low. The police also take advantage of the situation to harass the vendors in exchange for bribe. Another problem faced by water vendors is that it takes too long to repair breakages when they occur and bribes are asked before repairs are done by NWSC employees.

The water vendors reveal that the policy in making connections to NWSC main water lines is not fair but exclusive as the "*Rich clients*" like the multinationals located around the industrial area get connected to the main line with a 2-inch pipe while 100 "poor people" are connected to smaller pipes leading to low quantities, low pressure of water reaching high densely populated residents.

Water Vendor comments: The cost of labour in providing water is high. Water pressure is low and one is not allowed to pump it. Even the police take advantage of the situation to harass the vendors in exchange of bribe. NWSC employees take too long to repair breakages when they occur; they even ask for a bribe of well over 4,000/= to repair a single breakage.
Connections adopting the policy of exclusion. "Rich clients" like the multinationals around the industrial area get connected to the main line with a 2-inch pipe while 100 "poor people" are connected to smaller pipes of Half-inch. These pipes can only channel limited amounts of water quantity.

The implication is that problems faced by the water vendors curtail their ability to provide the water services to residents adequately. The vendors operate as individual entrepreneurs leading to limited resolutions of the challenges they experiences by the main water provider. The problem the water vendors faced are passed over to the resident who are the end users of the water through increased water prices, unreliable services and quality which is often not assured.

6.2.5: Water Problems as Identified by NWSC

The Water Company has experienced problems in loss of water due to illegal connections, pipe bursts as a result of using poor quality pipes. tampering with meters leading to loss of revenue. With increased water losses the company often disconnects water connection to the slum leading to major complain as there was no other reliable source of water in the slum and consequently bad relationship is often created between the company and inhabitants of Mukuru. The Chamber System has experienced some challenges during its implementation as follows;

Billing of the water used per water meter in the chambers takes long and when bills come with a cash money economy in the slums it may find when the customers have no funds to pay the accrued bills and when water is disconnected the customers do not pay the bill to warrant connection and the individual connections remain disconnected. In some instances the locked chambers are tampered with by the individual customers who open the chamber turn off some meter leading to unfair competition where only few individuals are able to provide water in the slum. This creates artificial shortage of water as demand becomes higher than the available supply. Occasionally some collusion occurs between employees of the water company and some customers who ensure the water is turned off leading to unfair competition by limited water supplies.

Another problem the water Company face is limited participation of the community in the water management in Mukuru as the current bulk metering project is purely an individual relationship between NWSC and the customer connected and this has led to increase in water prices by the customers of NWCS who eventually sell water to inhabitants of Mukuru. In the pilot project NWSC does not control the price of water distributed in Mukuru or fixed by water vendors. As long as their billed water is paid by individuals customers all is expected to be okay however there exists a gap in the Water Company connecting to its end users who are the poor communities in Mukuru. The Mukuru inhabitants get no fair deal as water price fluctuations is a regular occurrence and they are at the mercies of water cartels. Mukuru people as the case is in most slums pays as much as 10 times the cost paid by other customers having individual water connection in the city. The water Company has not been very prominent in disposal of waste water as sewerage lines require construction where the system can be set in a fairly straight path. Land tenure is a challenge in the area while the settlement is not planned to allow for infrastructure constructions that requires in collaboration with other actors the company has constructed Abolition blocks for use by the community in limited areas at a fee.

On the issue of water sustainability, the main water source of NWSC that is distributed to the city and to Mukuru is not sustainable as the capacity currently is not sufficient to meet the demands of people living in Mukuru and the City. This has been occasioned by rapid increase in population beyond the ability of the water company to increase supplies, the water Company inability to account for about 40 per cent of water pumped into their

system due to illegal connection, burst pipes which go unreported and uncoordinated efforts of the multi-actors in the service provision are some of the sustainability problems faced by the company. The implication is that water rationing will continue being experienced until a new system is constructed to bring additional water into the existing capacity or improved collaboration and partnership among the various actors in order to enhance the provision of water services in the informal settlement.

6.2.6: Sanitation Problems as Identified by Households

53 percent of the respondents in household category said there were sanitation problems experienced by the major actors. These include Full latrines which spill into the environment, Illegal connections to sewerage systems, limited collaboration among actors, Lack of water to facilitate sanitation systems, Flooding that easily lead to collapse of the pit latrines the main sanitation technology in the settlement. Complain of high sanitation fees, Long queues, Poor connection, unstable structures and people wishing to use facility but not willing to pay are some of the challenges revealed by household users. At household level 30 percent of the respondents said they do experience sanitation facility breakdown. These include poor plot organization, not well-coordinated service providers and poor drainage systems. 33 percent of the respondents in commercial users category revealed that there are sanitation problems experienced by the major actors in delivering the service. These include uncleanliness of the sanitation facility, when the facility fills up it takes time to empty, long Queues in the morning, Structures Collapsing

and inadequate water for flushing toilets during water shortage. At their business premise level, 34.2 percent of the respondents said to experience sanitation facility breakdown.

The implication is that sanitary facilities quickly fill up as there are fewer facilities in relation to the persons using the same. When the facilities are not often empted it implies that the human waste spill into open ground leading o poor environmental sanitation. High sanitation cost indicate that less people use the facilities and disposal of human waste in open spaces would remain a problem in informal settlements leading to deterioration of health status and high incidences of diseases among residents.

6.2.7: Mitigation Measures

This section sheds light on what the stakeholders, actors reveal should be done to alleviate the problems service providers' experience.

Water Vendors revealed that they need support to enable them improve their water kiosk businesses by the water company installing water meter where the water pipe stand is located. Towards this they indicate that NWSC need to take responsibility in establishing innovative, flexible scheme that enable vendors to afford quality piping consequently reducing frequent pipe burst and breakages experienced. The vendors reinforce that partnership is about taking responsibility and all actors have to be involved to ensure operational costs are kept low. The problem of low water pressure needs to be resolved in order to reduce labour and pumping cost incurred when boasting the water

pressure. Rationing frequency in a week should be reverted to the earlier conditions of two times a week and not a daily occurrence. And when rationing has to be done information needs to be put in the media as the case currently is with the electricity service provider. Credit facility need to be made available so that clients can have easy facilitation in buying the metal water pipes which are not prone to breakages in comparison to the plastic pipes. Investment in sanitation facilities and exhauster services can lead to entrant of more actors in sanitation services consequently improving the sanitation coverage in the settlement.

CBO Alliance suggested that NWSC staff designated for Mukuru work with the grassroots groups to resolve the water problems as identified by the community members. Streamlining of water distribution in order to make water available in plenty consequently making the price of water affordable. Citing of pipes in open places, entrance of alleys and sidewalks can easily reduce incidences of illegal connection, theft and diversion of water. The company staffs need to reduce incidences of corruption and bribe taking. Towards this the water company need to work put more efforts in increasing water accessibility to settlement residents. Active involvement of the community in the water management is an important aspect in water management and delivery. While collaboration among actors would imply reduction in wastage and ensure that the providers are responsive to the community concerns in improving the provision of water services.

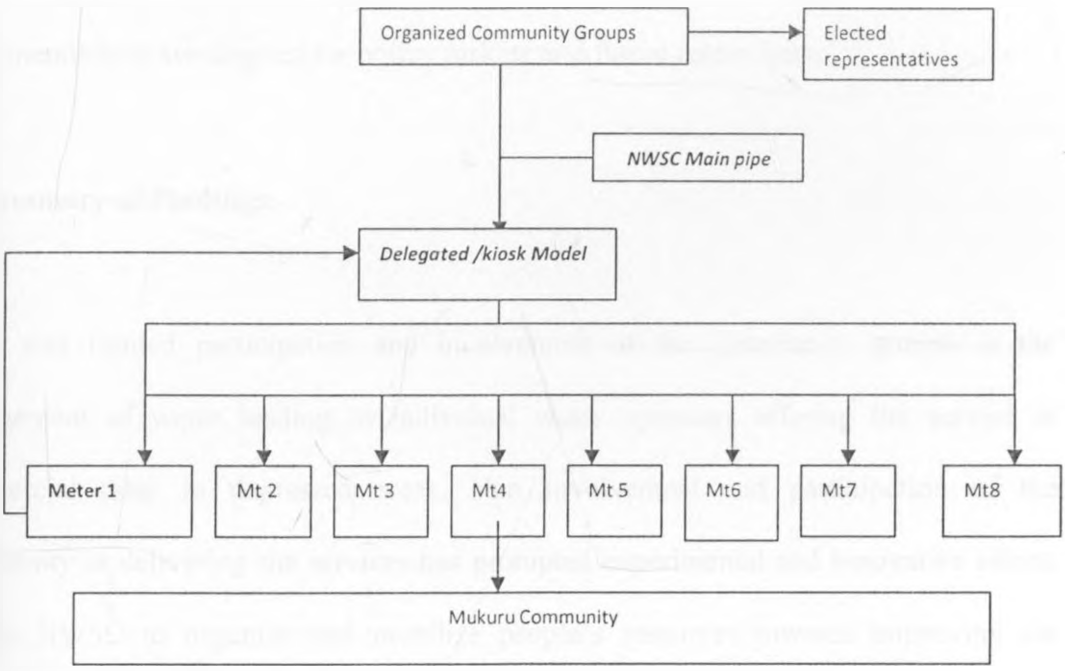
NWSC is the mandated service provider in the area and holds a key position in so far as water and sanitation service provision is concerned. The company acknowledges that; as aforementioned, Mukuru is an enterprising slum with many small businesses, enterprises that are constantly growing. The enterprises are defined with water as an enterprise taking up great prominence especially in Mukuru Kwa Njenga where small water actors with individual connection to NWSC are very aggressive and organized and at a point taking the nature of water cartels in Mukuru. NWSC has identified the importance of community involvement in water delivery and a better model for accessing water to informal settlements that give joint benefits on proceeds of the water sold as well as making accessible the water at reasonable prices to Mukuru residents.

During the survey it was revealed that NWSC recently conducted an evaluation to access the impact of the chamber metering project with a number of challenges identified and lessons learnt. This has led to discussion on a modified model of delivering water to informal settlement as the system had not been successful in increasing water accessibility to Mukuru informal settlement. The water Company intends to review and set up a better system that yield benefits to community and the individual customers while driving water costs down. Towards this the new system aims at breaking the water cartel system in the Informal settlement consequently leading increased community participation and involvement in water management. The Delegated Management/ Bulk Kiosk Model is a combination of individual connection and an introduction of delegated management whereby Bulk metering will be made to a single entity commonly known as bulk Kiosk with a single meter after which the single entity will make connection to

individual who will also be metered. However the Kiosk owner will be responsible for collecting the water bills utilized by individuals at individual connection and make single payment to NWSC at the bulk metering. NWSC expect to deal with fewer entities as opposed to the situation now where they have several individual customer relationships which also lead to delay in the billing system.

NWSC revealed that in the proposed model the water company would sell the water to the delegated Kiosk owner who would then connects other individual customers and if the individual customers in the current Chambers system (individual connection with NWSC) are disconnected they have an opportunity to get water from the delegated manager at Kiosk point and pay the operator directly. NWSC will also regulate the prices at which the Kiosk owner (on delegated responsibility) would be selling the water to slum dwellers. There is proposed increased participation of community members in order to ensure the water provides benefits to both NWSC and the slum dwellers. In the initial chamber system model there was limited provision for community benefit and participation as it was pure a customer-supplier relationship at market operations.

Figure 6.1: Proposed new water model for NWSC.



Source: (NWSC, 2006)

NWSC has developed a strategic guideline to be followed by all stakeholders involved in providing water to informal settlements. NWSC, World Bank, Athi Water services Board played a key role in developing the guide and the process has been participatory with other water actors giving comments and inputs to the draft document. The inputs were incorporated and currently the guideline is being published.

CHAPTER SEVEN

CONCLUSIONS AND RECOMMENDATION

This chapter presents the summary of findings, conclusions and recommendations. The recommendations are deigned for policy makers and future researchers.

7.1 Summary of Findings.

There was limited participation and involvement of the community groups in the management of water leading to individual water operators offering the service at commercial rates in depressed areas. Non involvement and participation of the community in delivering the services has prompted experimental and innovative efforts by the NWSC to organize and mobilize people's resources towards improving the delivery of these services.

The single most important actor in the provision of water and sanitation services in Mukuru is Nairobi water and sewerage Company with a high level of involvement. This denotes that any programs that aims at increasing water accessibility to residents of informal settlement need to recognize the role the Company plays as the main source of water and mandated by law to provide services in the area. The Bulk Metering program also illustrated that there is no single model that will be effective in all settings. Flexibility, incentives and innovation are thus important factors to consider. Moreover,

the programme has demonstrated that individual connection to bulk metering in settlement would not be automatic unless other incentives and registration requirements are reviewed.

Accessibility and cost of water is a consequent of other factors other than involvement of many actors in a particular area. It was established that the cost of water in the settlement was still higher than what other city residents paid in the city even in situations where the source of water was the same. The water company, individual water providers had to use expensive water distribution technology as the risks of delivering the service was high in informal settlement leading to increased operations costs consequently pushing the prices of water to the end user customers.

The level of collaboration among the various water actors in water services and management was limited with community not involvement in the water provision as active participants. There was no structured framework within which actors collaborated and entered into partnership. Several operational challenges are faced by the water actors in the delivery of the service. Sustainability of water sources was indicated as a challenge mainly caused by the rapid increase of population and inability of the water company to meet the increasing demand.

7.2: Conclusions

In the light of the above findings it is evident that limited accessibility and high cost of water in Mukuru is as a result of poor collaboration and partnership among the multi-players in the provision of water and sanitation. The study carried out in Mukuru revealed that there was both inadequate and limited accessibility of water and sanitation facilities. This ranges from inadequate domestic water supply, lack of sanitary facilities, poor drainage, uncollected garbage, inadequate sewerage system and inadequate provision of public social services like schools, health centers, roads and other infrastructural facilities. Limited participation of community in the management of water has also led to poor accessibility and high costs of water in the settlement.

Due to the financial strains the government, Water Company and small water providers are undergoing evidenced by the failure to provide the cited facilities. the study therefore emphasizes the importance of active community participation and involvement together with the application of planning from the grassroots level and thus making the following recommendation.

7.3: Recommendations

It is important to develop a clear strategy of utilizing community resources to deliver water and sanitation which requires new organization and mobilization in a participatory way through organized groups like self Help, co-operatives, self sustaining, community-

based organizations with minimal government involvement apart from reinforcing rules, regulations and setting standards. This would achieve delivery of water services to the poor living in depressed areas. There should also be legal systems to ensure that service providers are more accountable to low-income dwellers and putting poor people at the centre of service provision. The local community groups should be organized and strengthened in a legal framework to enable them monitor operations of the service providers while amplifying their voice in policymaking and strengthening the incentives for providers to serve the poor.

Community based development social workers should be deployed in the area to motivate Organize and mobilize of resident groups, self Help groups and community-based organizations on the need to actively participate in the management of water in their area and the clearly enumerate the resulting benefits. To attract the participation of tenants in informal settlement which comprise of a large percentage in relation to the landlords' projects should depart from overly stressing physical improvements in water and sanitation provision but programs that enhance quality of life and reasonable prices on the water and sanitation services provided.

Establishment of a pro poor programme needs to be put in place. The program should encourage poor households to easily connect to a piped-in water supply through community systems that are integrated into official private concessionaire wider systems. This would reduce the extent of water unreliability and artificial shortage created by

fewer water actors. The reliability of water would also enable installation of flush toilets which require substantial amount of water. This would also enable the standardization of water charges to make water affordable to the residents. This would finally result into more consumption of water, reduced cases of water related diseases.

The connection application requirements of land title, plot number should be waived to allow both tenants and landlords make direct application to the water company. Flexible financing schemes and water pricing which stagger payment of connection fees should be introduced to allow for cost sharing among residents and give average water rates for bulk connections among other incentives. This would enable residents have a water meter installed for them by the water company. It is important that water providers relax the stringent water connection regulations to allow for tenants individual connection even in the absence of plot numbers. Individual metered connection would be more cost effective as compared to buying water from individual water vendors.

Community members should play crucial roles in the organization and management of the water service in the area as relate to billing and collection of water charges from resident members, monitoring and maintenance of the facilities. There should be systematic installation of water meters in accessible and strategic locations like entrance of alleys, sidewalks, and visible spots. This would minimize cases of illegal tapping and illegal connection and reduce complaints about inaccurate and ineffective meter reading. Community representatives should be deployed as collection agents for the water

company hence creating employment opportunities in the settlement leading to general public trust.

The available water supply system should get better management and maintenance which should ensure increased availability of supplies more cheaply and quickly than increasing capacity. The individual water vendor systems pipes should well be maintained to avoid leakage which could lead to loss of water by use of water saving plumbing fixtures, flow control, educational programme and progressive tariffs based on marginal cost of water. A system should also not be over burdened with many outlets which would lead to shortage or low pressure.

Appropriate drainage system should be introduced in the area using appropriate technology which is locally available and affordable to take care of waste water. The drainage however should be a facility that community could maintain. Once this has been achieved borehole and wells could be drilled without possibility of contamination to supply additional water in the areas. However the drilled well and borehole should be located far from latrines to avoid possibility of any contamination. The drilling could be done with the assistance of NGOs currently working in the area towards safe water provision.

The government should device some appropriate building control to guide development within the area. It should promote the construction of sanitation facilities as part of the housing unit. There should be specifications on the kind of roofing materials to use. This

would check against situations where landlords build single housing units without providing for sanitary facility and use of rejected or poor quality materials.

The government should also come up with a legal framework which outlines by laws and regulations responding to residents demand for better water and sanitation services and to ensure that there is a legislative and regulatory system to guide the operations of the multi-actors and protect residents from exploitation. There should be public education to create awareness on health hazards and environmental quality which include solid waste management, sanitation facility and drainage construction as components that affect quality of water delivered.

There is need to involve the target community at all stages of the water delivery system from conception, through planning, design, implementation and operation. Planning from the community upwards is a practical means of improving water delivery services. Community participation can also serve as an input to service delivery usually in the form of labour, financial contributions.

There should be deliberate initiatives to strengthen collaboration and partnership among various water and sanitation actors and establish a policy framework of coordination necessary for the efficient delivery of water services and management of relationship among the actors. Nairobi water and Sewerage Company being the main water provider and mandated by the Athi water services Board should take a central role in forming the partnership framework with inputs from the settlement residents and multi- actors contracted to delivery water services in the area. This would lead to a Structured

Partnership, Collaboration and networking among the various actors where operations issues should be addressed. There should be possibility for actors to have an opportunity to appeal to the Athi Water services Board if there are disagreements on fundamental issues relating to policy. Active participation of Mukuru residents through organized community groups, self help should be a basic principle in the partnership. The water actors structured partnership should be recognized by the current water act 2002 in order to give it mandate and authority.

Demolition of some structures would also be necessary to create space for laying roads network, drainage system and water distribution lines. It is recommended that the structures within the settlements are upgraded into a neighborhood whereby there are open spaces, schools, social amenities and recreational facilities provided. To achieve this land tenure would need to be addressed to allow individuals upgrade their environment however clear rules and regulation for settlement upgrading would need to be put in place.

Mukuru residents can get sufficient water supplies to meet basic human needs from the branch of Nairobi River that transverses the areas. However this is not possible due to the high contamination of the water source from refuse disposal, human waste and inadequate sanitation and drainage within the area. There is industrial pollutant contamination as Mukuru is located next to the industrial area. To put this water into meaningful use and as a substitute to the current inadequate source the public authority could act as enablers, facilitators and work in partnership with the NGOS, private

organizations to extend service and public awareness to the residents on the capability of the water source to solve their water problems. With a clear understanding and agreement between the community and the agencies the river could be sealed off in such a way that refuse and dirty water can not get access into it. The River can then become an alternative source of water in the area. The above recommendations would ensure increased participation in the management of water services and better coordination of the role multi-actors play in the provision of water and sanitation services which can last to meet demands of the present population and future generations to come.

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Household Questionnaire Form

1.1. Date of interview (dd/mm/yyyy) |__|__|__|__|__|__|__|__| 1.2 Name of interviewer_____

1.3. Questionnaire number _____ 1.4. Name of village _____

Checked

By _____ Date |__|__|__|

Coded by _____ Date |__|__|__|

Verified By _____ Date |__|__|__|

2. PERSONAL DETAILS

2.1 Sex Male ☐ Female ☐

2.2 Marital status Married ☐ single ☐ divorced ☐ widowed ☐

2.3 What is your age 18- 23 yrs ☐ 24-29 yrs ☐ 30-35 yrs ☐ 36-41 yrs ☐ 42-47 yrs ☐ 48-53 yrs ☐ 54-59 yrs ☐ over 60 yrs ☐

2.4 What is the number of people in the household ? _____

2.5 What is the occupation of household head? permanent ☐ casual ☐ others (specify) _____

2.6 What is his/her level of Education? primary ☐ specify class ____ Secondary ☐ specify form ____ Tertiary college ☐ specify level ____ University ☐ specify level ____ Others (specify) _____

2.7 What other Income Generating activities is the household engaged in on a monthly basis

	Income
Activities	
Second clothes selling	
Selling paraffin, Charcoal	
Kiosk	
Hawking	
Others	

2.8 What is your collective family income in a month? _____ This is a blind question which is to be answered by information generated from the table

above.

3. WATER SOURCES/ACTORS/ACCESSIBILITY/USE

3.1 What is your source of water supply: City council connection ☐ Well ☐ Water kiosk ☐ Public standpipe ☐ Borehole ☐ Other (specify) _____

3.2 What is the technology of harnessing the water? _____

3.3 Who are the major Actors that provide water: Individuals ☐ Community Based groups ☐ women group ☐ NGO ☐ NWSC ☐ Other (specify) _____

3.4 Are the major actors of water and sanitation able to meet water demand? Yes ☐ No ☐

3.5 What is the distance to the nearest water source? _____ km

3.6 Is the quantity of water available sufficient? Yes ☐ No ☐

3.7 Do you undertake any treatment of water before you use it ? Yes ☐ No ☐

3.8 If yes which one? _____

3.9 Are there problems experienced by the major actors: Yes ☐ No ☐

3.10 If yes, what type of problems are they ? low water pressure ☐ Illegal connection ☐ breakdown ☐ Other (specify) _____

3.11 For what purpose do you use the water? Domestic ☐ Business ☐

3.12 What is the cost of 20 litre jerrican of water ksh _____

3.13 How many jerricans of water do you use in a day? _____

3.14 How often do you receive your water supply from the providers ? Through out the day ☐ At certain time ☐ Irregularly ☐ Other (specify) _____

3.15 Do you experience any breakdown in the water supply? Yes ☐ No ☐

3.16 If yes how often does it breakdown ? Once a week ☐ in 2 weeks ☐ Once a month ☐ others (specify) _____

3.17 Where else do you get your water supply when there is a breakdown in the system? Purchase from vendors ☐ Friends ☐ Other (specify) _____

3.18 How far is your alternative water source 1. _____ (metres) 2. _____ (Minutes)

3.19 How do you store your water at home? _____

3.20 What is the quantity of the storage facility? _____

3.21 Is it enough to take care of your water needs until the water supply is back? Yes ☐ No

3.20 If no how do you meet your water needs? _____

4. SANITATION SOURCES/ACTORS/ACCESSIBILITY/USE

4.1 What is the type of toilet facility used by the household? City council connection ☐ Pit latrine ☐ Open space ☐ Polythene bag ☐ Other (specify) _____

4.2 Who are the major Actors that provide sanitation: Individuals ☐ Community Based groups ☐ women group ☐ NGO ☐ NWSC ☐ Other (specify) _____

4.3 Are the major actors of sanitation able to meet toilet demand Yes ☐ No ☐

4.4 What is the distance to the nearest toilet facility you use? _____ km

4.5 What is the cost of using toilet facility per visit ? ksh. _____ per month ksh. _____

4.6 What is the cost of toilet facility in a month? _____

4.7 Are there problems experience by the major actors: Yes ☐ No ☐

4.8 If yes, what type of problems are they ? full latrines ☐ Illegal connection ☐ no collaboration among actors ☐ Other (specify) _____

4.9 For what purpose do you use the Sanitation facility? Domestic ☐ Business ☐

4.10 What is the technology used to provide sanitation? _____

4.11 Do you experience sanitation facility breakdown? Yes ☐ No ☐

4.12 How long does it take before the sanitation facility is repaired? _____

4.13 Where else do you get sanitation services when the facility has broken down? _____

4.14 How far is your alternative toilet facility? 1. _____ (metres) 2. _____ (Minutes

5. Disposal of Water and Sanitation

5.1 How do you dispose wastewater? City sewer ☐ open drain ☐ open field ☐ next to the house ☐ Septic Tank ☐ Others (specify) _____

5.2 What technology is used to dispose human waste once the sanitation facility is full? Open field ☐ open drain ☐ City sewer ☐ others (specify) _____

5.3 Is the technology used hygienic and safe? _____

5.4 If not why? _____

5.5 How do you dispose solid waste? Open field ☐ open drain ☐ City collection points ☐ Burn ☐ others (specify) _____

5.6 If solid waste/garbage is collected in the village who collects it? _____

5.7 What is the distance to the nearest garbage collection point? _____ km

5.8 Who are the major Actors that provide solid waste management services? Youth groups ☐ Community Based groups ☐ women group ☐ NGO ☐ NWSC ☐ Other (specify) _____

5.9 Are the major actors of solid waste management able to collect the generated waste Yes ☐ No ☐

5.10 Is there collective community responsibility to address environmental hygiene? Yes ☐ No ☐

5.11 If yes which ones? _____

6. General participation and sustainability

6.1 Who in your views provides water in the area? 1._____ 2. _____3. _____ 4. _____ 5. _____

6.2 Rank them on level of significance in providing water? 1._____ 2. _____3. _____ 4. _____ 5. _____

6.3 Who in your views provides sanitation in the area? 1._____ 2. _____3. _____ 4. _____ 5. _____

6.4 Rank them on level of significance in providing sanitation? 1._____ 2. _____3. _____ 4. _____ 5. _____

6.5 Do you know whether the water providers have legal licenses to operate? Yes ☐ No

6.6 Are you involved in the planning of water and sanitation services in the area Yes No

6.7 If yes how _____

6 8 Are you involved in the management of water supply in the area Yes ☐ No ☐

6.9 If yes how _____

6.10 Are there community meetings where water and sanitation issues are discussed? Yes No ☐

6.11 If yes how often are they held? _____

6 12 How open/participatory are the deliberations? _____

6.13 Are your concerns taken up to help improve the service provision? Yes No

6.14 If yes how? _____

6.15 Do you have a contact office of presenting your concerns on the water and sanitation service Yes No ☐

6.16 If yes where is it located? _____

6.17 Are you aware of any regulations that govern the water and sanitation providers in the area? Yes No ☐

6.18 If yes which ones? _____

6.19 Do you know whether the water supply you receive is sustainable? Yes No

6.20 if yes where is the main source of water supply used at household? _____

6.21 Do you know whether the water supply you use is legal? Yes No

6.22 For how long can you be assured of the water supply? _____

6.23 Do you undertake any water conservation mesures ? Yes No

6.24 If yes How ? _____

Observation by Research Assistants

1. Illegal Connections, Faulty meters, General Hygiene
2. Observe decision making process as per gender

Commercial Questionnaire Form

1.1. Date of interview (dd/mm/yyyy) |__|__|__|__|__|__|__|__| 1.2 Name of interviewer_____

1.3. Questionnaire number _____ 1.4. Name of village _____

Checked
By _____ Date |__|__|__|

Coded by _____ Date |__|__|__|

Verified By _____ Date |__|__|__|

2. PERSONAL DETAILS

2.1 Sex Male ☐ Female ☐

2.2 Marital status Married ☐ single ☐ divorced ☐ widowed ☐

2.3 What is the business owner's age 18- 23 yrs ☐ 24-29 yrs ☐ 30-35 yrs ☐ 36-41 yrs ☐ 42-47 yrs ☐ 48-53 yrs ☐ 54-59 yrs ☐ over 60 yrs ☐

2.4 What type of business do you run ? Food Kiosk ☐ Salon ☐ Vegetable vendor ☐ others (specify) _____

2.5 Have you employed other persons in the business Yes ☐ No ☐

2.6 If yes how many ? _____

2.7 How long have you operated the business in the area? 0-1 yrs ☐ 2-5 yrs ☐ over 5 yrs ☐ others (specify) _____

2.8 What is his/her level of Education? primary ☐ specify class ____ Secondary ☐ specify form ____ Tertiary college ☐ specify level ____ University ☐ specify level ____ Others (specify) _____

2.9 What other Income Generating activities is the business owner engaged in on a monthly basis

	Income
Activities	
Second clothes selling	
Selling paraffin, Charcoal	
Kiosk	
Hawking	
Others	

2.9 What is your total income from the business in a month? _____ This is a blind question which is to be answered by information generated from the table above.

3. WATER SOURCES/ACTORS/ACCESSIBILITY/USE

3.1 What is your source of water supply? City council connection ☐ Well ☐ Water kiosk ☐ Public standpipe ☐ Borehole ☐ Other (specify) _____

3.2 Who are the major Actors that provide water? Individuals ☐ Community Based groups ☐ women group ☐ NGO ☐ NWSC ☐ Other (specify) _____

3.3 What is the technology of harnessing the water? _____

3.4 Are the major actors of water and sanitation able to meet your water demand? Yes ☐ No ☐

3.5 What is the distance to the nearest water source? _____ km

3.6 Is the quantity of water available sufficient? Yes ☐ No ☐

3.7 Do you undertake any treatment of water before you use it ? Yes ☐ No ☐

3.8 If Yes which one ? _____

3.9 Are there problems experienced in providing water by the major actors: Yes ☐ No ☐

3.10 If yes, what type of problems are they ? low water pressure ☐ Illegal connection ☐ no collaboration among actors ☐ Other (specify) _____

3.11 For what purpose do you use the water? Sanitary ☐ Business ☐ Other (specify) _____

3.12 What is the cost of 20 litre jerrican of water ksh _____

3.13 How many 20 litres jerrican of water do you consume in a day during peak? _____(litres) and off peak business time? _____(litres)

3.14 How often do you receive your water supply from the providers ? Through out the day ☐ At certain time ☐ please indicate time _____ ; Irregularly ☐ Other (specify) _____

3.15 Do you experience any breakdown in the water supply? Yes ☐ No ☐

3.16 If yes how often does it breakdown ? Once a week ☐ in 2 weeks ☐ Once a month ☐ others (specify) _____

3.17 Where else do you get your water supply when there is a breakdown in the system? Purchase from vendors ☐ Friends ☐ Other (specify) _____

3.18 How far is your alternative water source 1. _____ (metres) 2. _____ (Minutes)

3.19 How do you store water at your business premise? _____

3.20 What is the quantity of the storage facility? _____

3.21 Is it enough to take care of your water needs until the water supply is back? Yes ☐ No ☐

3.20 If no how do you meet your water needs? _____

4. SANITATION SOURCES/ACTORS/ACCESSIBILITY/USE

4.1 What is the type of toilet facility used in your business premise? City council connection ☐ Pit latrine ☐ Open space ☐ Other (specify) _____

4.2 Who are the major Actors that provide sanitation: Individuals ☐ Community Based groups ☐ women group ☐ NGO ☐ NWSC ☐ Other (specify) _____

4.3 Are the major actors of sanitation able to meet toilet demand? Yes ☐ No ☐

4.4 What type of toilet facilities are used in the area ? Communal pit latrine ☐ Eco San ☐ Open space ☐ others (specify) _____

4.5 Do you have toilet facility at your business premise? Yes ☐ No ☐

4.6 If no how do your customers access toilet facility? _____

4.7 What is the cost of using toilet facility per visit ? ksh. _____ per month ksh. _____

4.8 What is the distance of toilet facility to your business premises? _____ metres

4.9 Are there problems experience by the major actors in providing sanitation : Yes ☐ No ☐

4.10 If yes, what type of problems are they ? _____

4.11 For what purpose do you use the Sanitation facility? Customer facility ☐ Business ☐ others (specify) _____

4.12 What is the technology used to provide sanitation? _____

4.13 Do you experience sanitation facility breakdown? Yes ☐ No ☐

4.14 How long does it take before the sanitation facility is repaired? _____

4.15 Where else do you get sanitation services when the facility has broken down? _____

4 16 How far is your alternative toilet facility? 1. _____ (metres) 2. _____ (Minutes)

5. Disposal of Water and Sanitation

5.1 How do you dispose waste water? City sewer ☐ open drain ☐ open field ☐ next to the house ☐ Septic Tank ☐ Others (specify) _____

5.2 What technology is used to dispose human waste once the sanitation facility is full? Open field ☐ open drain ☐ City sewer ☐ others (specify) _____

5.3 Is the technology used hygienic and safe? _____

5.4 If not why? _____

5.5 How do you dispose solid waste? Open field ☐ open drain ☐ City collection points ☐ Burn ☐ others (specify) _____

5.6 If solid waste/garbage is collected in the village who collects it? _____

5.7 What is the distance to the nearest garbage collection point? _____ km

5.8 Who are the major Actors that provide solid waste management services? Youth groups ☐ Community Based groups ☐ women group ☐ NGO ☐ NWSC ☐ Other (specify) _____

5.9 Are the major actors of solid waste management able to collect the generated waste Yes ☐ No ☐

5.10 Is there collective community responsibility to address environmental hygiene? Yes ☐ No ☐

5.11 If yes which ones? _____

6. General participation and sustainability

6.1 Who in your views provides water in the area? 1._____ 2. _____3. _____ 4. _____ 5. _____

6.2 Rank them on level of significance in providing water? 1._____ 2. _____3. _____ 4. _____ 5. _____

6.3 Who in your views provides sanitation in the area? 1._____ 2. _____3. _____ 4. _____ 5. _____

6.4 Rank them on level of significance in providing sanitation? 1._____ 2. _____3. _____ 4. _____ 5. _____

6.5 Do you know whether the water providers have legal licenses to operate? Yes No

6.6 Are you involved in the planning of water and sanitation services in the area Yes No

6.7 If yes how _____

6.8 Are you involved in the management of water supply in the area Yes No

6.9 If yes how _____

6.10 Are there community meetings where water and sanitation issues are discussed? Yes No

6.11 If yes how often are they held? _____

6.12 How open/participatory are the deliberations? _____

6.13 Are your concerns taken up to help improve the service provision? Yes No

6.14 If yes how? _____

6.15 Do you have a contact office of presenting your concerns on the water and sanitation service Yes No

6.16 If yes where is it located? _____

6.17 Are you aware of any regulations that govern the water and sanitation providers in the area? Yes No

6.18 If yes which ones? _____

6.19 Do you know whether the water supply you receive is sustainable? Yes No

6.20 if yes where is the main source of water supply used at household? _____

6.21 Do you know whether the water supply you use is legal? Yes No

6 22 For how long can you be assured of the water supply? _____

6.23 Do you undertake any water conservation mesures ? Yes □ No □

6.24 If yes How ? _____

Observation by Research Assistants

1. Illegal Connections, 2. Faulty meters 3. General Hygiene 4. Water point and sanitation locations

Must not interview a water vendor as a commercial actor

Observe decision making as per gender

Focus Group Discussion with Water Actors 7th August 08

Ice breaking questions

Introductions & agenda of the meeting.

How long has the actor operated in the area and where else do they also work.

Group 1 Association of water Vendors Discussion questions

1. When was the Association of water vendors in Mukuru formed?
2. In which villages do they operate?
3. How do you recruit your members?
4. Do you have any rules and regulations governing the Association work with regard to provision of water and sanitation Mukuru?
5. Which ones are they?
6. How much do you sell a 20 litre jerrican to your clients?
7. How much do you buy 1 litre of water from the Nairobi water company?
8. For those who offer sanitation services (toilet facilities) how much do you charge for the service?
9. How much do you pay for exhauster services?
10. Do you have partners who provide the same services? Name them
11. What are some of the problems or challenges that your association faces?
12. What would you want done in water rules to help improve your water kiosk business.

Ice breaking questions

Introductions & agenda of the meeting.

How long has the actor operated in the area and where else do they also work.

Group 2 CBO Alliance discussions questions

1. When was the CBO Alliance formed?
2. How many of your members provide water and sanitation services?
3. In which villages do they operate?
4. How do you recruit your members?
5. Do you have any rules and regulations governing the Alliance with regard to provision of water and sanitation in Mukuru?
6. Which ones are they?
7. How much do you sell a 20 litre jerrican to your clients?
8. How much do you buy 1 litre of water from the Nairobi water company?
9. For those who offer sanitation services (toilet facilities) how much do you charge for the service?
10. How much do you pay for exhauster services?
11. Do you have partners who provide the same services? Name them
12. What are some of the problems or challenges that your alliance faces?
13. What would you want done in water rules to help improve your water kiosk business.

Ice breaking questions

Introductions & agenda of the meeting.

How long has one been a village elder and they represent which village?

Group 3 Village Elders Discussions questions

1. Who are the main actors that provide water and sanitation in the village you represent?
2. For how long have they provided the service in Mukuru?
3. How are the water actors in your village organized in terms of;
    a. Membership
    b. Rules and regulations
4. Are there rules and regulations governing them while they are providing water and sanitation in Mukuru?
5. What is the price of a 20 litre jerrican for Mukuru residents?
6. As a village elder in relation to incomes of Mukuru residents is the price of water fair? Explain.
7. Do the actors and provider of water and sanitation in your village collaborate with other water and sanitation providers' e.g. CBO Alliance, Mukuru Community centre, Nairobi water and Sewerage Company?
8. What are the main challenges/problems that the water and sanitation providers in Mukuru experience?
9. What would you want done in water rules and regulations to help improve the water and sanitation provision in Mukuru?

APPENDIX C

HOUSEHOLD, COMMERCIAL QUESTIONNAIRE

INTRODUCTION

As part fulfilment for award of a Masters Degree in Urban Management at the Housing and Building Research Institute, University of Nairobi, I Esther Damar Kodhek (Reg. No. W50/P/8085/2004) is conducting research on: EVALUATION OF THE ROLE OF MULTILATERAL ACTORS IN THE PROVISION OF WATER AND SANITATAION IN MUKURU INFORMAL SETTLEMENT. (See attached letter)

This is therefore to confirm that the data being collected is purely for research purposes and will be treated with strict confidence.

Your co-operation is highly appreciated.

Thank you.

Esther D. Kodhek
B.arch . Hons U.O.N. (Nbi)
P.O. Box 3008-00100
Nairobi
Cell 0722-790523.

REPUBLIC OF KENYA

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HARAMBEE AVENUE,
P.O. Box 9583-00200
NAIROBI

When Replying please quote
Ref. MOST 13/001/ 38C 392/2

3rd July 2008

Esther Kodhek
University of Nairobi
P.O. Box 30197
NAIROBI

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on, *'Evaluation of the Role of Multilateral Actors in the Provision of Water and Sanitation,*

I am pleased to inform you that you have been authorized to carry out research in Nairobi for a period ending 30th August, 2008.

You are advised to report to the Provincial Commissioner and the Provincial Director of Education Nairobi before embarking on your research project.

On completion of your research, you are expected to submit two copies of your research report to this office.

M. O. ONDIEKI
FOR: PERMANENT SECRETARY

Copy to

The Provincial Commissioner
NAIROBI

The Provincial Director of Education
NAIROBI

3rd July, 2008

Tel 0725979782

TO WHOM IT MAY CONCERN

RESEARCH AUTHORIZATION

As part fulfilment for award of a Masters Degree in Urban Management at the Housing and Building Research Institute, University of Nairobi, I Esther Kodhek (Reg. No. W50/P/8085/2004) is conducting research on: EVALUATION OF THE ROLE OF MULTILATERAL ACTORS IN THE PROVISION OF WATER AND SANITATAION IN MUKURU INFORMAL SETTLEMENT. (See attached letter). I have authorized the following research assistants to assist me in data collection in Mukuru slum during the period 7th July up to 21st July 2008. Their names are us follow;

1. *George Omondi* – 0726-552350
2. *Moses Onyango*
3. *William Odeyo*
4. *Peter Odhiambo*
5. *Evans Otieno*
6. *Ogalo Jared Mboya*

This is therefore to confirm that the data being collected is purely for research purposes and will be treated with strict confidence.

Your co-operation is highly appreciated.

Thank you.

Esther D. Kodhek
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