

**WATER AND WASTEWATER INFRASTRUCTURE IMPROVEMENT PROJECTS IN
INFORMAL SETTLEMENTS: A CASE STUDY OF KISIP PROJECT IN KCC
VILLAGE, NAIROBI COUNTY**

**By
RUTH MUCHIRA
B63/80939/2012**

DEPARTMENT OF URBAN AND REGIONAL PLANNING
SCHOOL OF BUILT ENVIRONMENT
UNIVERSITY OF NAIROBI

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Declaration

I **Ruth Muchira** hereby certify that this is my original work and it has not been presented to any other academic or professional institution for scholarly purposes or otherwise.

Signed:
Sign Date:

I do confirm that this report has been submitted with my approval as the University of Nairobi Supervisor.

1. Dr. Silas M. Muketha.....
Name Sign Date:

2. Dr. S.V. Obiero.....
Name Sign Date:

Dedication

I dedicate this work to my husband, Sammy, for being such a strong pillar of support. To my daughters, Sheena and Sheela, you give me every reason to work so hard, the sky is not yet the limit.

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Abstract

Water and waste water infrastructure service provision is essential for human survival, health and dignity. Human settlements should develop with adequate water and waste water infrastructure services, but in real situation, settlements in particular informal settlements are occurring without adequate water and waste water infrastructure. The main objective of this study was to assess the effect of water and wastewater infrastructure improvement project on informal settlements. Specifically, the study sought to assess whether Kenya Informal Settlements Improvement Program (KISIP) project has improved water and waste water service provision, examine the issues faced in the planning, implementation and management of the KISIP Project, and evaluate the different roles, attitudes and perceptions of the stakeholders in relation to KISIP in the study area. The study used a combination of qualitative and quantitative methods of data collection. This included the use of questionnaires, interviews, observation and document analysis. Quantitative data was analyzed using SPSS qualitative data was grouped in themes and emerging patterns based on the objectives of the study. The results of quantitative data analysis were presented in charts, graphs and tables. The study revealed that the KISIP project has generally not improved water and wastewater infrastructure services in KCC Village. Access to this basic commodity is still poor, water supply from NCWSC is erratic and unreliable, and the drainage of the area is very poor. In addition, human waste disposal facilities are mostly shared amongst households. Although the toilets are connected to the NCWSC sewers, there's inadequate water supply leading to blockages of the sewerage system, thus inconveniencing the residents. Poor workmanship has resulted to fundamental flaws in the constructed infrastructure such as leaking sewer lines, broken manholes, as well as blocked and unfinished drainage channels. The study further revealed that financial constraints, spatial constraints, inadequate community engagement, and poor project management were the main factors that compromised effective project implementation and management. The study concludes that KISIP project has not considerably improved the water and waste water situation in the study area. The main recommendation of this study is that the government should incorporate all key players/stakeholders in planning, implementation and management of these projects.

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Abbreviations

AFD	African Development Bank
ASL	Above Sea Level
AWSB	Athi Water Services Board
CBD	Central Business District
DOPP	Director of Physical Planning
DRSRS	Department of Resource Surveys and Remote Sensing
ERC	Economic Recovery Strategy
GIS	Geographic Information Systems
GoK	Government of Kenya
IDA	International Development Association
KISIP	Kenya Informal Settlement Improvement Program
KENSUP	Kenya Slum Upgrading Program
KEWASNET	Kenya Water and Sanitation Civil Society Network
KUR	Kenya Uganda Railway
MDG	Millennium Development Goals
NCWSC	Nairobi City Water and Sewerage Company
NEMA	National Environmental Management Authority
NIUPLAN	Integrated Urban Development Master Plan
PPA	Physical Planning Act
RCI	Royal Charter of Incorporation
SIDA	Swedish International Development Cooperation Agency
SPSS	Statistical Package for Social Scientists

UACA	Urban Areas and Cities Act
WASH	Water Sanitation and Hygiene
WASREB	Water Services Regulatory Board
WSB	Water Services Board
WSS	Water Supply and Sanitation
UNESCAP	United Nations Economical and Social Commission for Asia and the Pacific
UNCHS	United Nations Centre for Human Settlements
USAID	United States Agency for International Development
SEC	Settlement Executive Committee

CHAPTER ONE INTRODUCTION

1.1 Background to the Study

Informal settlements are a distinctive type of market where affordability accrues through the absence of formal planning and regulation (Khalifa, 2015). These settlements represent a key challenge worldwide. A review of informal settlements upgrading policies shows that governments have moved away from eradication policies to provision, enabling and participatory policies (Khalifa, 2015). This shift was motivated by the recognition that informal settlements were not a problem but a solution stimulated by the society when the formal housing markets cannot fulfill its demand. In Egypt, despite all efforts to contain the growth of informal settlements, they are still steadily growing (Ibid, 2015).

Water and waste water infrastructure facilities can be considered as two of the most crucial urban services upon which the management of health and wellbeing of people in cities depend. Generally, human settlements should develop with adequate water and waste water infrastructure services, but in real situation, settlements in particular informal settlements are occurring without adequate water and waste water infrastructure (Muzondi, 2014).

According to Global Water Supply and Sanitation Assessment Report (2000), more than 2.4 billion people currently lack access to adequate water and waste water infrastructure and are forced to dispose of their excreta in unimproved and unsanitary conditions. Unsafe water, inadequate sanitation, and insufficient hygiene account for an estimated 9.1 percent of the global burden of disease and 6.3 percent of all deaths, according to the World Health Organization (WHO, 2008).

Developing countries are also experiencing challenges in water and sanitation management. Most of these countries are experiencing rapid urban growth which has far outstripped metropolitan and municipal authorities' capacity to provide basic services including water and adequate sanitation. This situation has been further compounded by weak local government structures and the lack of transparency and accountability in city governance (Chaplin, 1999).

According to Muzondi (2014), Africa faces a number of serious socio-economic problems that call for urgent remedial action if current trends towards endemic poverty and pervasive underdevelopment are to be turned around. The crucial role of water in accomplishing the needed socio-economic development goals is widely recognized. On the face of it, water should not pose a constraint to such development for Africa appears to have abundant water resources. It has large rivers, big lakes, vast water lands and limited, but widespread ground water resources.

The situation is no different in Kenya. It aspires to meet the goal of equal access to adequate water and sanitation, where majority of poor Kenyans, including those living in informal settlements, lack access to safe and affordable water and sanitation services (Kenya, 2010a). The water sector in Kenya is facing enormous challenges today. Health, industry and commerce, agriculture and the general economy of Kenya is affected by poor provision of water supply and waste water services as all this are interrelated. Provision of water and waste water infrastructure service is an intervention needed to improve living conditions among the world's poor and to reduce or prevent diarrhea and other seriously debilitating conditions, especially among children (Muraguri, 2012).

In the recent past, there have been efforts by various government organizations, Non-Government Organizations, Community Based Organizations to improve the situation. Globally, the upgrading strategies of informal settlements range from negligence to contemporary participatory development approaches and housing policies aimed at providing affordable shelter to the urban poor. However, there are some best practices of informal settlements upgrading projects that are influential driving forces affecting the success of these projects that are suitable for scaling up and replication (Khalifa, 2015).

In an effort to reverse this trend in Kenya, the Government of Kenya, in collaboration with other stakeholders, initiated the Kenya Informal Settlement Improvement Project (KISIP) in June 2011. The project is aimed at improving the livelihoods of people living and working in slums and informal settlements. This entails promoting, facilitating, and where necessary, providing security of tenure and provision of infrastructure. The provision of infrastructure has however

been occurring with serious planning, implementation and management challenges with issues of insecurity of land tenure and minimal public participation resulting to unsustainable projects.

This study aims at assessing the infrastructure improvement programmes in the water and waste water service provision. The study examines the implication of KISIP informal settlements improvement/upgrading strategies in KCC village with specific reference to water and waste water infrastructure service provision. KCC Village is among scores of informal settlements inhabited by almost two-thirds of the Nairobi city's four million people.

The study examines some best practices of informal settlements upgrading projects. This is with a view of isolating fundamental driving forces contributing to the success of these projects. The best practices will be used for scaling up and replication of the KCC project.

1.2 Statement of the Problem

Human settlements should develop with adequate water and waste water infrastructure services, but in real situation, settlements in particular informal settlements are occurring without adequate water and waste water infrastructure. In recent years there have been efforts by various government organizations, Non-Government Organizations, Community Based Organizations to improve the situation.

KISIP has considerably not improved in its mandate of providing improved water and waste water services in KCC village, Nairobi. It has failed in ensuring efficient and equitable use, conservation of the water resources. KCC Village for instance, is recently facing a water rationing crisis. This should not have been the case if KISIP had sought innovative ways of managing, conserving and harnessing this economic resource. Further, sanitation situation is also worrying as the facilities are poorly managed while at the same time, drainage is very poor in the study area.

This has thus led to poor access to adequate water and sanitation services. This has consequently resulted to time wastage, exploitation by vendors, deterioration, deaths, reduced life expectancy,

and increased expenditure on water related diseases as well as slowed down economic growth and development of the study area and the nation as a whole.

Better innovative ways of ensuring increased coverage of the project of improving access to safe and clean water and sanitation in the study area is hence called for. It is therefore important to look into KISIP's strengths and weaknesses and build on them to come up with ways of sustainably providing water and waste water infrastructure services.

1.3 Purpose of the Study

The main objective of this study is to assess the effect of water and wastewater infrastructure improvement project on informal settlement.

1.4 Specific Objectives of the Study

1. To examine the issues faced in the planning, implementation and management of KISIP's water and waste water infrastructure project in the study area.
2. To assess whether KISIP project has improved water and waste water service provision in the study area.
3. To evaluate the roles, attitudes and perceptions of the stakeholders in relation to KISIP's water and waste water infrastructure in the study area.
4. To propose strategies that can be adopted to ensure sustainability of infrastructure improvement projects in informal settlements

1.5 Research Questions

1. Are there issues faced in the planning, implementation and management of KISIP's water and waste water infrastructure project in the study area?
2. Has KISIP project improved water and waste water service provision in the study area?
3. What are the roles, attitudes and perceptions of the stakeholders in relation to KISIP's water and waste water infrastructure project in the study area?

4. Which strategies can be adopted to ensure sustainability of infrastructure improvement projects in informal settlement?

1.6 Scope

The study was within KCC village. KCC village is situated in the Eastlands region of Nairobi County, Mowlem Sub-Location of Mowlem Location, Embakasi West Constituency. The settlement is named after a milk processing facility adjacent to it, known as Kenya Cooperative Creameries (KCC). It is bordered by a railway line on one side.

Infrastructure as a whole is a very wide topic. The study focused on water and waste water infrastructure. The research investigated the existing situation in relation to water and waste water infrastructure service provision with an aim of coming up with strategies that enable provision of sustainable water and waste water services in KCC village.

1.6 Justification of the Study

This research is significant to both private and public stakeholders involved in the implementation of water and sanitation improvement projects in the informal settlements in Kenya. The information gained can be used to redesign, improve and eliminate projects or programs that don't add value to the residents or are poorly designed. In addition, such information can also be used to provide input to the appropriate design of future projects and programs.

The information obtained in this study will be significant to the policy makers as it would give a rational evaluation of water supply and sanitation projects and how they affect the livelihoods of slum dwellers. The study will point the implications of water supply and sanitation projects initiated within informal settlements with the view of assisting policy and decision makers adopt sustainable strategies towards water projects in informal settlements; given the fact that such projects receive immense donor funding from various local and international organizations.

The findings of this study will also be beneficial to the slum dwellers as it would highlight the views and opinions of the beneficiaries of such water projects so as to further understand their needs and get a clear perspective of how they perceive these water supply and sanitation projects and the areas they feel can be improved to raise their living standards. This is an important aspect of community participation in development projects where they are incorporated in the planning and implementation as well as operation of these projects with the aim of giving them a sense of ownership and collective responsibility. The views collected in this study will give much valuable insight to the policy and decision makers even as they identify critical areas that may have been ignored and disseminate funds for these projects.

The study would be invaluable to researchers and scholars, as it would form a basis for further research. The students and academicians will use this study as a basis for discussions and will be a source of reference material for future researchers.

1.7 Operational Definition of Terms

Informal settlements

These are residential areas of the urban poor more often in the cities of the developing world. They are found on public, private or customary land accessed by invasion or developed against planning, building and ownership. They are usually characterized by illegal occupation of land, non-adherence to building codes and infrastructure standards, and insecure security of tenure.

Slum- A slum is generally defined as a contiguous settlement where the inhabitants are characterized as having inadequate housing and basic services. Slums are neglected parts of cities where housing and living conditions are appallingly poor. Slum range from high-density, squalid central city tenements to spontaneous squatter settlements without legal recognition or rights, sprawling at the edge of cities.

Infrastructure: is the basic physical systems of a place and includes transportation, communication, sewage, water and electric systems.

Waste water: Domestic effluent consisting of black water (excreta, urine and fecal sludge) and greywater (kitchen and bathing wastewater)

Slum Upgrading: these are programmes oriented to the betterment of the current conditions of Informal settlements and neighborhoods, often in situ and incremental.

1.9 Organization of the Research

The research has been structured into six chapters. Chapter one introduces the research, identifies the key problem under investigation, states the general and specific objectives and asks the relevant research questions. It further defines its scope, gives a justification and significance for carrying out the research. This chapter is significant to the study as it puts the study into perspective and helps to check deviations.

Chapter two presents a review of relevant literature on provision of infrastructure services in informal settlements, definition of related terms, reviews the history of informal settlements, looks at the challenges of infrastructure provision in informal settlements and the case studies. The chapter culminates with a conceptual framework. Chapter three focuses on the research design, the data needs and the sources of data, the research instruments employed, instruments validity and reliability, target population, sample and sampling procedures, data collection procedures and data analysis procedures

Chapter four offers an overview of the study area laying focus on the background of the study area in terms of its location, area, socio-economic activities and neighborhood. It articulates the historical background of the study area and its site characteristics as well.

Chapter five provides the presentation, analysis and interpretation of the quantitative and qualitative data collected in the field. This chapter attempts to answer the research questions and forms the basis for the research recommendations. Chapter six constitutes a summary of the findings, a conclusion and recommendations for the study.

CHAPTER TWO LITERATURE REVIEW

2.0 Introduction

This chapter presents the concept of informality, looks at the dynamics of informal settlements, challenges of water and waste water service improvement in informal settlements, the role of stakeholders and best practices of water and waste water service improvement. It culminates by coming up with a conceptual framework that tends to explain in a nutshell, all the literature reviewed.

2.1 The Dynamics of Informal Settlements

2.1.1 Concept of Informality

According to Abebe (2011), the term informality has received many different interpretations from various authors. Since the early 1970s, the informal sector has been a central theme of various research and studies investigating into the dual character of the economies of developing countries and recently industrialized ones (UN-Habitat, 2006). The borderline between formality and informality in relation to economic activities, employment and human settlements still remains unclear. Taking from the origin of the concept, the numerous definitions mostly hinge on the economic sectors. The consensus, however, relates to the lack of regulation of the activities in the informal sector (Ibid, 2006).

Informality comes up as a result of different factors, which can be economic, legal or social factors. Aramburu (2014) describes informality in three perspectives; the legalistic perspectives, whereby informality is termed as all that happens outside of formal regulatory procedures. For example, illegal land transfers, informal negotiations between developmental actors etc. secondly, the economic perspective defines informality as unregistered informal activities constituting the informal city. It is usually associated with black market activities (no work contracts, lack of insurance, unrecorded payments, no benefits and socially, people get engaged in informal social networks to alleviate the vulnerability of the poor people (Aramburu, 2014).

Informal settlements are a spatial manifestation of informality.

2.1.2 Informal Settlements

A clear definition of informal settlements is hardly available. There are many synonymous words that are used in literature to refer to informal settlements such as irregular, squatter settlements and spontaneous settlements. On the other hand, some literatures use the word slum and informal settlements interchangeably. While a clear definition of informal settlements remains elusive, several researchers have given description of informal settlement. These definitions however vary depending on the context of the research work.

According to Lirebo (2006), Informal settlements are residential areas of the urban poor more often in the cities of the developing world. These settlements sit on all lands; private, public or customary land, and are accessed by invasion or developed against planning, building and ownership regulations. They could also be unauthorized residential areas (Lirebo, 2006).

Hurskainen (2009) in his study ‘The informal settlements of Voi’ describes informal settlements as settlements whereby persons assert land rights or occupy for exploitation of land which is not registered in their names, or government land, or land legally owned by other individuals. He further adds that these settlements lack basic services and infrastructure.

Mathenge (2013) defines informal settlement as neglected parts of urban towns where the state of the housing conditions and living conditions are appallingly poor. They are considered to range from high-density, squalid central city tenements to spontaneous squatter settlements that do not have any legal recognition or rights and are seen to sprawl at the edge of urban centers. In his study he considers lack of security of tenure as a central characteristic of informal settlements and regard it as prima facie evidence of illegality and slum occupation (Ibid, 2013).

Kasala (2016) defines informal settlements as areas located in places that are prone to hazards, areas that are confronted by uncoordinated urban development and they lack infrastructures in terms of sewerage system, drainage channels, water system, roads and solid waste disposal mechanisms

The UN-HABITAT (2011) ties up all the definitions from countries across the globe and defines informal settlements as either residential areas where a group of housing units has been constructed on land to which the occupants have no legal claim, or which they occupy illegally or unplanned settlements, and areas where housing, is not in compliance with existing planning and building regulations.

Hence based on this premise we can conclude that informal settlements are settlements on government, communal or privately land and are not in compliance with the existing planning and build regulations and/or without having a development authorization building permit and lack basic services and infrastructure.

2.1.3 History of Growth of Informal Settlements

This section elaborates how informal settlements evolved without requisite infrastructural services. In the industrial revolution, crowded settlements emerged without water, sanitation and other infrastructure. This problem did not die away but rather became a major face of most developing nations.

2.1.3.1 Global

The issues of informal settlements represent a key challenge worldwide. Historically, after the Industrial Revolution industries came into being and small workshops were transformed to big factories. Due to increased demand for labor, the village men could come to the cities to work in the factories and return to their villages to rest after their days work. This was not sustainable and as such, they sought shelter within the city (Sofianou, 2015). These cheap, rural labour forces could however not afford to buy a house in the cities due to the high prices. Therefore, they built some huts using flimsy basic materials in the suburbs, hence the birth of informal settlements. This attitude of illegal occupation of urban lands and commensurate flouting of building regulations and/or of urban zoning prescriptions continued up until the turn of the 20th Century (Ibid, 2015).

Similarly, in third world countries, active industrial areas attracted the labour force from different regions of the country and the excess labour force settled in suburbs and inappropriate

and deteriorated buildings. This was and still remains the face of most developing countries across the globe (Fazli, 2016)

2.1.3.2 Africa

According to Fazli (2016), Growth of informal settlements dates back to the colonial period where only Europeans were exclusively allowed to live in cities and a small number (workers) of Africans and Asians. The latter group was not allowed to acquire or own land (Fazli, 2016)

Njamwea (2003), notes that after independence most Africans flocked to the cities. This made the population too large that it stretched the services initially planned for a small number of people. In Abidjan, Cote D'Ivoire, after independence, rural populations moved to the urban areas to seek for employment in the midst of insufficient housing. This led to development of temporary structures with little or no services and hence the rise of informal settlements (Njamwea, 2013).

Khalifa (2015) notes informal settlements in the city of Cairo, Egypt grew as a result of uncontrolled development of small satellite villages and reduced availability of land for new residential areas due to strict control over agricultural to residential land conversion. He further adds that other contributing factors to historical growth of informal settlements are rural-urban migration, influx of refugees and natural calamities that do not seem to improve (Ibid, 2015).

Khalifa (2015) notes that urban poverty has led to growth of these settlements in that urban people build their own houses with no title or official permission thus resulting to lack of support in provision of basic social services and infrastructure by local authorities.

2.1.3.4 Kenya

According to Nabutola (2004), development of informal settlements initially occurred before Kenya gained independence in 1963. During this period, the urban housing layout was marked by spatial segregation of colonial planning based on race. This is whereby Africans and Indians were confined to the east and south of the Nairobi City Center in flood prone areas deprived of basic services (Ibid, 2004). Public resources, like water, electricity, garbage collection, allocated for the housing and infrastructural needs of the African group were grossly inadequate. This has

continued to date with what was formerly referred to as African reserves largely defining Nairobi's informal settlements (Nabutola, 2004)

After independence, the policies that segregated settlement patterns according to race were done away with. The result was increased rural to urban migration which was not commensurate with the corresponding rate of housing provision (Githira, 2016).

Githira (2016) adds that city boundaries were extended to include some formerly rural settlements located on the periphery of the city boundaries. However, the housing layout and general standard of construction in these areas did not conform to the prescribed standards that were in force in the original city boundary and had no infrastructure, thus unable to provide essential public services such as piped water supply. Consequently, proliferation of informal settlements continued (Githira, 2016).

2.1.4 Theories Underpinning Informal Settlements

The theories frequently discussed in an attempt at defining how informal settlements came about are the Chicago School of thought, Alonso's neo-liberal theory of informal settlements and the postmodern theory. According to (Diang'a, 2011), the Chicago school in the 30's considered informal settlements as residential differentiation resulting from the different income levels of the different ethnic groups who competed for desirable urban land. Diang'a (2011) indicates that Alonso's neo-liberal Theory suggested that informal settlements are a response to the housing needs of the urban poor who cannot afford a formal dwelling due to the discriminatory urban regulations. Diang'a (2011) further notes that the post-Modern theory of urban landscape perceive informal settlements as the product of skills segregation within urban spaces where urban dwellers settle according to the profession and social status.

According to Diang'a (2011), developing countries have four major elements of theories on informal settlements notably: Land management, colonial legacy, inadequate economy, and demand and supply equilibrium. Firstly as argued by Sietchiping (2004), is that inefficiency of urban authorities, along with poor land management practices and inadequate urban planning schemes cause the informalization of urban areas. The second view by Sietchiping (2004)

connects the expansion of informal settlements to political and historical factors, most notably colonialism, post-colonial practices, civil and political instabilities. The third view suggests that the introduction of a new economic system has played a crucial role in the development of informal settlements (Ibid, 2004). The theory, according to Diang'a (2011) argues that the introduction of urban trade, income and class difference is spatially translated into residential discrimination and social exclusion. The fourth view by Sietchiping (2004) explains the emergence and growth of informal settlements by the disequilibrium between the demand and supply of urban commodities (land, services and infrastructure). This view explores the sustainability and persistence of informal settlements and postulates that while the effort is deployed to improve the informal settlements, there are new ones mushrooming in other parts of the city (Diang'a, 2011).

Diang'a, (2011) concludes that there is no single theory that can fully explain the emergence and expansion of informal settlements. From the above literature it can be argued that informal settlements are the result of a combination of several factors: poor management especially failed urban policies, poor governance, inappropriate/inadequate regulations, dysfunctional land markets, poor performance, social insecurity and lack of political will.

2.1.5 Characteristic of Informal Settlements

According to Abebe (2011), the physical, social, economic and spatial features of informal settlements vary from one country to the other across the globe. Some features are however common across all settlements in the world. Abebe (2011) in his study on '*Modelling informal settlements growth in Dar Es Salaam*' notes that informal settlements are often characterized by low-standard housing, overcrowding, acute shortage of basic services, high environmental and health threat, non-compliance to planning regulations, insecurity of tenure, faulty alignment of streets and unfavorable socio-economic and living conditions.

Onyekachi (2014) asserts to the above characteristics as he claims that these settlements are illegal human habitats that lack security of tenure, are environmentally degraded (decayed settlements), made up of temporary structures, lack social amenities, like cinemas and infrastructure/utilities. He further states that people in these settlements have very low incomes

and cannot command the economy. These informal settlements however live in harmony and comfort under these circumstances (Ibid, 2014).

2.1.6 Factors Contributing to Growth of Informal Settlements

According to Mathenge (2013), informal settlements grew and continue to grow in terms of space and population increases due to a number of factors. Irrespective of the sub-region or level of development of a country, some crucial factors have been identified as commonly influencing the development of informal settlements. Mathenge (2013) further states that these factors are mainly interrelated and include: rapid urbanization and movement of people into specific urban centres, inefficient public administration, inappropriate planning and inadequate land administration tools, high poverty levels and the lack of low-cost houses or serviced land and war and natural disasters to force people to move to safer places and areas that provide certain opportunities.

2.2 Concept of Infrastructure

Infrastructure is a key player in economic productivity and growth. Improved infrastructure promotes economic growth, both locally and nationally as it lowers transaction and other costs.

Infrastructure provision is inextricably linked to economic development. Developing nations are investing in motorways, railroads, and utilities to allow their economies to grow. The linkage between economic activity and infrastructure continues to grow stronger and more critical as economic activity itself becomes increasingly more complicated and global in scope. In an era of accelerating change, the infrastructure challenge will be how to continue to broaden that range of choice, and in so doing improve the quality of people's lives (Bello, 2010).

Until recently infrastructure provision for the urban poor was almost non-existent. Third world shantytowns were denied access to services such as piped water, sanitation, sewerage, electricity, storm water drainage, on the basis that informal and unplanned settlements were illegal. As such, low-income dwellers did not have the right to tenure of the land and to claim for the services that legal settlements obviously enjoyed (Bello, 2010).

2.3 Theoretical Background to Informal Settlements and Infrastructure Development

This section describes various theories that explain infrastructure provision in the developing world.

2.3.1 Infrastructure-Led Development

Bello (2010) defines infrastructure as public goods and services that goes into the production process as Complementary inputs for traditional factors of production such as capital, labor and Entrepreneur. Various schools of thought have been advanced on the different roles of infrastructure in development. The infrastructure led developments proponents advocate that infrastructure to be developed first for ease of development (Muketha, 2007). Bello (2010) adds that the success of economic development process depends largely on the available resources and an enabling environment. Resources such as capital, manpower and technology are necessary inputs in the growth process .However, the efficiency of these inputs and the sources of economic growth endeavors largely depend on the available enabling environment as defined in part by the available infrastructure (Bello, 2010).

According to Bello (2010), infrastructure-driven development holds that a country directs a substantial percentage of its resources onto long term infrastructural development so as to stimulate long-term economic efficiency. This ensures that the country achieves a sustained economic growth and reduces the poverty level. Improvement of water and wastewater infrastructure, essentially improves the health of the general population in terms of helping to reduce infant mortality, enhancement of early childhood health, and maintaining a healthy labor force for maximum productivity. (Ferro, 2008).

2.3.2 Resource Led Development

According to Muketha (2007), the resource-led development is a paradigm which advocates that infrastructure should only be taken to areas that are well endowed with natural resources such as land, capital, labour and human resources. This school of thought advocates for infrastructure to

be taken where there is adequate population who can afford to pay for such infrastructure (Muketha, 2007).

According to Muketha (2007), this school of thought can be attributed to the current problems of infrastructure provision in the developing countries. The effect of this paradigm is unequal distribution of resources. The informal settlements, often home to the urban poor, become the biggest culprits with such a paradigm since most cannot afford to pay for the services.

2.3.3 Social-Led Development

It is a paradigm that advocates for social equity which is one of the goals of planning. Sustainable development and better outcomes for communities could be achieved from a community-led development approach. Incorporating social activities in government policies, programmes and processes promotes development further, as fewer conflicts are encountered. Communication between the stakeholders gives way for mutual understanding and ownership of infrastructure project (Muketha, 2007).

2.4 Systems Approach to Provision of Water and Waste Water in Informal Settlements

According to Ejigu (2007) a system is often defined as a complex of interacting elements. Systems theory in its development has introduced to the world new concepts that apply to nearly all systems – natural, social, socio-economic, technical. These concepts regard views that attempt to discuss interactions between systemic elements, which often are referred as agents.

Ejigu (2007) further adds that the systems approach is an approach to analysis that is based on the belief that the component parts of a system will act differently when isolated from its environment or other parts of the system. It includes viewing systems in a holistic manner, rather than through purely reductionist techniques.

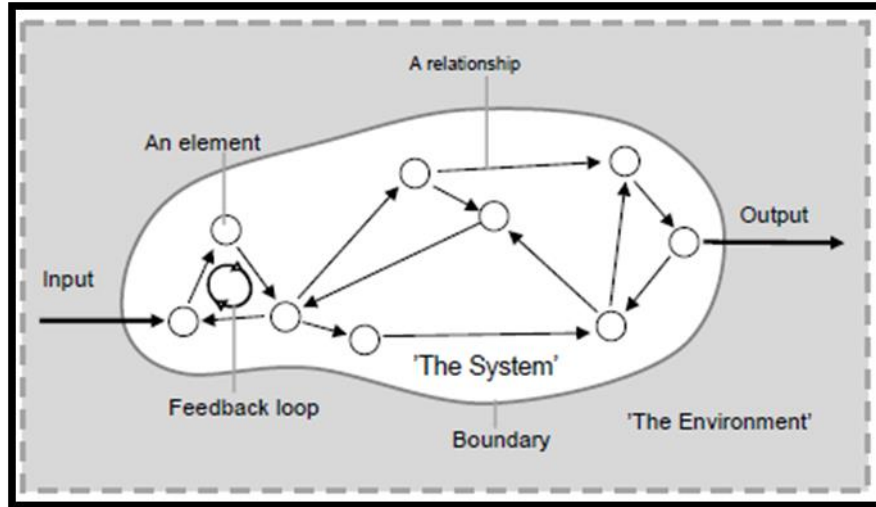


Figure 2.1: General Conception of a Systems

(Source: Ejigu, 2007)

The critical question that the theory deals with is what perceivable actors should be considered to be a part of the system and what factors should be seen as belonging to its environment. The assumption is that change is caused by the influence of a system's states on the actions that change those states (Ibid, 2007). Differences between a desired state and an actual state initiate action intended to reduce the difference between the desired state and the actual state. However, actions intended to alter a state often alter other states as well, such that the consequences resulting from the action may not result in the desired states. This leads to a new set of actual and desired states, based on which further action is taken. The term feedback is used for this situation, in which a state causes an action that influences the initial state, either directly, or through intervening states and actions (Ejigu, 2007)

2.5 Water and Wastewater Infrastructure Provision in Informal Settlements

2.5.1 Provision of Water in Informal Settlements

Globally, sustainable human development is premised upon accessibility and availability of basic services such as water provision. Access to water is a backbone to life sustenance hence water is universally accepted as the panacea for sustainable human development (Muzondi, 2014). Water is a scarce precious natural resource that human beings cannot survive without. Human life revolves around the availability and accessibility of water (Ibid, 2014).

Muzondi (2014) further adds that the sustainability of water provision systems can be interpreted from the consumer and the service providers' perspectives. The consumers' viewpoint of sustainable water provision is based on the mode through which becomes justifiably disposable to them. Sustainability of water services for consumers is judged on the bases of the following criteria: accessibility, availability, reliability, convenience, quantity and quality. The expectation of consumers, which is often unmet in informal settlements is that they should have equal access to water services, in the rightful quality and adequate quantity, which is the same as those in formal and planned settlements (Muzondi, 2014).

Muzondi (2014) further adds that informal settlements inhabitants tend to be susceptible to exclusion and alienation from service provision in that the water services available for them is devoid of proper planning and is ultimately unreliable, inconvenient and unsustainable. The unsustainability of the water services is affirmed by the poor quality or lack thereof, insufficiency and inadequacy in terms of meeting the bare requirement for survival. Conversely, sustainability of water provision is, from the perspective of service providers, is determined to a large extent by factors such as consumers' willingness to pay, together with revenue collection and cost recovery issues, infrastructure feasibility, water resources and land tenure. In this regard, the feasibility of water provision in informal settlements can be compromised due to the nature in which they are structured, without sufficient space to expedite any infrastructural and engineering facilities (Muzondi, 2014).

Muzondi (2014), concludes that strategizing water provision entail consideration of the demographic and service information such as, the current population, the number of households, the number of residential consumer units, the incomes related to these consumer units, current levels of water service, current and expected consumption, the demand for services in terms of the willingness to pay, population growth, economic growth, growth in number of consumer units, level of service provided to residential consumer units and changes in income levels of residential consumers. All the afore-mentioned factors determine the level of achievement in terms of water provision and a holistic water provision planning approach/strategy could perhaps consider such aspects (Ibid, 2014).

2.5.2 Provision of Waste Water in Informal Settlements

Waste water refers to domestic effluent consisting of black water (excreta, urine and fecal sludge) and greywater i.e. kitchen and bathing wastewater (WHO, 2016).

Waste water service provision facilitates the disposal of water which has been used (WHO, 2016). Wastewater generated is calculated to be of 80% of the water being supplied in a given area. Poor wastewater management is a root cause of many other development challenges such as poor health which impacts the productiveness of the labor force and education performance (Mwai, 2012).

Proper sanitation entails the safe collection, storage, treatment and disposal of human excreta, solid waste, grey water, industrial waste products and hazardous wastes. Improper disposal of untreated wastewater into the environment has implications on the people's health through polluting potable water, contamination of surface and recreational water, entry into the food chain and is also breeding site for insects and flies (WHO, 2016).

According to Mwai (2016), there are two primary methods of wastewater disposal; offsite waste disposal mechanisms and onsite waste disposal mechanisms. Offsite waste disposal is a waste management unit which is located away from the area the waste is generated. The wastewater is transported to another location for treatment purposes through sewerage systems. The wastewater is treated at a treatment plant before it is safe for use or can be released into the environment. An on-site wastewater treatment, on the other hand, is wastewater management unit which serves a residence or commercial establishment where the final effluent is discharged, within the boundary of the property (Mwai, 2016).

2.5.3 Nexus of Water and Waste Water Service Provision in Informal Settlements

According to Munyao (2013), rapid growth of informal settlements is a critical challenge for those charged with the responsibility of infrastructure service provision. While sustainable water and waste water service provision promotes wellbeing and living conditions of people, water

scarcity problems and inadequate provision of water and waste water services continue to plague informal settlements in countries across the globe (Munyao, 2013).

In a study by Mwangi (2012) *'Better water and sanitation for the urban poor'*, there are several features of service delivery that tell the story of communities living in informal settlements. These communities prefer to buy for services on daily basis and mostly purchase between 5-30 litres of water on a daily per capita. However a small number obtain water free of charge from public standpipes. The various sources of water for these communities are water wells/boreholes, and public or private kiosks connected to piped networks. Intermediaries like landlords, private kiosks or vendors supply these communities on a daily basis (Mwangi, 2012).

According to Muzondi (2014), access to these basic water and waste water services remains varied in many countries depending on a number of factors. Africa for instance, has the least water and sanitation coverage; at least 1 in 3 Africans residing in urban areas do not have adequate water services and facilities. This could be as a result of structural difficulties, weak institutional arrangements, inadequate human resources' working capacities, lack of political will, poor community participation and lack of competitive policies and strategies. In addition, Africa still has the lowest proportion of households in urban areas that have access to piped water at 38.3%, whereas Latin America and the Caribbean have the highest at 89.3% (Muzondi 2014).

Muzondi (2014) concludes that this is still a bit difficult to achieve, especially in informal settlements as South Africa is experiencing high urbanization and industrialization trends as well as sustainability challenges. Thus, water supply in informal settlements is not reliable in terms of quantity, quality and availability. This consequently means that currently, South Africa has about 2,700 informal settlements with 1.2 million households that are without adequate water and waste water service provision (Muzondi 2014).

2.6 The Journey to Informal Settlements Upgrading

2.6.1 Eviction-and-Demolition Approach

During the 1970's, informal settlements were unwanted and the most common reaction across the globe was eviction and clearance. This strategy consisted of clearing up informal settlements i.e. evicting the occupants and demolishing their spontaneous shelters and other informally erected structures (Ndung'u, 2011).

Ndung'u (2011) adds that approach was based on two major assumptions; that slums are illegal and slums are an unavoidable but temporary phenomenon that can be overcome by economic development in both rural and urban areas. Government planning institutions never placed emphasis on slums to an extent that planning documents such as land use maps didn't include slums or urban informal settlements but showed them as blank spots denoting undeveloped land (Mathenge, 2013).

Many developing countries, Kenya included, pursued this approach until research and the international experience started to provide evidence of the failures of these eradication policies, their deficiencies and the destructive effects they had on the urban poor (Ndung'u 2011)

2.6.2 Aided Self-help Strategy

Self-help scheme as defined by Tshikotshi (2009) is a process whereby the urban poor households improve their quality of life by using their own resources such as labour, management and savings. He further states that it involved the recognition of the people themselves taking action to construct their own housing units. The plots allocated by the State were seen as a mode of subsidy to enable them to own a house. During these periods, the State stopped demolition of slums and instead turned to upgrading the settlements and providing infrastructure; roads, schools, markets (UN-Habitat 2006). The strategy was financed by World Bank and USAID, and included provision of serviced sites on cost recovery basis (Ndung'u, 2011).

Target communities were organized into building groups and others into voluntary savings in cooperatives while the government focused on legalizing tenure and provision of basic infrastructure i.e. Roads ,sewer line, water, schools ,hospitals and electricity (GOK, 2006). This aided Self-help strategy however failed due to the assumption that families had financial

resources to build the houses. Poor families did not benefit from these projects, resulting into gentrification (Ndung'u, 2011).

2.6.3 Site and Services

The site and service schemes were World Bank's instigated programmes that opted for direct and centralized state interventions on informal settlements (Tshikotshi 2009).

Tshikotshi (2009) describes site-and-services schemes as the provision of plots of land, either on ownership or land lease tenure on top of a bare minimum of infrastructure appropriate for human settlements. Site and services provides areas with services such as roads, water, electricity, footpaths, sewerage etc. Individual households are then left to build their own houses. A major benefit of the site-and-services scheme is that it mobilizes the savings of a private household which is capable of carrying out construction over a period of years making piecemeal improvement according to their financial capability (Tshikotshi 2009).

According to Ndung'u (2011), site-and-services schemes are mostly characterized by two key actors: Intended beneficiaries who are normally the urban poor households living in informal settlements with low incomes, the implementing agency which is likely to be a government department. Furthermore, governments in developing countries are unable to provide complete serviced houses to the urban poor households. However, governments often manage to offer site and service schemes for the low income group on the peripheral area. In most cases serviced land in more attractive locations is often taken by elite (Ndung'u 2011).

Tshikotshi (2009) notes that there are various challenges in relation to urban poor households under site-and-services schemes such as location at the margins of the city, delay in provision of services due to lack of coordination by the various actors, high building standards and cost recovery problems. Developing countries normally face high rates of unemployment and social exclusion but the development of low-cost housing of the urban poor is far away from the city and/or job opportunities making it difficult for the urban poor to access due to higher transport costs (Tshikotshi 2009).

2.6.4 Informal Settlements Upgrading

According to World Bank (2012), upgrading at its most basic level involves improving the physical environment of the slums and squatter settlements. This includes improving and installation of basic infrastructure like water, sanitation, waste collection, access roads, footpaths, storm water drainage, lighting, public telephones and land regularization among other things. Njamwea (2013) put it slightly differently by saying that upgrading consists of physical, social economic, organizational and environmental improvements undertaken cooperatively and locally among citizens, community groups, and local authorities to ensure improvements in quality of life for individuals.

According to Anulo (2015), upgrading of informal settlements means transforming illegal structures into legal ones. It requires the recognition of three conditions which are: the property rights, the property values and the physical attributes of the underlying assets and their impact on each other. The significant difference between the sites and services schemes and settlement upgrading is that upgrading focuses on settled informal settlements while the site-and-services projects are where the construction of the dwelling is the responsibility of the occupants (Ibid 2015).

Mureithi (2016) defines informal settlements upgrading as an integrated approach that aims to turn around downwards trends in an area. She further suggests that these downward trends can be legal (land tenure), physical (infrastructure), social or economic. Mathenge (2013) considers the upgrading of existing slums as being more effective than resettling slum dwellers and advocates for this measure as an interventions measure for informal settlements initiatives. Eradication of slums and resettlement of slum dwellers can create more problems than solutions. It is envisaged that eradication and relocation unnecessarily destroy a large stock of housing affordable to the urban poor and the new housing provided frequently turn out to be unaffordable resulting into some of the relocated households moving back into the slums. He adds that the already existing social ties should be maintained (Mathenge 2013).

According to Mathenge (2013) classic upgrading schemes provide footpaths, roads, street lighting, water supply, drainage, and sewerage. Settlement improvement involves regularization of land tenure and upgrading of the existing basic services. Nevertheless, it does not necessarily

consist of a home construction but it offers loan options for home improvements (Ndung'u, 2011).

Tshikotshi (2009) accentuates the importance of the process of decision making during the settlement upgrading. If there is a plan by the government to provide for tenure security to informal settlements inhabitants, it is very important to take preventive measures at the initial phase against the inevitable influx of residents. This can be done using low level aerial photos indicating the existing informal settlements to avoid conflicts (Tshikotshi 2009).

Mathenge (2013) concludes that one of the major constrain to informal settlements upgrading identified is the inappropriate or lack thereof planning standards and construction regulations preventing the poor from affording services.

In some of the developing countries like Kenya, Tanzania, South Africa, the informal settlement upgrading approaches are being executed. It is in line with these settlement upgrading that the Kenya Informal Settlement Improvement Program (KISIP) was launched in Kenya. Let's have a look at the KISIP model.

2.6.4.1 .Kenya informal Settlement improvement programme (KISIP)

The Kenya Informal Settlement Improvement Programme (KISIP) was initiated by the Government of Kenya (GoK) through the Ministry of Lands, Housing and Urban Development (MoLHD) to support its urban and local government sector (Muraguri, 2012).

KISIP was meant to be a five year (2011-2016) project of the Government of Kenya (GOK) with support from the World Bank, through The International Development Association, (IDA), the Swedish International Development Cooperation Agency (SIDA) and the French Agency for Development (Muraguri, 2012). It is directed by a program coordination team, comprised of staff from the Ministry of Land, Housing and Urban Development that is responsible for program design, overall program coordination, financial management, procurement, monitoring and evaluation (M&E), and reporting (Ibid, 2012).

KISIP deals with improvement of infrastructure (water and sanitation, roads, foot paths, lighting, vending platforms and waste management), tenure regularization, capacity building and

prevention of future growth of informal settlement through planning for growth (Muraguri, 2012). It is thus designed into four components:

- a) Component 1: focuses on strengthening institutions and program management by supporting institutional strengthening and capacity building of the Ministry of Lands and Housing, and the selected municipalities.
- b) Component 2: enhances tenure security by supporting systematization and scale-up of ongoing efforts to strengthen settlement planning and tenure security in urban informal settlements. Several activities undertaken under this component include preparation of guidelines for informal settlements, establishing databases on land tenure, community organization and mobilization, preparation of development plans including determination of settlement boundaries, detailed mapping and provision of secure tenure, identification and verification of beneficiaries based on agreed eligibility criteria, preparation of local physical development plans, issuance of letters of allotment to households/groups, surveying of individual plots and preparation of registry index maps, registration and issuance of titles to households or groups.
- c) Component 3: focuses on invest in infrastructure and service delivery. The focus is mainly on roads, bicycle paths, pedestrian walkways, street and security lights, waste management, water drainage, sanitation, green spaces, platforms etc. in the informal settlement spaces.
- d) Component 4: the focal area is on planning for urban growth, support planning and development of options that facilitate the delivery of infrastructure services, land, and housing for future population growth. The goal of this initiative is to take measures that will reduce or prevent slums

The objective of KISIP was to improve living conditions of people living and working in informal settlements and/or slums through improving security of land tenure and investing in infrastructure based on plans developed in consultation with communities

The project outputs are aimed at promoting Kenya's vision 2030 in which the government envisaged 'a well-housed population living in an environmentally-secure urban environment'. The project is however limited to fifteen municipalities (from fourteen counties), namely;

Nairobi, Mombasa, Eldoret, Naivasha, Machakos, Malindi, Kakamega, Nyeri, Thika, Kericho, Kitui, Garissa and Embu. This selection criteria is based on the consideration of existing land tenure status, settlement location in relation to environmental sustainability, and scale of potential displacement of residents, size and density of settlements, proximity to trunk infrastructure, community readiness to participate and identification of priority activities.

There are other Informal settlements improvement programmes that have been existent in Kenya, most notably is the Kenya Slum Upgrading Project (KENSUP) which has been in existence since 2005. A lot of research has been done on KENSUP. There are similarities and differences between KISIP and KENSUP.

The central difference between KENSUP and KISIP is that KISIP has a short-term (5 years, 2011-2016) focus on infrastructure and land tenure in 15 municipalities, while KENSUP is a country-wide, long-term strategy (2005-2025), focusing on housing issues (Mwelu, 2015).

KENSUP and KISIP are implemented concurrently by the government of Kenya through the Ministry of Housing and the Ministry of Lands, and support from relevant county governments. KISIP is directed by a program coordination team, comprised of staff from both the Ministry of Housing and the Ministry of Land, that is responsible for program design, overall program coordination, financial management, procurement, monitoring and evaluation (M&E), and reporting. A staff from the Ministry of Housing and the Department of Slum Upgrading manages KENSUP (Mwelu, 2015).

Primarily international donors finance the programs. KENSUP is a long-term project and part of the memorandum of understanding between GoK and UN-HABITAT, which established the Slum Upgrading and Low Cost Housing and Infrastructure Fund to serve as a central depository for the funding of slum upgrading programs. Its initial funding came from UN-HABITAT with subsequent financial allocations from the National Budget. KISIP was funded by the World Bank (60%), SIDA and AFD (30%) and the Kenyan government (10%) (Mwelu, 2015).

2.7 Challenges Faced in the Provision of Water and Waste Water Service Provision in Informal Settlements

This section discusses a number of challenges that create a barrier to the successful realization of sustainable water and waste water service provision. These challenges are in terms of space, economy, and regulatory bodies. A consequence of these challenges may be relocation, displacement, breaking of social ties, natural calamities e.g. earth quakes.

a) Security of Tenure

According to Tshikotshi (2009), land ownership tends to be very complex in the slums. Security of tenure is a prerequisite for sustainable improvement of informal settlements. The rising of informal settlements in cities in developing countries often indicate disparities in the share of wealth and resources (Mathenge, 2013). This has resulted too many urban populations living in the informal settlements without any formal security of tenure and poor access to infrastructure. Tshikotshi (2009) argues for formalization of tenure for the poor in informal settlements to reduce poverty and not a mere provision of formal land titles.

According to UNCHS (1999), secure land tenure is a key element for the integration of the urban poor, as is their recognition by the public authorities. It can also encourage families to invest into upgrading their plots and diversify their use. This can give them protection against possible evictions and provides them with an asset that may serve as a guarantee in certain markets (e.g. for the purpose of acquiring bank loans (UNCHS 1999).

Anulo (2015) observes that insecure land tenure discourages urban poor households from improving their housing structures and conditions as they are unsure of their future occupations. They live in fear of adding any improvement that could be demolished at whichever time. Coupled with the fact that the urban poor have low income levels and lack credit facilities to improve their living conditions. Anulo (2015) concludes that security of tenure is very necessary, but not sufficient, condition for creating sustainable living conditions.

b) High population density

Kahariri (2013) states that high population density and the ensuing congestion of houses contribute to the lack of space for laying of infrastructure services. The majority of the informal low-income communities are located in difficult terrains such as marshy land, swamp, steep slopes, abandoned refuse tips or grave yards, flood plains and rocky areas (Sulaimaini 2006)

c) Poverty

According to Mathenge (2013) informal communities generally have low and irregular incomes thus unable to pay for services at all times. Poverty and unemployment rates in most cases make it unaffordable for household meters and other water services. Cost recovery becomes difficult. In addition, self-help groups (meant to help and uplift communities' welfare) are often difficult to organize because of the diverse culture of communities in these settlements (Mathenge, 2013).

Population growth rate is not always taken into account while planning to provide these services. In informal settlements, population is likely to increase (natural growth, influx of more people and so on). This changing number of these settlements may create difficulties in providing these basic services. Besides, inaccurate population statistics like incorrect population figures may most probably lead to over serving or under serving households in these settlements (Mathenge, 2013).

d) Technical constraints

Sulaimaini (2006) in his study notes that provision of water and waste water service in the settlements is often marred by leakages because of vandalism and the rough terrain of the area, contamination of the water as a result of the leakages hence poor quality of the water. In Egypt, most slums are located in the desert, thus stability of infrastructure and housing structures becomes difficult (Khalifa, 2015).

Sulaimaini (2006) indicates that the high cost of infrastructure implementation hinders successful provision and improvement of infrastructures in informal settlements, For example In Manila, Calcutta, the WB, put a lot of efforts in slum upgrading but the cost ran into millions of US dollars. Most infrastructure services are expensive to maintain. Maintenance of infrastructural services hinders effective improvement in informal settlements. Mathenge (2013) notes that

development agencies are known to propose low quality infrastructures in informal settlements so as to keep costs low. He further adds that contractors tend to de-emphasize quality of construction especially when contractual arrangements are corrupt and supervision is inadequate leading to rapid deterioration of the infrastructure facilities. The option of looking at the sustenance of the infrastructural facilities is not taken much into account (Mathenge 2013).

e) Spatial constraints

Sietchiping (2009), notes that the topographical location of most informal settlements are on the periphery of cities, riverbanks, steep slopes, dumping grounds, abandoned or unexploited plots, along transportation networks, near industrial areas and market places, and in low lying areas or wetlands or in previously unused land which makes the laying or expansion of standard network utilities technically difficult.

He also notes that these settlements are generally unplanned creating complicated layouts leaving little or no room for infrastructure installation. The rough and inaccessible areas translates into high cost infrastructure installation.

f) Lack of good governance

Good governance can be described as the set of policies, functions, responsibilities, and procedures that an entity establishes to guide and direct how it is going to achieve its goals. United Nations Economical and Social Commission for Asia and the Pacific defines good governance as a process of decision making and procedures by which those decisions are implemented or not implemented (UNESCAP, 2009).

Generally, there is lack of policies and strategies for regularizing and/or addressing issues of the informal settlements, thus no clear regulatory framework. As such, coordination between main actors is complicated resulting to rather overlapping roles. A lack of enforcement of regulations is also experienced (Mathenge, 2013).

Mathenge (2013), explains that informal settlements are not homogenous and each has its different characteristics. He further notes that apart from the urban poor who live in the informal

settlements since it is a form of cheap housing, there are others who take advantage and perpetuate their criminal activities there. Some groups of people who thrive in the disorderly ways of informal settlements by providing the lacking amenities like water, sanitation and health services. Such groups of people are well known to frustrate any efforts to improve infrastructure provisions as such are a threat to their survival (Mathenge, 2013).

2.8 Roles, Perception and Behavior of Stakeholders in Provision of Water and Waste Water Service in Informal Settlements

a) Community Based Organization

These are organizations which comprise and are managed by members of the local community, who are a representative of the whole community. These powerful groups are mandated to make informed choices about how funds are managed and accounted for in provision of water and waste water services in the area. They also act as a link between communities and water and waste water providers/agencies, NGOs or donor agencies.

b) The National Government

The government aims to ensure that the community members and the entire citizen fraternity receive adequate water and sanitation supply in the country. There are a number of state departments and ministries established to ensure the successful implementation of this goal; The Ministry of water and irrigation is mandated to oversee the water services sector in the country. This is through formulation of policies and strategies for water and sewerage services; co-ordination and monitoring of other water institutions in the country and overall investment, planning and resources mobilization in the water and sanitation services sector.

The Water Services Regulatory Board (WASREB) licenses and supervises WSBs, approves or disapproves the SPAs, develops and negotiates tariff guidelines, sets standards and develops guidelines for service provision; and publishes results for sector monitoring of the situation in the water and sanitation services provision.

The WSBs develop and rehabilitate water and sewerage facilities for investment planning and implementation, while the Water Services Providers (WSPs) provide water and waste water services directly to residents.

National Environment Management Authority NEMA is responsible for the development of water quality regulations to ensure that the water reaching the consumers is of high quality.

c) County Government

The County government is in charge of all county-related management issues ranging from planning, service provision, infrastructure development and maintenance, collection of levies, and environmental conservation. This is in accordance with the County Governments Act of 2012 which gives effect to chapter 11 of the Kenya's constitution, which provides for county governments' powers, functions, and responsibilities to deliver services and for connected purposes (GoK, 2012).

d) NGOS and Civil Organizations

Civil organizations, like the Kenya Water and Sanitation Civil Society Network (KEWASNET), serve to ensure adequate service delivery in the water sector especially for the poor residents and ensure proper policy implementation in the water services reforms. It also advocates for the protection of water services provision infrastructure from vandalisms and continuously appeal to the members of the community to be responsible in the use and consumption of the water and sanitation services available. NGO's are also involved in funding and institutional capacity building for WSS services.

e) World Bank and other Donor Agencies

These donor organizations are very instrumental in provision of infrastructural facilities in informal settlements. They usually support infrastructure provision in low income residential areas through financial and technical programmes.

f) Community

The community plays a very big role in the provision and maintenance of infrastructural facilities in informal settlements. This is because they are the beneficiaries and users of the infrastructures and they have a key role in ensuring their sustainability.

The sustainability of infrastructural facilities largely depends on the maintenance culture of the users which also depends on the availability of funds. This however hinges on the willingness of the users to pay for the services.

2.9 Case Studies in Water and Waste Water Service Improvement in Informal Settlements

This section explores the various best practices of improved water and waste water services in Ghana, Tanzania and Kenya

2.9.1. WASH-UP Program in Ghana

WASH-UP is funded by USAID through the African Urban Poor Improved water Supply and Sanitation Program. The program started on October 1st 2009. This program sought to increase equitable access to improved water supply and basic sanitation in five urban poor slum communities.

The main objectives of this program were to increase household access to affordable, improved and sustainable drinking water supply, improve household access to improved and sustainable sanitation facilities, promote innovative economic enterprises in the areas of water and sanitation, improve hygiene and sanitation behaviors among the urban poor and strengthen local governance for water supply, sanitation services and hygiene promotion.

The key strength of the program was the participatory approach which was used to achieve its goals and objectives. It involved national level institutions, municipal assemblies, development partners, NGO's and civil society groups.

The key strategic activities by this program include; extensive consultation, awareness creation, construction of household and institutional sanitation, development of training materials and user manuals and collaboration with WASH sector players in sharing knowledge.

By September 2012 all the WASH targets were surpassed in all the 5 settlements. For instance, 26% (higher than WASH target of 25%) of targeted community had improved water supply and 2,711 households had installed private latrines which is also higher than WASH target of 875 households. Thus sanitation coverage was expanded, waste water infrastructure and management was improved and ownership of WASH programs by communities was realized.

The success of this program was due to a number of factors that if borrowed and customized to the Kenyan context may lead to successful implementation of sustainable provision of water and waste water service infrastructure:

First this program ensured enhanced stakeholder participation leading to insightful consultations and success of the program. The community, private sector and other stakeholders were actively involved in all these strategic activities of the program.

A second factor is that WASH only focused on water and waste water management thus it became easier to coordinate, control and explore as many technologies as possible and better decisions as well. The program also explored the different latrine technology options thus increasing sanitation coverage especially in areas where conventional options/existing latrine technologies could not be applied.

WASH-UP also ensured awareness creation on matters of water, sanitation and hygiene through passing and sharing information. It also offered loans for purpose of household water and sanitation and ensured that the loans were used for their intended purpose.

The program however faced a minor setback of delays in cases where the community and beneficiary whose income is low, irregular or sometimes nil as they could not afford to pay up

connection fee for the project to start off. Loan granting process also took too long (2 months) hence frustrating borrowers.

It was also difficult to meet up with the community members due to their busy schedules thus a section of community members were not adequately informed.

2.9.2 Infrastructure Upgrading in Hanna Nassif Informal Settlement, Tanzania

These community-based water projects involved setting up a social infrastructure that can manage community water and sanitation needs. A physical water infrastructure, i.e. community water kiosks are built and placed strategically within these settlements. People from these settlements are then employed to operate and run these kiosks.

The Hanna Nassif community based upgrading took an innovative approach in the institutional set up and the use of labor-based community contracting and community management in an urban context. It was aimed at addressing the basic infrastructure problems in this settlement.

The project sought to build the local capacity both in socioeconomic and technical terms (imparting skills). It also took into account the framework for regularizing informal settlements thus upholding the National Urban Development Policy of 1995, which provides for the framework.

The result of this project is that flooding and waterborne diseases drastically reduced, there was improved access to water services and the socioeconomic life of the residents was greatly transformed (jobs, income, skills e.t.c). Hence, poverty alleviation and social wellbeing of the community attained.

2.9.3 Social Innovation on Umande Trust Bio Centers in Informal Settlements

The community based organizations from these settlements entered into a collaboration with Umande Trust to ensure affordable and proximate water and waste water services. The main agenda of the latter party was to offer technical support and act as a link between the communities and other key stakeholders, like NCWSC, AWSB, NGO's and other International Donors.

The approach used is a community-led development approach whereby the trained community members could get ‘hands on’ the job and design bio centers that befit the site characteristics, the communities’ value and vision. This approach is useful not only in building the capacity of the community but also in transforming the social relations of the community.

The Bio centers, besides housing toilets, bathrooms and community centers, also have a bio digester that turns human waste into clean gas and liquid fertilizer. These centers provide quality services at affordable (e.g Ksh. 3 per 20 litre container) prices and are within short walking distances from households.

Bio centers have greatly reduced the menace of flying toilets, thus better solid waste disposal leading to environmental wellbeing of the societies.

More than 60 centers have been implemented in these settlements thus increasing access to water and waste water service provision and sanitation coverage. Additionally, there are reduced instances of water related diseases, such as typhoid and diarrhea.

These centers allow for optimal utilization of space as they are constructed with bio digesters on the basements, toilets and bathrooms on the ground floor and a community center on the top floor.

These centers have as well ensured economic transformation of members of the community as money got from fee charged on any outsider accessing any service in these centers belongs to the community and is mostly deposited in the community group’s bank account.

2.10 Legal, Policy and Institutional Framework

This section explores the acts and policies that guide informal settlements and provision of water and waste water infrastructure services. It also identifies the various institutions responsible for ensuring these acts and policies are enforced.

2.10.1 Legal Context

2.10.1.1 The Constitution of Kenya 2010

This supreme law requires that all people be entitled to a clean and safe environment. The responsibility to sustainably manage land resources is vested in each and every member of the public. The State on the other hand may regulate the use of any land for purposes of safeguarding public interests. Public participation is also called for in the conservation and management of the environment resources. This is achieved through various media including filing court cases, public barazas, advertisements, notices and so forth.

Article 43, states that every person has the right to the highest attainable standard of health, which includes the right to health care services, including reproductive health care; right to accessible and adequate housing, and to reasonable standards of sanitation; clean and safe water in adequate quantities.

Chapter five of the Constitution on land and environment recognizes land use planning as an imperative to the total wellbeing of the country. Thus, regularization of informal settlements is allowed so as to make these settlements formal and planned. This supreme law does not clearly define the roles of the two levels of government and other stakeholders with regard to provision, maintenance and management of water, waste water and sanitation services.

2.10.1.2 The Water Act, 2002

The Water Act provides for the establishment of a legal and institutional framework for management, conservation, and control of water resources, and for the acquisition and regulation of rights to use water; regulation and management of water supply and sewerage services and related purposes. It prohibits activities that may cause pollution of water sources for domestic, industrial, agricultural or recreational use.

Part II, section 18, of the Water Act, 2002 provides for national monitoring and information systems on water resources. Following on this, sub-section 3 allows the Water Resources Management Authority to demand from any person or institution, specified information, documents, samples or materials on water resources.

Section 25 of the Act requires a permit to be obtained for among other uses of water from a water resource to discharge pollutants into a water resource. Section 75 and sub section 1 allows a licensee for water supply to construct and maintain drains, sewers and other works for foul water arising or flowing upon land for preventing water belonging to the licensee or which he is authorized to take from being polluted. However, if the proposed works affect or is likely to affect any body of water in the catchments, the licensee shall obtain consent from the water resources management Authority.

Section 76 states that no person shall discharge any trade effluent from any trade premise into sewers of a licensee without the consent of the licensee upon application indicating the nature and composition of the effluent, maximum quantity anticipated, flow rate of the effluent and any other information deemed necessary.

The act needs to narrow down to the management and administration activities in the counties for more citizens to access the services easily. Water resource management authorities can be mandated to manage, administer and handle issues concerning water installation and distribution at the grass root level (counties). Waste water management roles are not clearly assigned, the process is also scanty.

2.10.1.3 The Physical Planning Act, Cap 286

This Act mandates preparation of regional and local plans for all areas. Probable routes for water drainage and sewerage and other public utilities should also be delineated. Streets shall be laid out in a manner to facilitate natural storm water flow. Provision for adequate drainage facilities by streets, drainage reserves wayleaves which should not be less than 3 metres should also be put into consideration when subdividing land, during road design and construction among other projects.

Short term plans such as subject plans can be used to give detailed treatment of water supply, sewerage among other planning aspect. This Act acknowledges that water and waste water should be used and managed in a sustainable manner and such mandates all county governments

to manage water and waste water in their area of jurisdiction by ensuring developers comply with the county by laws and other laws regarding method of water supply, sewerage disposal, surface water disposal and refuse disposal.

2.10.1.4 Environmental Management and Coordination Act No. 8 of 1999.

Part II of the said Act states that every person is entitled to a clean and healthy environment and has the duty to safeguard the same. The modalities for waste water disposal, treatment and management is generally least discussed in this act.

a) Environmental Management and Coordination Act(Water Quality Regulations, 2006)

The Regulations provides for sustainable management of water resources including prevention of water pollution and protection of water sources (lakes, rivers, streams, springs, wells and other water sources). It is an offence under Regulation No. 4 (2), for any person to throw or cause to flow into or near a water resource any liquid, solid or gaseous substance or deposit any such substance in or near it, as to cause pollution.

Regulation No. 11 further states that unless there is compliance with the standards for effluent discharge into the environment it is an offence for any person to discharge or apply any poison, toxic, noxious or obstructing matter, radioactive waste or other pollutants or permit the dumping.

b) Environmental Management and Coordination Act(Waste Management Regulations, 2006)

The regulations provide details on management (handling, storage, transportation, treatment and disposal) of various waste streams including: domestic, hazardous and toxic, pesticides, biomedical, and radioactive wastes.

Regulation No. 4 (1) makes it an offence for any person to dispose of any waste on a public highway, street, road, recreational area or in any public place except in a designated waste receptacle.

Regulation 5 (1) provides categories of cleaner production methods that should be adopted by waste generators in order to minimize the amount of waste generated and they include:

improvement of the production processes, monitoring the product cycle from beginning to end, and incorporating environmental concerns in the product design and disposal.

2.10.1.5 Public Health Act, Cap 242

This Act aims at achieving a clean environment free of any nuisance so as to promote public health and safety. This Act acknowledges that it shall be the duty of all local authorities (County Governments) to take all lawful measures for maintaining their areas of jurisdiction at all times in a clean and sanitary condition for remedy of any nuisance or condition liable to be injurious to health. Every municipal council and every urban area council may make by-laws as to sanitation.

2.10.2 Policy Framework

2.10.2.1 Vision 2030

This development blueprint plan of Kenya for the period 2008 to 2030 focuses on making Kenya a newly industrializing, middle income country and on providing high quality life for all its citizens by the year 2030. The Vision is centered around three key pillars: the Economic Pillar whose target is to maintain a sustained economic growth of 10% p.a. over the next 25 years; the Social Pillar which promises a just and cohesive society enjoying equitable social development in a clean and secure environment, and the Political Pillar which aims to ensure an issue-based, people centred, result-oriented, and accountable democratic political system. The Social Pillar is further subdivided into 8 key sectors, among them ‘Housing and Urbanization’, whose Vision is to achieve an adequately and decently housed nation in a sustainable, all-inclusive environment. This is achievable through enhancing the role and capacity for planning, better development of and access to affordable and adequate housing; enhanced access to adequate finance for developers and buyers, and pursue targeted key reforms to unlock the potential of the housing sector.

2.10.2.2 National Land Policy 2009

The National Land Policy (2009) seeks to set broad goals and objectives that any land administration exercises need to meet in pursuit of sound and sustainable utilization of the land resource. Environment is the totality of land and landed resources and the principles evolved

under the National Land policy come in handy in matters of land administration. It provides the overall framework and defines the key measures required to address the critical issues of land administration, land use planning, restitution of historical injustices, environmental degradation, conflict resolution, and proliferation of informal settlements, outdated legal framework, institutional framework and information management.

The vision of the policy is to guide the country towards a sustainable and equitable use of land. This vision is supported by a number of principles. Some of the principles include; equitable access to land, secure land ownership, effective regulation of land development, sustainable land use, efficient land management, etc. The Land Policy recognizes the importance of: optimal utilization of land (compact development), recognition and provision for informal sector activities, promotion of mixed use development and provision for coordinated framework for enforcing planning decisions.

This policy was formulated to address, among other critical issues, the unplanned proliferation of informal urban settlements by setting out slum upgrading modalities that the Government is expected to undertake, providing for the assessment of the suitability of land currently occupied by squatters and above all, ensuring public consultations in all strategies undertaken in these settlements.

Besides addressing land rights, the policy is silent on the progressive development of land, the structures and mechanisms for the same. It also does not give timelines for assessment of the suitability of land currently occupied by squatters. This may hinder resource mobilization for upgrading since more people continue settling in informal settlements daily.

2.10.2.3 The National Housing Policy (2004)

This policy was enacted to facilitate progressive realization of the right to adequate housing. Its targets include urban housing, slum upgrading and vulnerable groups. In an attempt to provide adequate housing to citizens of the state, the policy uses strategies such as, development and facilitation of urban middle-income and low-income housing, upgrading of slums and informal settlements and encouraging construction of rental housing.

The sessional paper no 3 (Kenya, 2004) on national housing policy for Kenya, in its effort to alleviate poverty among the people, it states that; The Government recognizes the ingenuity exhibited by poor people in their quest for shelter. It will continuously revise by-laws, standards and regulations relating to planning, building and environmental management to ensure that the poor urban citizens will have access to their most basic needs including access to shelter, food, infrastructure, water, health and other basic services; and be engaged in activities that can sustain their livelihoods.

In the policy's effort to provide required infrastructure, the opening of new land for housing development or the upgrading of existing informal settlements require installation and maintenance of infrastructure such as water, sewerage, roads, electricity, social services and security. Infrastructural facilities therefore form a major and vital component of shelter provision.

Accessibility to adequate urban basic services will greatly improve people's economic capacities, health and the quality of life in general. This policy recognizes the absence of comprehensive land use management plans. It aims at facilitating the formulation of comprehensive plans in land administration for sustainable housing development in the future among others.

In as much as the National Housing Corporation attempts to provide low cost housing to Nairobi residents, the situation of formal housing shortages in Nairobi still persists. The housing demand for instance is at least 120,000 new housing units annually but only 35,000 homes are built, leaving the housing deficit growing by 85,000 units per year. This has resulted in overpricing of houses, pushing more people to informal settlements. (Noppen, 2012)

Further, investment in housing sector has been minimal due to lack of an enabling environment for private sector participation in housing delivery process particularly for lower middle and low-income groups; low government funding; high cost of finance; lack of serviced land; high cost of building and construction materials; inappropriate building and construction technologies;

limited research on low cost building materials and construction technologies; stringent planning regulations and standards, and high cost of infrastructure (Noppen, 2012).

2.10.2.4 National Water Policy

National Water Policy of 1999: This policy guides the provision of safe water for household consumption and sets out the framework for the water sector reform to overcome the institutional and operational weaknesses in the sector.

2.10.3 Institutional Arrangement

Table 2.1 Institutional Framework

Institution	Role
1. The Ministry of Water and Irrigation (MWI),	Undertake policy formulation, sector strategy development, research and training, sector coordination, planning and financing
2. The Water Regulatory Services Board (WASREB),	Regulation of water and sewerage services, including development and maintenance of quality Standards and issuance of licenses for service provision and issuance of guidelines for rates, fees, and handling service complaints.
3. Water Service Boards	Provision of water and sewerage services within their prescribed areas of jurisdiction under license from the WSRB. Holding or leasing and developing water assets, contracting water service providers (WSPs) Preparing plans for improvement of services, including expanding service coverage and reviewing tariffs
4. Water Service Providers (WSPs)	Responsible for direct provision of water services. The WSPs can be community groups, non-governmental organizations, or autonomous entities established by local authorities or other persons.
5. Water Reform Programme	Manage the implementation of the reform programmes in the

	Ministry
6. The Water Resources Management Authority	Management of water resources as provided in Section 8 (i) of the Water Act (2002).
7. Water Services Trust Fund	Mobilization of financial resources for development and rehabilitation of water and sewerage services infrastructure, especially to unserved areas.
8. Water Appeals Board	Conflict resolution within the sector management.
9. Nairobi City Water and Sewerage System	Providing water and sewerage services to the residents of Nairobi.

2.11 Research Gap

From the above literature, it can be noted that there has been considerable research into the areas of informal settlements and their upgrading. The issue of slum proliferation has attracted enormous research but there is need to focus on the impacts of upgrading programmes on the residents within the informal settlements. However, little or none at all has been done on the evaluation of the KISIP model of upgrading informal settlements, specifically the water and waste water infrastructures. Therefore this research explores the KISIP model of informal settlements upgrading and also looks at the issues faced in the implementation of the program. The main aim of this research is to contribute to this gap and to bring to light more knowledge on the aspect. The case study helps to do this by providing actual experiences of approaches used.

2.12 Conceptual Framework

According to Mugenda (2008) a conceptual framework refers to the main structure or skeleton that not only gives form and shape to the whole system, but also supports and holds together all the other elements in a logical configuration. In this research, the conceptual framework is the concise description of the phenomenon under study accompanied by visual depiction of the variables under study.

The literature has revealed that there are several factors that interplay towards the development and expansion of informal settlements. It was established and explained by the theories that within the context of rapid urbanization, poverty contributes immensely to the informal settlements development. Aside from these factors, institutional challenges and other socio cultural factors facilitate their expansion. These conditions impact negatively on the levels of infrastructure in such settlements which are measured by their availability, accessibility, affordability and reliability. Unfortunately, these settlements which accommodate a very high percentage of urban population lack the most basic infrastructure and where they are available they are in deplorable state. Infrastructure provision in a human settlement is very critical and cannot be ignored.

There have been attempts to improve the conditions in informal settlements by provision of infrastructure. Figure 2.2 highlights the conceptual framework for this study.

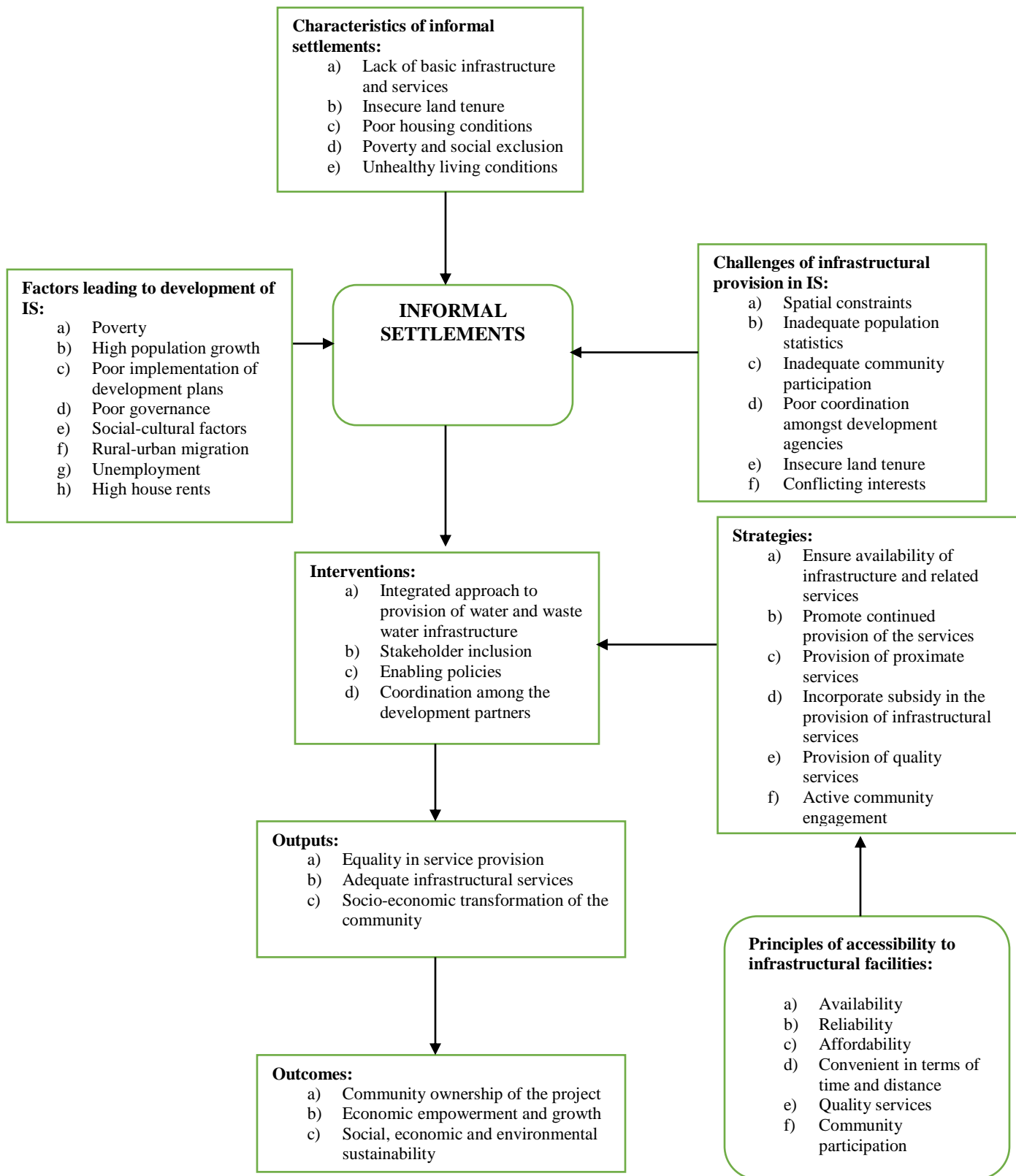


Figure 2.2 Conceptual Framework

(Source: Author (2017))

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This chapter presents a detailed description of procedures that was used to answer the research questions and achieve the objectives of the study. The chapter begins with a description of the research design, population, and the selection of the study site. This is followed by a description of the sampling design, data collection and analysis methods.

3.1 Research Design

According to Oso et al. (2009), a research design describes the pattern that the study intends to follow, it is the plan or strategy for conducting the research and has two main strategies: qualitative and quantitative. This research used a descriptive survey research design. This type of research design involves identifying the characteristics of an observed phenomenon and exploring possible correlations among two or more phenomena. It employed the following research methods: questionnaire, interviews, observations and archival methods.

3.2 Target/Accessible population

Population refers to the total number of subjects (Oso & Onen 2009). Target population refers to an entire group of individuals, events or objects having a common observable characteristic. Thus, it is the aggregate of all that conforms to a given specification (Mugenda & Mugenda 2003). All the residents of KCC Village were eligible for the study.

3.3 Selection of the Study Site

Normatively, settlements ought to be planned based on minimum planning standards and development controlled regularly. Planning of this settlement, though done formally by NCC, appears to contradict the principles and theories of planning. As a result, public planning and planners appears to have contributed in the informality of KCC Village. The need to understand the rationale of encouraging informality despite the challenges that goes with it makes KCC a critical case for the study.

KCC Village was also chosen because it is the only site in Nairobi that KISIP has undertaken the upgrading of Water and Waste Water infrastructure service improvement. Other sites in Nairobi have focused mainly on road improvement. KCC therefore provides an ideal case study area for in-depth analysis of the impacts of KISIP on water provision and waste water disposal in informal settlements.

Table 3.1: Sample of KISIP sites in Nairobi City County

	Name of KISIP Site	Location	Status	Size in Ha	Number of Subplots	No of Households	Population Density
1	KCC Village	Eastlands	Planned by NCC	13.706	788	9542	
2	Soweto	Eastlands	Informal Growth	102.613	2210	26,520	

Source: Compiled from Preliminary Field Visits and Literature, 2017

KCC Village is named after a milk processing facility adjacent to the settlement. It came into existence as a result of resettlement of squatters by the late minister Honorable Mwenje. 501 plots were allocated to the enumerated community and thereafter allotment letters issued to the beneficiaries between years 2003 and 2004. In 1977, KCC relocated these families from the current location to an alternative site behind the factory. However, in 1978, the families relocated back to the current site near Mwenje high school. There has been subsequent subdivisions and the settlement currently has 788 plots. The water and wastewater infrastructure in the settlement was recently upgraded by KISIP.

3.4 Sampling Design

This section describes the sampling frame, the sample size and the sampling techniques that were used in the research.

3.4.1 Sampling Frame

The sampling frame for any probability sample is a complete list of all the cases in the population from which the sample was drawn (Mugenda & Mugenda, 2003). The list of houses as depicted in the satellite imagery formed the sampling frame for the study.

The research targeted all inhabitants of KCC village who are the main stakeholders of the project: source of local knowledge and the main beneficiaries of the project. The targeted population for this study included both male and female adults who have been in the settlement before and after the water projects were implemented as they were in a better position to describe the situation before and after the implementation of the water development projects. This is because any water development project is meant to benefit the entire community and as such all residents would have been affected in one way or the other.

3.4.2 Sample Size and Sampling Technique

A sample is a set of respondents (adult respondents) selected for the purpose of this study. The sample size of 10 – 20% of accessible population will be acceptable in a descriptive survey research (Mugenda & Mugenda, 2003). However, studies have also indicated that for a normally distributed sample, a minimum of 30 cases is adequate. To this end, based on a population of 788 subplots, a final sample size of 79 respondents was determined which is 10%. For data collection purposes, eighty five (85) questionnaires were prepared to cater for any that spoiled. For the key informants, one representative deemed to have the knowledge on the subject was considered per institution. The household questionnaire used is attached in appendix 1.

3.4.3 Sampling Techniques

Different sampling techniques were applied to sample the residential units as well as the key informants for the study. The study applied a systematic sampling technique to get the

households for the study. This technique ensured coverage of the entire settlement which is homogeneous.

Purposive sampling was used to interview the key informants who included representatives from Nairobi City County, Planning department, KISIP, NCWSC and the village head.

3.5 Objective-Specific Data Collection Methods

This section describes the data needs, methods of data collection, sampling techniques and techniques of data analysis that employed for each objective of the study.

3.5.1 Whether the KISIP Project has Improved Water and Wastewater Situation

The Researcher needed to understand past and current experiences in the provision of water and waste water services. This objective aims to fulfill the needs of the study as it seeks to obtain historical data on provision of water and waste water services.

3.5.1.1. Data Needs

The data required to achieve the first objective of the study include temporal data on planning, implementation, use and management of water and waste water services. Data on population trends, socioeconomic profiles of the residents also came in handy. Thus, data on past and present experiences pertaining water and waste water service provision was collected and critically analyzed. Variables such as incidences of waterborne diseases, access to adequate water and sanitation and water supply and demand equation was considered in coming up with emerging issues and telling the story of the success/failure of the project as well.

3.5.1.2. Data Sources

The above information was sourced from the KCC residents, NCC, KISIP and NCWSC. Data was also obtained from existing relevant secondary sources through document analysis as well as observation.

The data required for the study was collected from both primary and secondary sources. The collection method was dependent on the data source used.

3.5.1.3. Methods of Data Collection

a) Primary Data Collection

Primary data was collected using questionnaires, observation schedules and interviews as the main methods.

Questionnaires

This involved administration of written open and closed ended questions to the residents of KCC Village with an aim of acquiring required information.

Observation

This involved capturing and recording the variables relevant to objective. The aspects that were captured and recorded during the study include; Number of structures without water or wastewater service, availability of impaired streams and stagnant pools, number, location, condition and intensity of use of water sources, current level of awareness and reliability of the current water systems. This was directly observed and captured on cameras. The pictures were used for illustrations that guided the research.

Interviews

The KCC community leaders, KISIP officials, NCC officials, NGO's and CBO's are some of the key informant residents who are believed to have first-hand knowledge on the above objective. The researcher probed for information through asking the key informants questions specific to this objective and took notes or record the conversation where necessary.

b) **Secondary Data Collection**

Secondary data collection entailed document analysis to find facts and any other relevant information required. The documents included: books, periodicals, journals, previous written works related to the topic, legal, policy and institutional documents and case studies.

3.5.2: Issues faced in the Provision of Water and Waste Water Services in Informal Settlements

The second objective of the study aimed to examine the issues faced in the provision of water and waste water services in KCC village.

3.5.2.1 Data Needs

Availability of data on plot sizes, road widths, open spaces/ unbuilt up areas, number of households, population density and so on, came in handy in determining the key challenges that affect the success of KISIP project in the study area.

3.5.2.2. Data Sources

Data on issues faced in the provision of water and waste water services in KCC village was obtained from KCC residents, NCC and KISIP officials, ministry of lands, housing and urban development.

Primary data collection and secondary data collection methods complement each other in that the latter is faster and cheaper but may not fully meet the needs of the study while the former is more adequate and up to date. In this case therefore, both methods were used.

3.5.2.3. Methods of Data Collection

a. Primary Data Collection

Questionnaires

Engaging and varied questions designed for both qualitative and quantitative analyses were administered to the sampled residents of KCC village to gather views and opinions on the challenges that face the successful implementation of KISIP projects in the study area.

Observation

This method allowed for collection of real-time data and did not rely on people's willingness or ability to provide information. Thus, issues of plot sizes, road widths and other observable characteristics were gathered through taking notes and photographs.

Interviews

The NCC and KISIP officials, village head are some of the people who have particularly informed perspectives on this objective of the study. These key informants aided in providing insight on the nature of problems and give recommendations for solutions.

b. Secondary Data Collection

Data that is readily available was used to establish and compare variables to come up with conclusive information. The researcher reviewed books, periodicals, journals, previous written works related to the topic, legal, policy and institutional documents and case studies to obtain enriched data on the challenges faced in the provision of water and waste water in informal settlements.

3.5.3. The Roles, Behavior and Perceptions of Stakeholders in Relation to Planning, Implementation and Management of the KISIP Project in the Study Area

A successful project is one that achieves its objectives and meets the expectations of the stakeholders. Stakeholders provide insight regarding the probable reaction to a project's outcome, which facilitates project adjustments. Thus, the roles, behaviors and perceptions of stakeholders have considerable influence over a project and its outcomes. This objective aims to establish the different roles each stakeholder plays in water and waste water service provision and their varied opinions as well.

3.5.3.1. Data Needs

The roles, opinions and conduct of all stakeholders are key in assessing sustainability of the KISIP project in the study area.

3.5.3.2. Data Sources

Data to achieve this objective was collected from KCC residents and key informants; NCC, KISIP, NCWSC and other professionals (planners, surveyors) in the ministry of lands, housing. Data required for the study was collected from both primary and secondary sources.

3.5.3.3. Methods of Data Collection

a. Primary Data Collection

Questionnaires

Written open and close ended questions were administered to respondents with an aim to obtain an overall measure of the attitudes and opinions of the respondent towards KISIP project.

Observation

Data on conduct and perceptions of stakeholders was gathered through watching behavior and events and either noting or if possible, taking videos and photographs.

Interviews

It is important to gain an understanding of the perspectives, behavior and roles of stakeholders of a project, as this may help to explain the shortcomings and successes of KISIP. The NCC, KISIP, Village head were engaged in an insightful conversation by the researcher.

b. Secondary Data Collection

This involved an exhaustive review of literature from books, eBooks, journals, reports laws and policies and periodicals. Useful data about the role, perception and behavior of stakeholders towards water and waste water service provision in informal settlements was obtained, analyzed, and documented for future references.

3.5.4 Strategies that Improves Sustainability of Infrastructure Improvement Projects in Informal Settlement

3.5.4.1. Data Needs

The data required to achieve this objective of the study include data on best practices of planning, implementation, use and management of water and waste water services, integrated strategic urban development plans (ISUDP's) to propose measures that can be put in place to ensure sustainable water and wastewater service provision in the area.

3.5.4.2. Data Sources

The above data was obtained through both primary and secondary data collection methods.

3.5.4.3. Methods of Data Collection

a. Primary Data Collection

The data was obtained through opinions of the various stakeholders starting from the key informants to the household respondents who gave their opinion on strategies that can improve sustainability of infrastructure improvement projects in informal settlements.

b. Secondary Data Collection

Extensive literature review was done on integrated water and waste water service infrastructure planning approaches. Principal best practices were borrowed and lessons learnt from failed or stalled projects. Thus came up with sustainable strategies for the study area.

3.6 Research Procedure

Questionnaires was designed and standardized by the researcher to fit the research questions and the target population. Standardizing is a measure that increases reliability of the instrument which is the consistency of the measurement. Respondents were required to react to a collection of issues and items usually in writing. The questionnaire was designed to capture all research question and therefore to address the objectives of the study. The questionnaire was administered by the researcher and two research assistants who were trained in advance.

3.7 Pre-Testing of Instruments

Kothari (2004) states that a pilot study is a replica and rehearsal of the main survey and establishes weaknesses of questionnaires and the survey techniques. In this study, a pilot study was conducted at Swahili village in Machakos, an informal settlement where water and waste water was also improved by KISIP.

Prior to the field work, after the field work tools preparation, a small sample was selected to test the feasibility of the selected data collection methods. This helped indicate the problems which

may not have been anticipated during the questionnaire development. The results from the pilot study were incorporated in the final questionnaires.

The pilot study permitted preliminary pre-testing of the questionnaire instrument. The questionnaire was designed and pre-tested by picking at random 10 respondents who are served by the KISIP project.

The pilot study enabled amendment of some research questions which was replaced with new ones that could best represent the reality. The pilot study provided an insight on information that was not available at the beginning of the study. It also provided the researcher an opportunity to evaluate the usefulness of data in relation to the research problem.

3.8 Methods of Data Analysis

This section involves cleaning, transforming and synthesizing the data collected to be of more significance. The data was analyzed as indicated below:-

- i. The quantitative data was analyzed using SPSS and Excel software
- ii. The qualitative data was analyzed using logical reasoning based on past studies and case studies as indicated in the literature review

3.9 Data Presentation and Interpretation Techniques

The data was presented once the data analysis was complete. The data was presented as categorical or continuous data. Continuous data was represented using descriptions while categorical data was presented as bar charts, pie charts and other techniques.

3.10 Ethical Consideration

According to Kothari (2004), a number of key phrases describe the system of ethical protections that contemporary social research establishment has created to try to protect rights of their research participants. The study upheld the principle of voluntary participation that requires that people are not coerced into participating in research. The study sought the involvement of participants through informed consent. Essentially, this meant that the prospective research participants were fully informed about the procedures and risks involved in the research and gave their consent to participate.

Ethical standards also require that researchers should not put participants in a situation where they might be at risk of harm as a result of their participation. Harm can be defined as both physical and psychological. The study applied two standard practices in order to help protect the privacy of research participants.

Firstly, the researcher guaranteed the participants confidentiality by assuring that information will not be made available to anyone who was not directly involved in the study. Secondly, by applying a stricter standard in the principle of anonymity, essentially the participant remained anonymous throughout the study.

3.11 Study Limitations

The major limitation of this study was not all key informants in government agencies were willing to participate. Unfortunately, some of the vital key informants, such as representatives from the Nairobi County Department of Environment and the Nairobi City Water and Sewerage Company (NCWSC), declined to participate in the study. These are the organizations which bear the greatest responsibility in regard to the phenomenon under study and their unwillingness to participate in the study was revealed by the results of the data obtained.

3.12 Chapter Summary

The chapter has described the research approach adopted for the study. The data variables to be measured in the study have also been identified together with their sources, the method of collection and the tool to use in collecting the data. It also touched on the series of strategies the

researcher adopted to ensure that the results are valid and reliable as well as identified the techniques used for the analysis of the data collected. Having done all these, the stage is now set to collect valid data which would be analysed in the next chapter after having a close look at the area of Study in detail.

Table 3.2: Data Needs Matrix

Research Objective	Types of Data Required	Use of data	Source of data	Method of Data Collection	Data analysis method
To assess whether KISIP project has improved water and waste water service provision in the study area.	Historical data Population trends Socio-economic data	The data required to determine if KISIP has made any significant change in water and waste water service provision in the study area	KCC residents NCC NCWSC UNHABITAT	Observation guide Interviews Questionnaires Document analysis	SPSS, Excel Content Analysis
To examine the issues faced in the planning, implementation and management of the KISIP Project in the study area.	Plot sizes Width of road Open spaces Number of households Population density	To assess feasibility of KISIP project as a solution to infrastructure needs in informal settlements	Survey Records Planning records at NCC Population data from Chief, KNBS	Observation guide Interviews Questionnaires Document Analysis Measurement	SPSS, Excel Content Analysis
To evaluate the roles, attitudes and perceptions of the stakeholders in relation to KISIP in the study area.	Roles of stakeholders Opinion of stakeholders Conduct of Stakeholders	To conduct stakeholder analysis	KCC residents NCC NCWSC NGO CBO	Interviews Questionnaires Observation	SPSS, Excel Content Analysis
To propose strategies that improves sustainability of infrastructure improvement programmes in informal settlement.	Integrated urban planning approaches	The data evaluated the extent to which KISIP has addressed Water and wastewater infrastructure needs	Case studies KCC residents Professionals	Document Analysis	SPSS, Excel Content Analysis

CHAPTER FOUR

BACKGROUND TO THE STUDY AREA

4.0 Introduction

This chapter looks at the background of the study area in terms of its location, area, socio-economic activities and neighborhood. It articulates the historical background of the study area and its site characteristics as well.

4.1 Historical Background of the Study Area

The growth of many urban centers can be traced to the pre-independence period when they were used as centers of administrative, economic and political control by the colonial authorities. The City of Nairobi owes its birth and growth to the Kenya Uganda Railway (KUR). The railhead reached Nairobi in May 1899 enroute to the present day Kisumu. It became a good stopping and resting place for the trains from and to Mombasa and Kisumu. This promoted the moving of the railway headquarters from Mombasa to Nairobi by its chief engineer, Sir George Whitehouse resulting in the subsequent growth of Nairobi as a commercial and business hub of the then British East Africa protectorate (Mitullah, 2003). The Transfer of provincial offices from Machakos to Nairobi also contributed to the growth of Nairobi City.

Nairobi grew and became a large and flourishing place with the settlement consisting mainly of the railway buildings and separate areas for Europeans and Indians. The Indians allowed to the city were mainly the laborers employed on the construction of the railway. There was no African Settlement in the city. The boundary of the urban center was defined in 1900 when Nairobi assumed the function of the capital of Kenya.

In 1907, Nairobi became the capital of Kenya. Developments slowed down in 1930's but picked up again during the World War II in the 1940's, when the town was a military base for the allied campaign against the Italians in Ethiopia. After the war, some city railway lines were rerouted and replaced with the six lane road now called Uhuru Highway which was opened in 1952.

Nairobi was elevated to a city in 1950, thanks to the preparation of the first Nairobi master plan of 1948. By 1963 the Africans, who formed a major part of the population, lived in the eastern parts, while the Europeans and Asians lived in the western suburbs with access to better services.

Ziwani municipal housing, Starehe government staff housing and Kaloleni housing projects were the first housing projects to be built for the Africans. The then spatial segregation in terms of race is now reflected by differences in incomes as well as population densities in residential settlements. The people living in the western suburbs are generally the more affluent while the lower and middle-income elements of society dominate the eastern suburbs.

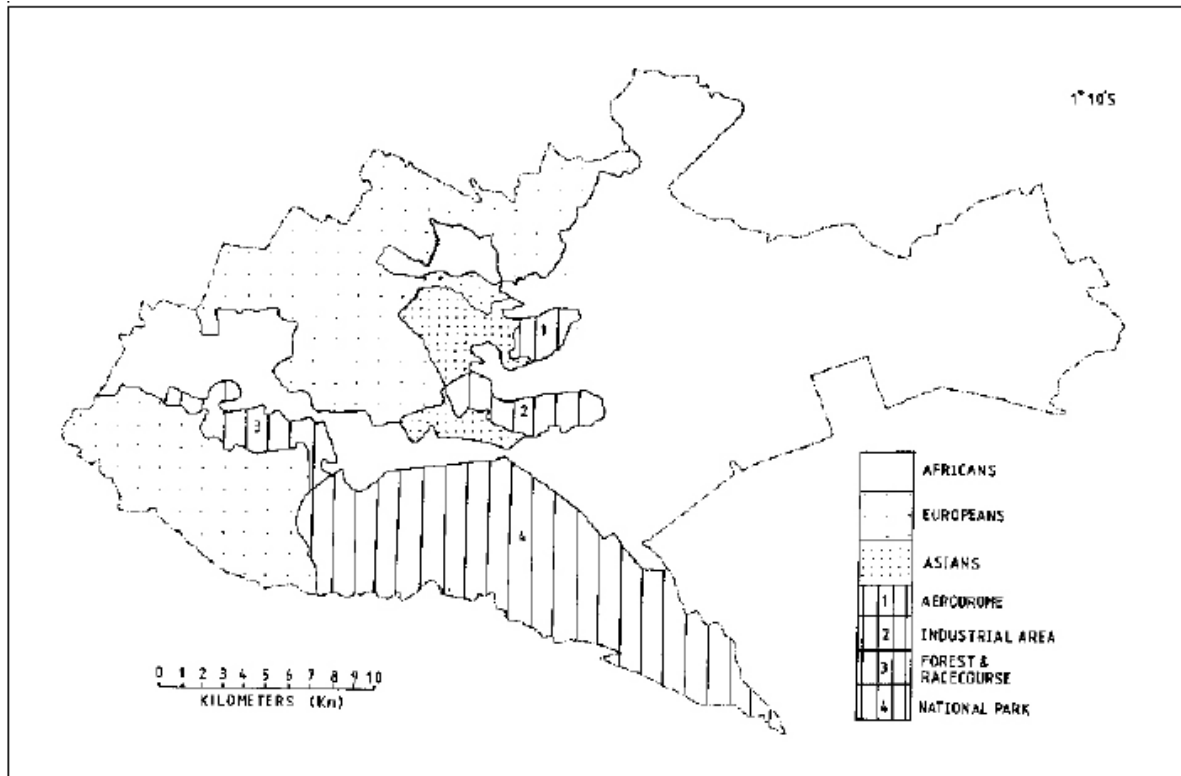


Figure 4.1. Map Showing Spatial Segregation in Nairobi
(Source: Mathenge, 2013)

KCC Village is named after a milk processing facility adjacent to the settlement. It came into existence as a result of resettlement of squatters by the late minister Honorable Mwenje. An enumeration was done in 2000 by the Nairobi City Council and 788 plots were allocated to the community. Most plots in KCC (Embakasi) Informal Settlement measure 19ft x 20ft.

4.2 Site Analysis

4.2.1 Location and Size

Kenya is located on the east coast of Africa, with the equator running almost straight through the middle of the country, and is bordered by Ethiopia, and South Sudan to the north, Uganda to the west, Tanzania to the south and Somalia and the Indian Ocean to the east. Kenya's approximate size is square kilometers.

Nairobi County occupies a transition zone between the eastern shoulder of the Rift Valley and the level plains to the east. It lies at the southern end of Kenya's agricultural heartland at 1.19 degrees South of the Equator and 36.59 degrees East of meridian. The county is bounded by Kajiado County on the South and South West, Kiambu County on the North and North West and Machakos County on the East and South East. Its altitude varies between 1,600 and 1,850 metres above sea level (Mitullah, 2003). The County has a total area of 705.58 square kilometers.

Nairobi is the capital city and the largest city of Kenya as well as one of the most important economic centres in East and Central African Regions. It is also the headquarters of Nairobi County government. The city accounts for 50 % of formal employment in Kenya and generates over 50 % of GDP (NIUPLAN, 2014). Thus, Nairobi city plays an important role not only as a political centre but also as a model for economic development and social development.

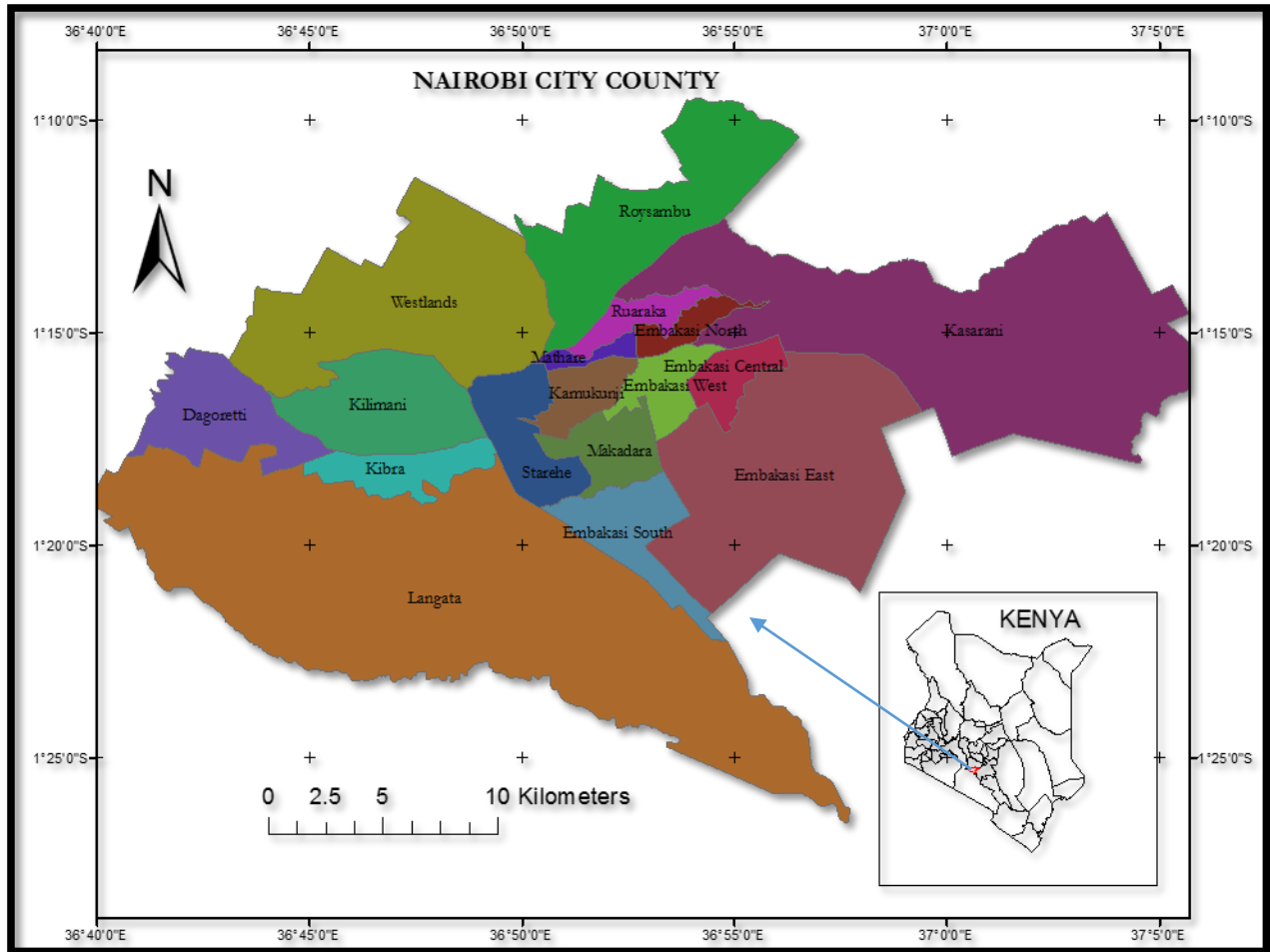


Figure4.2 Map Showing Nairobi Constituencies

KCC settlement is located in the eastern part of Nairobi in Kariobangi South Location, Embakasi Constituency. The settlement is approximately 33 acres. It is accessed through Kangundo Road, Outer ring and Komarock Roads.

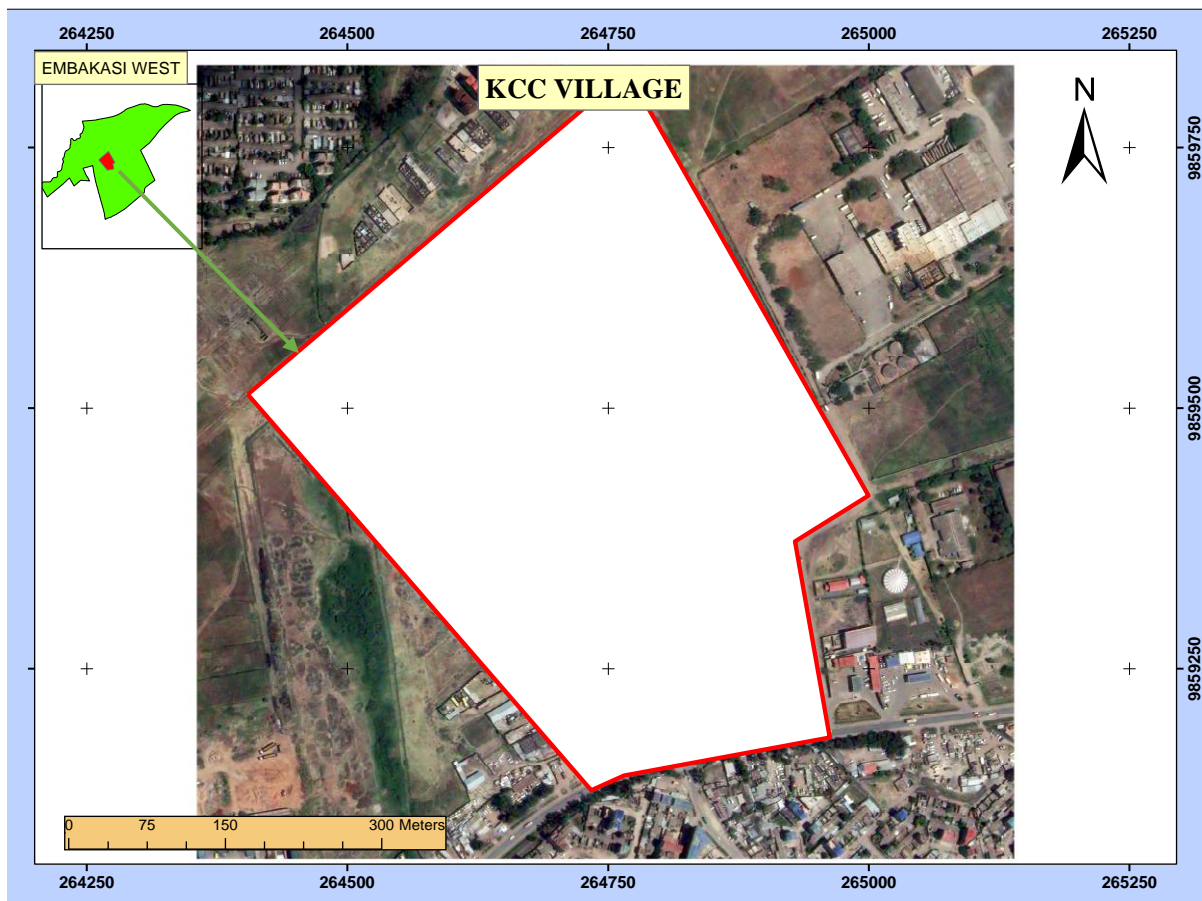


Figure 4.3 KCC Village

4.2.2 Land Tenure and Ownership

Land ownership in Kenya is through private, public and communal land ownership. In Nairobi, most land is privately owned through leaseholds. The land where KCC settlement sits is public land that the government has issued allotments to the settlers.

4.2.3 Population

Population of Nairobi city was 3.1 million in 2009 (Mitullah, 2003). The population in KCC settlement is estimated at 30,000. The settlements is made up of approximately 800 plots, most of which have between 3-10 rooms (Njoroge, 2013).

4.2.4 Economic Activities

Nairobi is an international, regional, national and local hub for commerce, transport, regional cooperation and economic development. The City is a business strategic hub for eastern, central and southern African countries. Nairobi City is a major contributor to Kenya's economy. Most manufacturing and private business enterprises are based in Nairobi; majority of urban workers are also based in the City. The livelihood of most inhabitants of Nairobi comes from informal economic activities, and formal wage employment has been decreasing, as the public sector continues to retrench its employees.

4.2.5 Weather and Climate

The settlement experience Nairobi's climate which has a temperate tropical climate with two rainy seasons. Highest rainfall is received between March and April and the short rainy season is between October and December. The mean annual rainfall ranges between 850 – 1,050mm. The mean daily temperature ranges between 12oC and 26°C. It is usually dry and cold between July and August, but hot and dry in January and February. The mean monthly relative humidity varies between 36% and 55%. The mean daily sunshine hours varies between 3.4 and 9.5 hours. The cloudiest part of the year is just after the first rainy season, when, until September, conditions are usually overcast with drizzle.

4.2.6 Topography

The physiology of Nairobi Metropolitan region varies from the steep slopes valleys in the northern zone to the mild sloppy central and flat terrain in the southern and eastern zones. The elevation varies from 1,800m a.s.l to the north (Kiambu, Limuru, Kikuyu and Ngong) to 1,600m a.s.l. in the south and east (Kajiado) over 50km providing reasonable slope, explaining why the upper zones of the Metropolitan are well drained. The main features influencing the topography of the region are the Aberdares, Kikuyu escarpment and Ngong Hill for the Northern zone. The KCC settlement is on a relatively flat terrain with a gentle slope towards the Nanyuki- Nairobi railway crossing to the North.

4.2.7 Geology and Drainage

Nairobi River is the main river of the Nairobi river basin that flows through the city. It comprises several parallel streams flowing eastwards, all of which join in the east of Nairobi and meet the Athi River, eventually flowing to the Indian Ocean.

4.2.8 Rainfall

The average annual rainfall in Nairobi is about 900mm, but the actual amount in any one year may vary from less than 500 mm to more than 1500 mm. As already mentioned, there are two rainy seasons, from mid-March to the end of May (the so-called "Long Rains"), and from mid-October to mid-December (the "Short Rains"). The dates on which these rainy seasons start and end vary from year to year. The area experiences a bi-modal rain pattern.

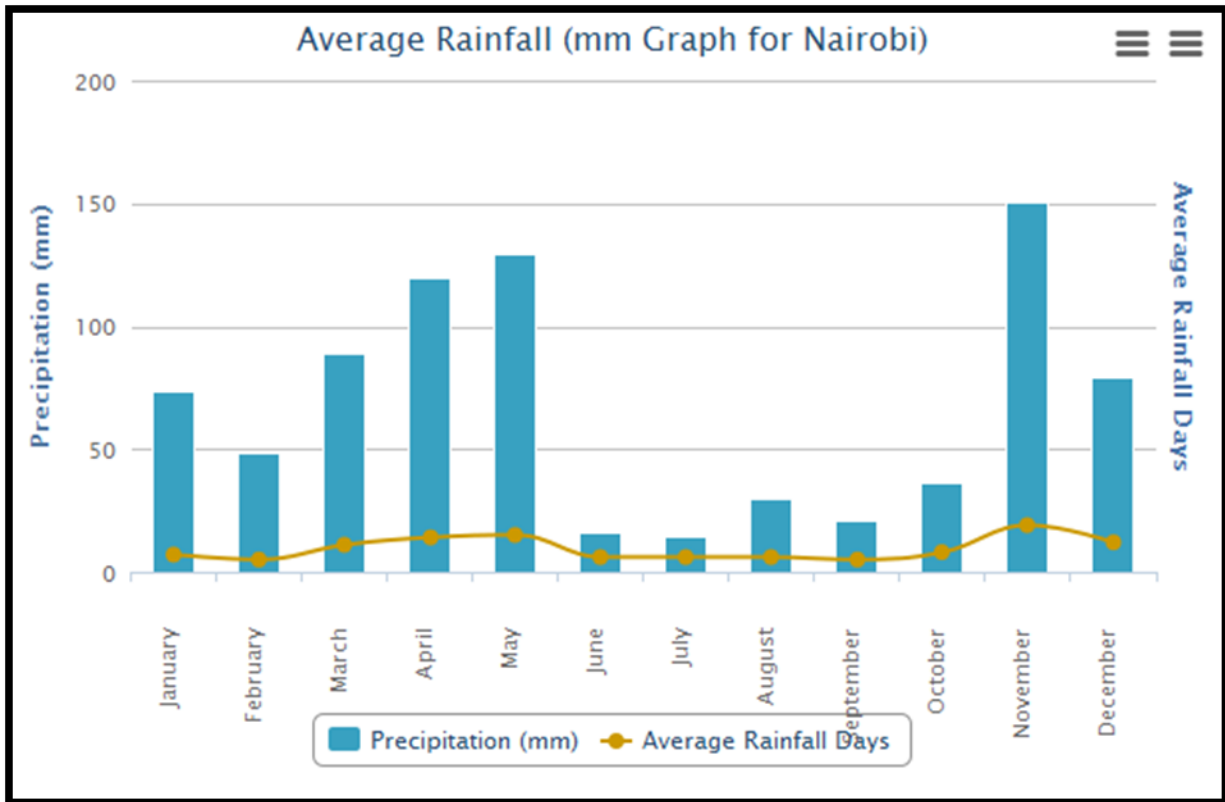


Figure 4.4: Average Rainfall in Nairobi (Source: World metrological organization, 2001)

4.2.9 Temperatures

The climate is generally a temperate tropical climate, with cool evenings and mornings becoming distinctly cold during the rainy seasons. The area has 12 hours of constant daylight with the mean daily maximum temperature by month ranges from 28°C to 23°C and the minimum ranges from 15°C to 12°C.

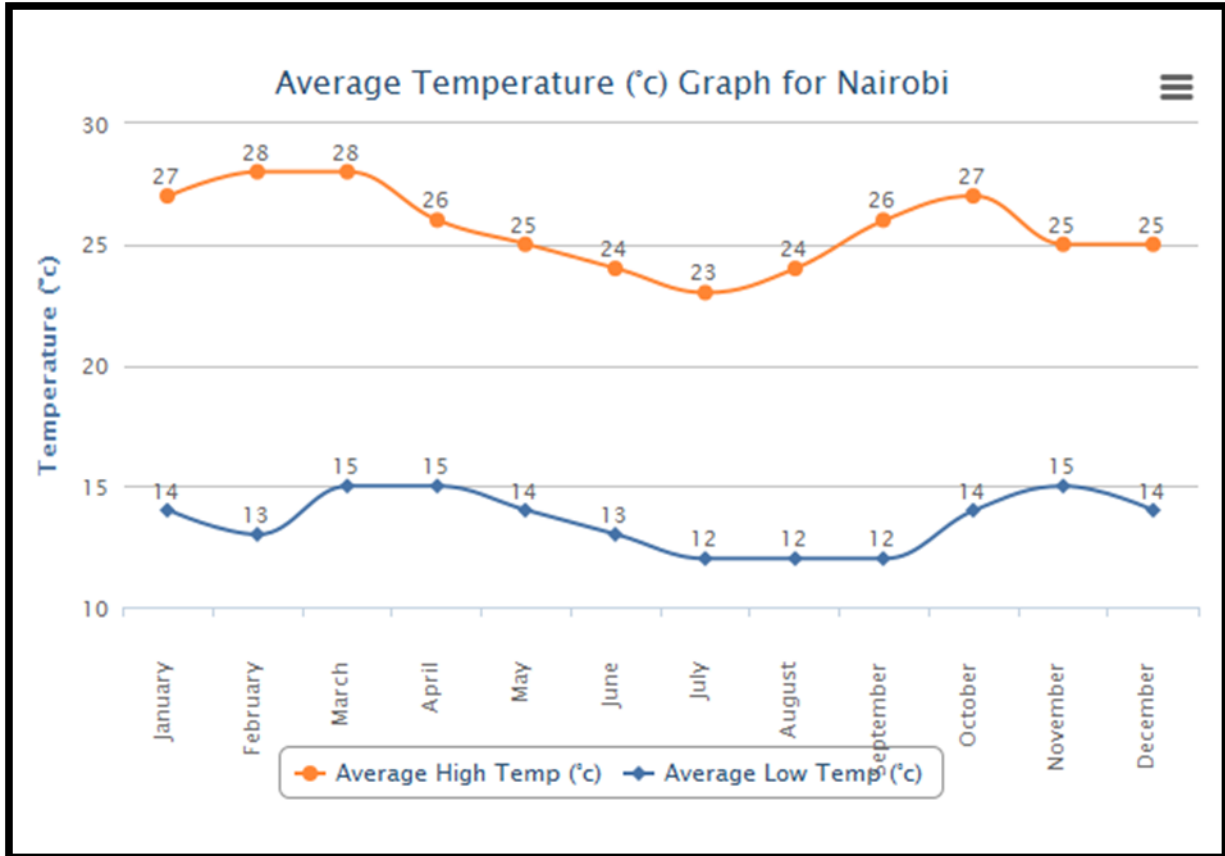


Figure 4.5: Nairobi Average Temperatures (Source: World metrological organization, 2011)

4.2.10 Water Resources

The main river in the Nairobi (the Central Zone) is the Nairobi River flowing through the city. It is the main river of the Nairobi river basin, a comprising of several parallel streams flowing eastwards. All of the Nairobi Basin Rivers join east of Nairobi and meet the Athi River, eventually flowing to the Indian Ocean. Nairobi River is the main influencing basin with its tributaries including Ruiru River, Kamiti River, Rui Ruaka, Karura River, Gitathuru River,

Mathare River, Kirichwa and Motoine-Ngong River. The Motoine River flows to the Nairobi Dam and further onwards the stream continues as Ngong River.

4.2.11 Land Use

Nairobi has eight major land-use classes identified according to DRSRS. These are: residential use; industrial; commercial and service centres; infrastructure and development; recreational areas; water bodies and riverine areas; urban agriculture; open lands and others; and protected areas. The land where the settlements sit is used largely for residential use with sections used for commercial and infrastructure development.

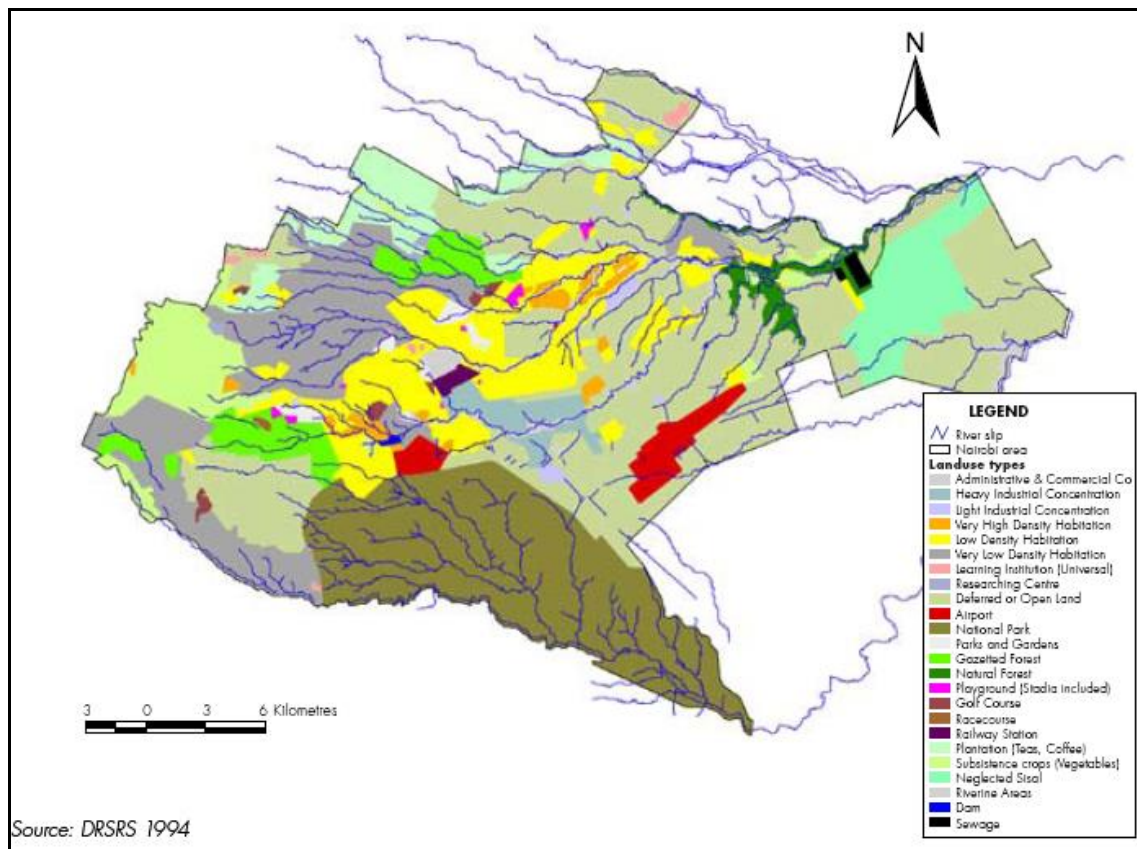


Figure 4.6: Land use map of Nairobi

4.3 Conclusion

Having looked at the area of study in details, let us now have a look at the research findings and analysis of the data collected.

CHAPTER FIVE

RESEARCH FINDINGS AND DISCUSSION

5.0 Introduction

The chapter presents the results of the data analyses and discussions based on objectives of the study. It commences by giving the socio-economic characteristics of the study area. The situation of water and waste water service provision before the and after the KISIP project has been analysed for the study area.

5.1 Socio-Economic Characteristics of the Study Area

The researcher was able to administer Seventy-nine (79) questionnaires to the residents of KCC Village, with the aim of satisfying the objectives of the study. An approximate equal number of both male, female, youth and the elderly were considered during this exercise.

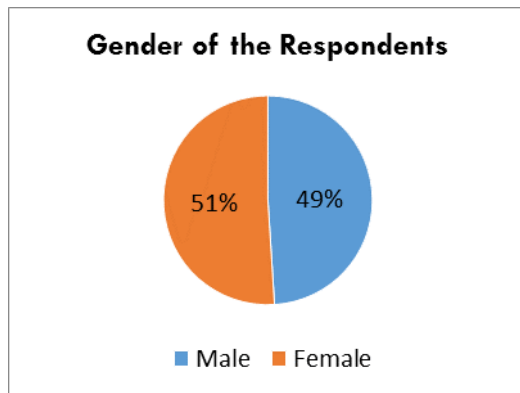


Figure 5. 1: Gender of the Respondents

(Source: Author's field survey, 2017)

The modal age was thirty-six years and majority of the respondents are married, leaving out only 17% as either single or widowed. The average number of people in the households was found to be four (4) members. The household size is significant in research in regard to provision of infrastructural facilities as it affects consumption levels. Household size directly affects the amount of water consumed as well as the amount of solid and human waste generated.

The study revealed that 50% of residents in KCC village have rented houses as shown in figure 5.2. This has an implication in that people may find it difficult or unnecessary to invest, for

instance, in a house that is entirely not theirs, despite the fact most of the residents have stayed in the unit for over twelve years. Low and irregular incomes also dictate the kind of services the residents get, as others are unable to meet their basic needs and still find a remainder to pay for these services. The study also reveals that 34.1% of the plot owners have allotment letters. Allotment letters are not used to access credit in financial institutions to enable the residents improve the infrastructure in the area. KISIP could have taken a first step of improving the security of tenure as an entry point to improvement of infrastructures in KCC village.

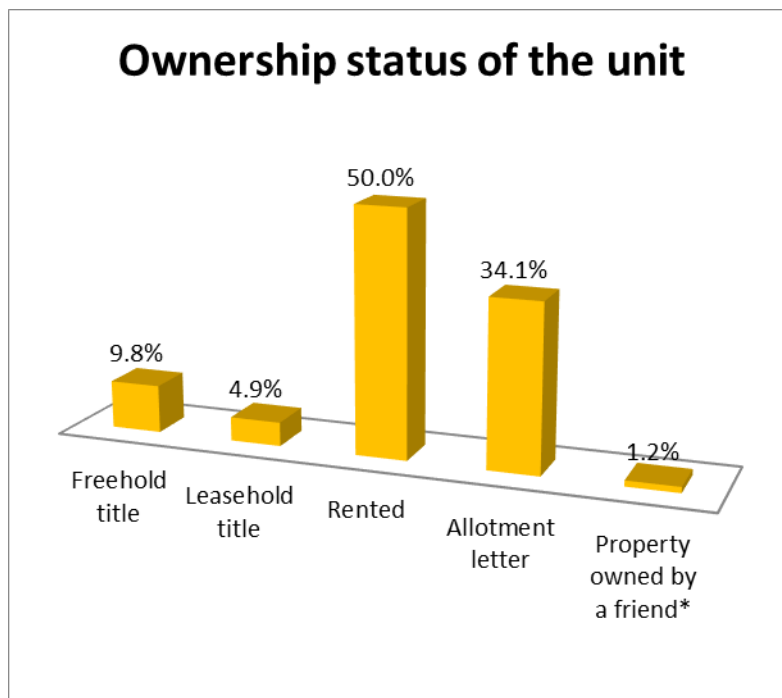


Figure 5. 2: Ownership Status
(Source: Author’s field survey, 2017)

It can be deduced that only (12.5%) of the population have been able to further their studies up to tertiary level as shown in Figure 5.3. Over half of the respondents have however been able to acquire basic education and thus able to read and write.

In this case, it is often very key to ensure the community is sensitized on matters water and waste water, whenever a chance is gotten as most people may not be very much exposed to these pertinent issues. It can also be a way of reminding the community on the need to conserve water.

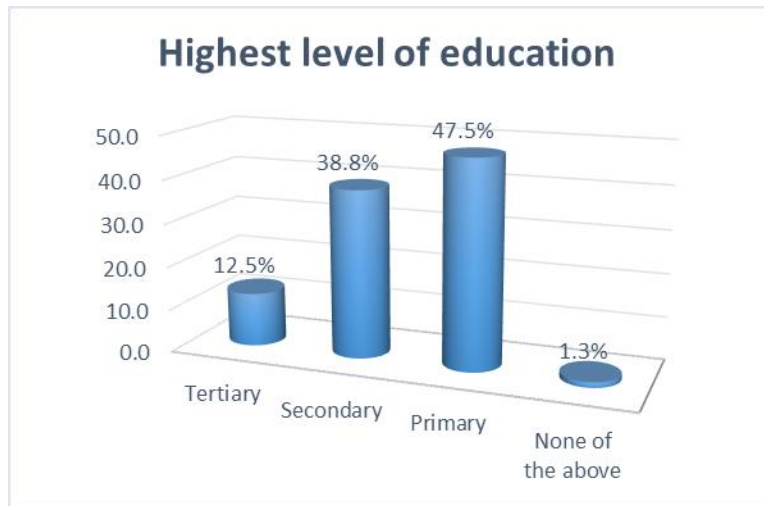


Figure 5. 3: Highest Level of Education
 (Source: Author’s field survey, 2017)

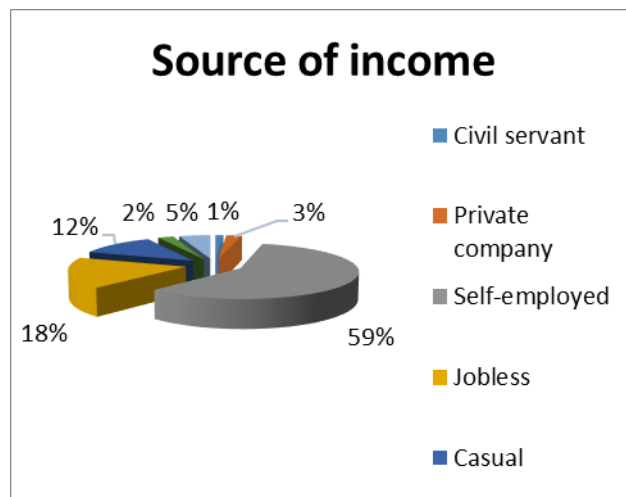


Figure 5. 4: Source of Income
 (Source: Author’s field survey, 2017)

KCC Village is mostly dominated by people who are self-employed as shown in figure 5.4. According to the study, most residents either own businesses in the area and or are landlords of some houses in the same area while others may be both. The mean monthly income for was found to be Kshs. 16,657.14.

There are however a significant number of the youth who are unemployed. This could be risky as the number may rise and as such there could be incidences of crime and other vices in the area as long as the jobless proportion of the population remains unemployed. This group of unemployed youth could have been used in the management of water and waste water services in KCC village, making them own the project.

There are 788 plots in the settlement. The majority of the plots have rental houses. The building type in the area can be put into 4 categories as shown in the table 5.1.

Table 5. 1: Housing Typology

Housing Type	Approximate Coverage
Semi-permanent single roomed Iron sheet rental houses.	45%
Singled roomed masonry stone houses	30%
3 storey single roomed rental houses.	20%
Individual Houses, on-developed	5%

(Source: Author's field survey, 2017)



Figure 5. 5: Semi-Permanent House in KCC Village
(Source: Author's field survey, 2017)

5.2 Impacts of KISIP Project on Water and Waste Water Service Provision

This section assesses whether KISIP project has improved the water and waste water service provision in the study. This data analysis aims to answer the first objective of the study.

5.2.1 Access to Water Services

KCC Village has been experiencing water shortages and associated problems since the settlement started. Prior to the implementation of KISIP project in the area, the residents had to buy water from nearby estates which are Umoja 1 and Kariobangi South estates that are a distance of approximately 500Meters. The residents in the settlement initiated a community project that brought water closer to the village. KISIP came in and laid new water infrastructure that provided access for all households willing and able to connect. This is shown in figure 5. As such, the community became connected to piped water from the nearby Kangundo Road pipeline. The perception of KISIP officer interviewed was that the provision of the infrastructure was adequate enough in solving the settlement's water and waste water provision challenges. KISIP office feels that the project is a success. In as much as the pipe layout was done in the entire village, it is apparent that NCWSC has not been supplying adequate water to the

settlement leading to prolonged water shortages. The residents have continued to buy this precious commodity from water vendors who use carts to transport the water even after the implementation of the KISIP project.

Table 5.2: Water Situation before and after KISIP

Source of water	Before KISIP		After KISIP	
Borehole	Percentage no. of people served	Reliability of the water source (%)	Percentage no. of people served	Reliability of the water source (%)
	3.7	7.6	2.5	8.1
NCWSC piped water	55.4	48.2	50.6	24.7
Vendors	40.7	44.1	46.8	66.8
Other sources e.g rain water	0.2	0.1	0.1	0.4

(Source: Author's field survey, 2017)

Currently, only 50.6% of the respondents are connected to NCWSC (household) but they still complain that this water is not reliable as they only get it only once a week. This has resulted to the residents purchasing water from vendors as shown in Table 5.2 at a very high price as the high water demand of up to 90 litres per household per day cannot be met by NCWSC. A 20 litre Jerri can goes for ksh.25. As a result of the unreliable water supply from NCWCS, most residents have opted not to install water meters making it very difficult for NCWSC to manage water provision in the settlement.



Figure 5.6: Water Vendors

(Source: Author's field survey, 2017)

In as much as water vendors ensure constant water supply to the residents of KCC Village, the water may not be safe as it is not clear where they get it from and how it is handled in terms of transportation and storage. As such, this water may pose a health risk to the residents of KCC village.

The amount of money residents used to spend on water before KISIP seems to have increased as shown in table 5.3. Due to the widespread water shortages, residents have resulted to buying water from vendors and also have to contend to pay monthly water bills to NCWSC for the little water received (for households with water meters). The study can therefore posit that KISIP project may have laid down the water infrastructure but did not effectively solve the problem of reliability in terms of increasing water supply and reducing water costs for the residents. This can be attributed to poor coordination between KISIP and NCWSC. KISIP also failed to involve the community in ensuring reliability of water provision where alternative sources of water supply could have been considered like boreholes or putting up water storage reservoirs.

Table 5.3 Water Services Fee

Expenses on Water Services	
Mean monthly payment for water services before KISIP intervention	Kshs. 1,171.69
Mean monthly payment for water services after KISIP intervention	Kshs. 2,332.89

(Source: Author’s field survey, 2017)

5.2.2 Access to Sanitation Facilities and Drainage Services

5.2.2.1 Human waste disposal facilities

The prevalent human waste disposal mode before the KISIP project in the settlement was through NCWSC sewer (39.5%). The KISIP project increased the number of household connection to the NCWSC sewer mains to 64.2% as shown in figure 5.4. The new connection came with connection charges whereby households were to be connected to the sewer mains at a fee. The project also made a provision for shared facilities.

Table 5.4 Mode of Human Waste Disposal

Mode of Human Waste Disposal	Before KISIP Intervention	After KISIP Intervention
NCWSC sewer	39.5	64.2
Septic tank	14.5	12.6
Pit latrine	36.8	17.9
Communal ablution	9.2	5.3

(Source: Author’s field Survey, 2017)

The study revealed that despite the additional connections to the main sewer by the KISIP project, the infrastructure that was put in place pose serious challenges that compromise the resident's ability to access this facilities.



Figure 5.7: NCWSC Toilet Facility
(Source: Author's field survey, 2017)

Inadequate and inconsistent water supply from NCWSC, the toilets and sewer lines are frequently clogged as there isn't enough water to flush the toilets and to convey the human waste through the sewer lines.

Poor workmanship and lack of maintenance of the sewer infrastructure has led to open or unproperly sealed man-holes (as shown in Figure 5.8) leading to solid waste accumulation in the sewage system, bad odor from the sewer lines, and overflowing sewage as a result of blockages.



Figure 5.8 NCWSC Manholes

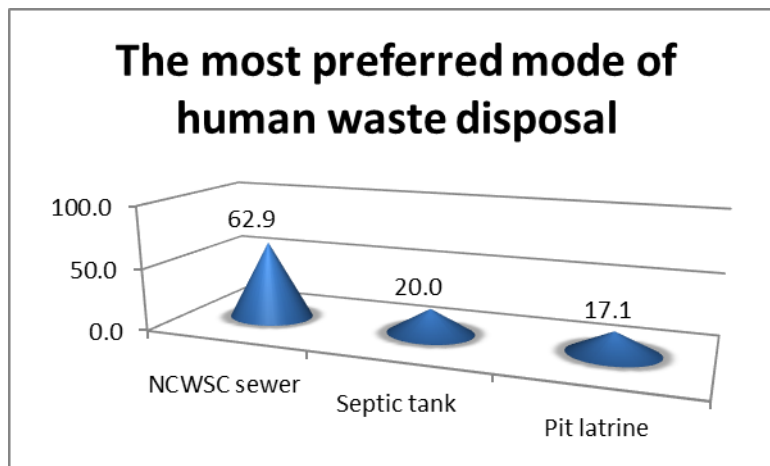


Figure 5.9 Preferences on Mode of Human Waste Disposal

(Source: Author's field survey, 2017)

Despite the above challenges, a good number of the residents attested to the fact that they would still prefer an NWSC human waste disposal method for as long as corrective measures are considered and implemented accordingly. As per the study findings, KISIP considerably increased sewage connection in KCC from 39% to 64%. This shows that the KISIP project positively impacted on the accessibility on the sewer connection in KCC village.

5.2.2.2 Efficiency of drainage structures

The residents of KCC Village felt that the drainage structures constructed parallel to the roads during the KISIP project in the area were inefficient as some are uncovered (as shown in Figure 5.10) posing a threat to the safety of the residents, as people have to cross them to get to their houses. Accounts from the respondents indicated that one person was injured and another died as a result of accidentally falling into these open drains. It was also observed that some residents use these open drains as dumping sites and so when it rains, storm water mostly stays stagnant or flows slowly causing flooding of the roads and the houses near the drains. The stagnant water is an ideal breeding ground for mosquitoes which have become a nuisance in this settlement as explained by the respondents. The stagnant water mixed with other decomposing waste also produces an unbearable bad odour further compounding the problem for the residents.



Figure 5.10 Condition of Drainage Structures

(Source: Author's field survey, 2017)

The study established that failure by the KISIP project to employ an integrated approach to the waste water service provision in the study area hindered the effectiveness of the drainage

channels put in place. The lack of a solid waste management system in the study area has resulted into residents dumping the solid waste in the drainage channels.

5.3 Issues Faced in the Planning, Implementation of and Management the KISIP Project

The second objective of the study set was to find out the issues faced in the planning, implementation and management of the KISIP project in KCC village. The implementation of the KISIP project in KCC Village was aimed at improving the livelihood of KCC residents by ensuring provision of water and wastewater infrastructure and services in the study area. This is defined in component three ‘*Investing in infrastructure and service delivery*’ which is one of KISIP’s mandate as discussed in the literature review. The residents however felt that KISIP did not do a satisfactory job as supported by their responses shown in Figure 5.11.

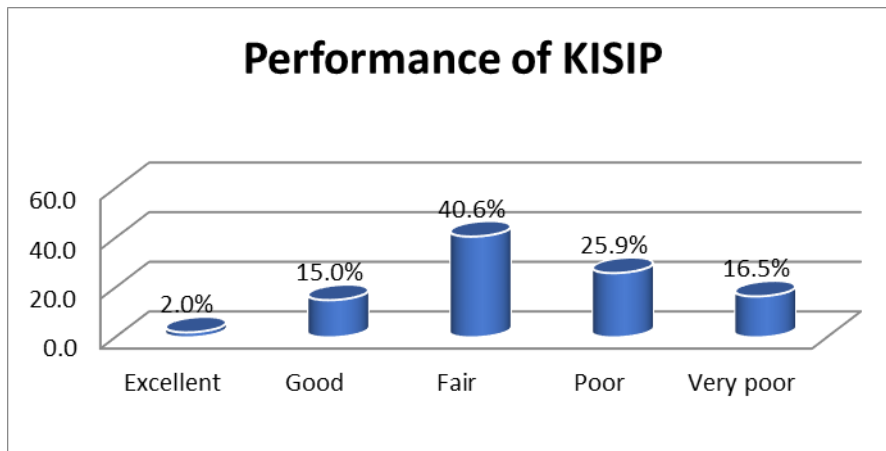


Figure 5.11 KISIP Performance Rating
(Source: Author’s field survey, 2017)

KISIP’s performance, according to the respondents, was attributed to: insignificant improvement in water supply, poor drainage and sewer management, inadequate community sensitization, and poor workmanship including not completing the entire project.

The residents raised a number of factors that they felt could have led to under-performance of this project as discussed below:

a) Inadequate public participation

Public participation is seen as key and crucial to the success of any project involving a targeted population. The participation of the local affected community should not be overlooked as they are the ones that know and understand their own needs and priorities.

I. Visioning phase

About 78% of the residents interviewed claimed that they were not consulted before the project commenced. While those that agree they were consulted say that they were not given an opportunity to prioritize the projects based on their most pressing needs. Among the topics discussed were water and sanitation, road projects and community sensitization. With these statistics, the project could not have been sustainable from the onset. Figure 5.13 presents stakeholder involvement in the visioning stage.

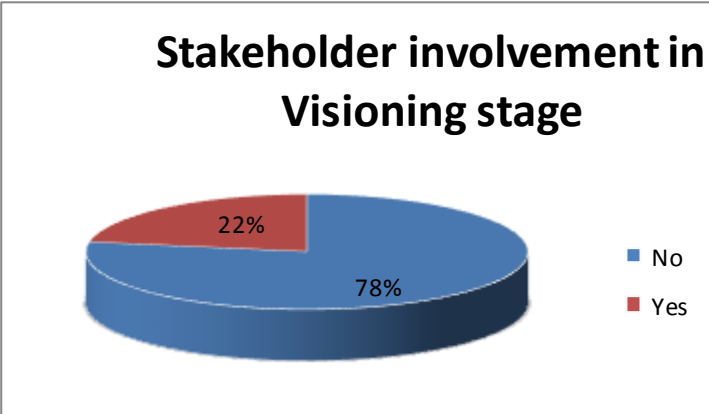


Figure 5.12 Community Participation in Planning of KISIP

II. Implementation phase

This is the stage where the local, affected people get to feel that they own the project. There are various ways of involving the community in this stage, such as providing jobs to them and getting ideas from them too. They can also be represented in the management of the project, like financial management. This at some point brought conflicts as the residents demanded to know what was going on. It even caused stalling of projects causing some not to be completed successfully. The study revealed that only 7% of the residents were involved during project implementation.

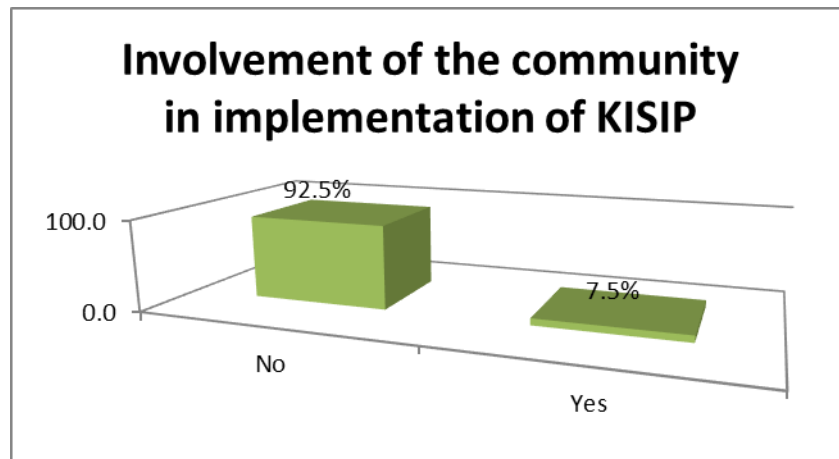


Figure 5.13 Community Participation during Implementation of KISIP

III. Management and monitoring phase

Failing to involve the residents in the visioning and implementation phases of this project led to lack of ownership. Ideally, the local people are the best managers of a project as they mostly know what affects them and can quickly give mitigative measures based on the context of the area. However, their seclusion from the project and lack of ownership led to poor management, misuse and in some cases not using the facilities at all. The residents felt that they were not obligated to maintain and manage facilities which were planned and implemented without their involvement. They contend that the implementers should be responsible for maintenance and management. The failure of this has led to use of NCWSC services without paying for them hence poor management and maintenance of the project.

b) Poor waste management by the residents

Waste in this estate is mostly dumped or burned on site. Others dispose it by throwing in the open drains as shown in figure 5.14. As a result, this has caused blockages which have led to flooding during the rainy seasons. Exposure to diseases is inevitable due to poor handling of these solid wastes. KISIP on the other hand did not sensitize the public on the dangers of haphazardly dumping wastes.



Figure 5. 14 Poor Waste Management by KCC Residents

(Source: Author's field survey, 2017)

c) Spatial constraints

Road reserves in these areas have been taken up by structures built by the residents. As a result, utility providers found it difficult to construct infrastructure. At some point, people had to be displaced and compensated for their loss. This disrupted many businesses in the area and the angry and affected residents demonstrated, leading to chaos, conflicts and project disruption.

d) Financial constraints

The residents of KCC Village mostly complained that the associated costs of household connections to municipal water and sewerage services were very high for them. As such, they opted to continue getting water from vendors or from the previous areas, where they used to walk for longer distances. This has consequently rendered the project as unsustainable in terms of improved water provision and sewerage services.

5.4 Roles, Attitudes and Perceptions of the Stakeholders in the Study Area

The third objective of the study was to evaluate the roles, attitudes and perceptions of the stakeholders in relation to the KISIP project in KCC village.

5.4.1 Planning and Implementation of KISIP

The study revealed that various stakeholders were involved in some ways during the project visioning and implementation. However, respondents felt that there were challenges with some chosen members and with the nature and level of engagement as discussed below.

a) Community Leaders/Elders

They were mostly members of the settlements executive committee (SEC) and were used as channels of information between KISIP and the local community. The residents however felt that they did not represent their needs adequately citing lack of integrity and their inability to satisfactorily represent the true needs of the people.

b) The Youth

The few youth who were mostly involved in the KISIP project provided casual labour to KISIP project. They were for instance involved in digging of drains and road excavations. Despite few youths being involved, they complained that they were paid low wages and did not get equal opportunities as these chances were given to a chosen few.

c) The Church

This institution gave moral support to the residents. It ensured that there were minimal conflicts and acted as arbitrators where conflicts occurred.

d) Professionals

They guided the casual laborers during project implementation. They also promoted the local business people in the area by purchasing their products such as food and other refreshments.

5.4.2 Management of KISIP

The residents of KCC Village felt that they were the best fit to manage KISIP projects in the area. They felt that the project would be sustainable if they were directly involved in the management as this provided a sense of ownership. 35% of respondents supported this idea but an almost equal percentage (33%) felt that NCC would better manage the projects as shown in Figure 5.16.

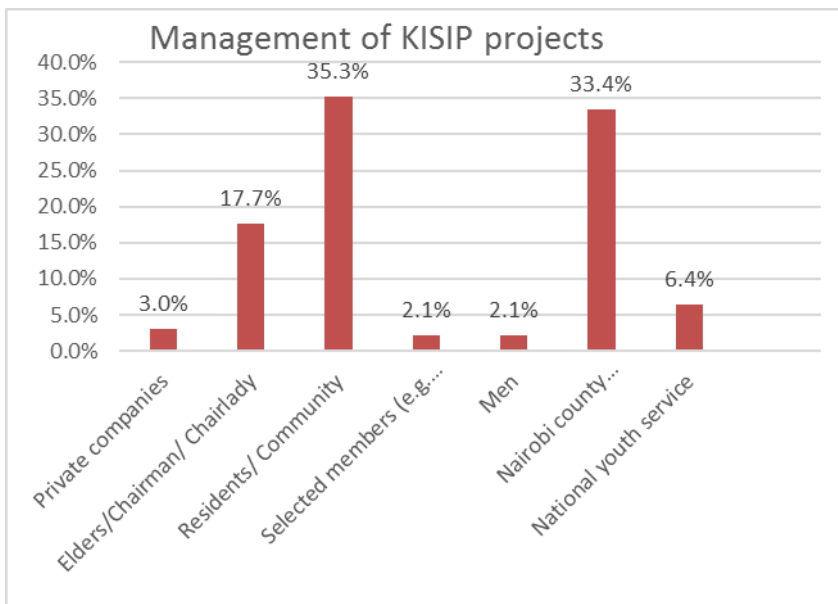


Figure 5.16 Community Perceptions on Management of KISIP
(Source: Author’s field survey, 2017)

5.5 To Propose Strategies that Improves Sustainability of Infrastructure Improvement Projects in Informal settlement

According to the residents of KCC Village, the project could have been more successful and sustainable if the following strategies were adopted during inception and implementation.

a) Active stakeholder involvement

Respondents interviewed felt that KISIP projects may have partly failed in the area due to passive involvement of the community in these projects. As a result, this led to conflicts in the area between the residents and KISIP. The community held demonstrations on two occasions against KISIP projects in the area. It is therefore, important to involve the community at all stages of the project to avoid conflicts and implement projects that are owned and have benefits to the community.

b) Good management

From responses obtained, the community did not clearly know who should manage KISIP projects in the area. They gave varied responses such as; selected members of the community, the government, and NGOs. However, they noted that management of these projects is still poor. First, they complained that KISIP water and waste water projects were incomplete despite the fact that according to KISIP reports, the water and waste water infrastructures were completed. For instance, almost three-quarter of the residents interviewed admitted that they had no meter so the water they are using is not in any way metered. This was partly because of the high connection fee. Secondly, there were broken water pipes and poorly constructed drainage channels around the area. Some drainage channels were still unfinished as at the time of data collection.

The residents therefore, proposed that all households be installed with water meters to ensure all the residents can access water. This is important as water supply for the entire village has often been cut off due to the unmetered connections. A second proposal was that the community should be involved in the management as they are in a better position to identify those evading paying service fees in the area.

c) Transparency and integrity

Residents cited lack of transparency and integrity during the KISIP project as a major hurdle. They claimed that the projects only involved a chosen few from the settlement, who in some way only favored their families and friends when it came to employment opportunities in these projects.

The respondents proposed that it was better to be transparent through holding meetings to inform the community on each and every step of the project. Also, they advised that jobs should be advertised to the general public to ensure free and transparent hiring of the people in the project. Another basic proposal was that KISIP should set up a website that can be easily accessible to members of the public. This website should detail out each and every KISIP project in the study area.

d) Financial considerations

Residents expressed their frustrations in regard to high water connection fees. The residents proposed that the connection fee be reduced or allow those that cannot afford to at least work in these projects and be paying for the connection fee by working for KISIP.

e) Set management office near settlement

The residents were not quite sure of who manages KISIP infrastructures. They however suggested that management offices be brought closer to them or in the area. They saw it as a better idea as it will be easier for them to give their views and channel their complaints. This will also be better as there will be fewer conflicts in the area.

5.6 Chapter Summary

The chapter looks at the situation of water and waste water services in KCC village before and after the implementation of the KISIP project. The analysis was objective-based to help not lose focus of the item under study. The next chapter looks at a summary of the findings, recommendations and conclusion.

CHAPTER SIX

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

6.0 Introduction

The previous chapter presented the analysis and discussion of the data collected. This chapter summarizes the major findings that emerge from the study and draws implications for policy formulation. Recommendations on sustainable improvements of water and waste water service provision in informal settlements are also given. The chapter ends with areas of further research.

6.1 Summary of Findings

In general, the water and waste water service improvement project in KCC village seems not to have yielded much success as had been anticipated. The summary of the findings are discussed under the relevant study objectives in the following sections.

6.1.1 If KISIP Project has Improved Water and Waste Water Service Provision in the Study Area

KISIP may have improved accessibility of NCWSC water in the settlement but not reliability. This is supported by study findings which show that about 57% of the respondents obtain water from vendors. In addition, 56% of respondents felt that water vendors currently are the most reliable source of water. Sanitation on the other hand improved as shown by the study findings. Previously, only 39% of respondents were connected to the municipal sewer but after the KISIP project, this increased to 64%. However, residents still experience some sanitation challenges such as clogged toilets, blocked sewer lines, and inadequate water supply to flush the toilets. In addition, a considerable 15% of the respondents still use pit latrines and septic tanks as means of human waste disposal. The drainage situation elicited mixed feelings from respondents with the view that it was poorly done. Some drainage channels are open, and have been used for dumping solid waste leading to blockages. The open drains have also been a hazard to residents with some reported accidents and one fatality. These channels are also breeding grounds for mosquitoes due to stagnant water.

6.1.2 Issues faced in the Planning, Implementation and Management of the KISIP Project in the Study Area

Inadequate community participation led to conflicts which consequently delayed the implementation of the project. The safety of the community and the people working on these projects was also not taken into consideration as evidenced by reported accidents during and after implementation. In addition to this, financial and spatial constraints, poor management and approach used also reduced the sustainability of this project.

6.1.3 Roles, Attitudes and Perceptions of the Stakeholders in Relation to KISIP in the Study Area

Some respondents felt that KISIP only involved and favored a few chosen members of the community during project design and implementation. The youth and women especially felt that they were not well represented in these projects as only the SEC comprised of elderly men and a woman were selected. These residents felt that it was wise for KISIP to devise a broader framework of community engagement incorporating all residents in regard to gender and age of the participants.

It was not clear about who manages these KISIP projects, with 34% claiming that no one manages these projects while 36.2 % and 23.4% said that it was selected members of the community(from SEC) and Nairobi City County respectively. The rest of the residents interviewed were unable to tell. There is therefore a clear gap as to how projects are managed and maintained after implementation which should be addressed earlier on in the planning and design phases. In the absence of such clear guidelines, the projects are susceptible to misuse, underuse and even vandalism. The respondents were of the opinion that all stakeholders be involved in project planning, implementation and management to ensure project sustainability. They felt that organizations such as NCWSC would provide technical support in case of infrastructure breakdown while the residents would be actively engaged in activities such as unblocking drainage channels and the general maintenance of the projects.

6.1.4 Strategies that Improves Sustainability of Infrastructure Improvement Projects in Informal Settlement

Over 50% of respondents were categorical that sustainability of the projects depended to a large extent on the involvement of residents. Involving the residents was seen as creating a sense of ownership which encouraged the residents to care for and protect these projects as their own. The residents also felt that relevant organizations such as NCWSC and the ministry of lands should also be actively engaged alongside the residents to provide the prerequisite financial and technical expertise thus improving project sustainability.

Active community engagement as envisioned by the respondents should involve the targeted beneficiaries in planning, implementation and management of these projects. That way, ownership of the project by the community will be enhanced right from the onset. It also ensures that social, economic and environmental considerations are deliberated and agreed upon at every stage of the project to mitigate any future challenges.

6.2 Conclusion

The study concludes that KISIP project has not generally improved the water and waste water service situation in the study area. The study concludes that various factors have to be taken into account to improve the water and waste water situation in informal areas, among them are key involvement of all the residents in all stages, maintaining minimum planning standards and coordination of the relevant stakeholders.

The study also concludes that prioritization based on the real needs of the community, increased coordination with the relevant development agencies, improved workmanship to ensure infrastructure durability. A holistic approach in infrastructure improvement should be undertaken.

6.3 Recommendations

One of the recommendations is that there should be clear guidelines, roles and responsibilities of each player, within the central and county government in the water and waste water service provision sector to avoid duplication of roles and seal loop holes that exist. This will reduce inter-government agencies conflicts, reduce wastage of scarce financial resources, and lead to more sustainable projects. For example, it should be clear from the word go that once KISIP lays the infrastructure in place, the NCWSC should take up the role of provision and maintenance of the water supply and the waste water. Water pipeline without water is as good as nothing.

The systems approach, as discussed in the literature, should be taken into account. All stakeholders to be fully involved. A holistic approach should be used in provision of the water and waste water services. For example, Undertaking a water and waste water service provision for KCC village should not be done in isolation. The solid waste must also be considered as it will affect the performance of the water and waste water. The lack of a solid waste management system in the area has made the residents to dump the solid waste in the drainages blocking them.

Another recommendation is that the projects should ensure active and adequate community participation for sustainability purposes. This is to avoid conflicts that eventually lead to stalling of the projects. As a result, the community will also have a sense of ownership of the project and will be proud to actively contribute in the design, implementation, and operation phases of these projects. The projects should also have in place a comprehensive project safety protocol to protect residents from accidents and injuries during construction and operation phases of the projects. This will help avoid accidents and fatalities such as those reported in KCC village. To enhance transparency and accountability, the programme should have an accessible database such as a website with full information on projects. This would include project status reports, challenges faced, and an interactive forum to get the peoples' views.

There should be clear guideline on minimum planning standards when considering area for provision of the water and waste water services. To ensure optimization and sustainability local

factors should be considered on a case by case basis as informal settlements are not homogenous. This will ensure the project is implemented based on the priorities as identified by the residents themselves and as complemented by other development partners such as NCWSC.

Further recommendations is that a detailed survey of the area should be undertaken and various options which are most viable considered. This gives room to explore for more possible technologies and options. For instance, it appears that to ensure availability, reliability, accessibility and affordability, water storage facilities should have been explored rather than just laying infrastructure solely depending on NCWSC water supply. Water conservation techniques such as reuse and rain water harvesting to be considered so as to conserve the resource. Appendix 6 shows an example of water harvesting model.

As a long term strategy for reducing poverty in the slums there is need to invest in human capital, especially in education, shelter and social services. This will increase the residents' productivity and also resolve some of the root causes of poverty. From a planning perspective, the following interventions exploring different scenarios for providing water and waste water services in KCC Village are discussed below. They include nil intervention, incremental approach and redevelopment.

6.3.1 Nil Intervention

Under this option it is assumed that the situation remains as is. Under the physical spatial component the infrastructure as implemented by KISIP remains the same, drainage channels continue getting clogged as a result of solid waste accumulation and poor maintenance, there is no improved water supply from NCWSC, the laid out water infrastructure is not useful to the residents as issues of water supply have not been addressed, the residents cannot afford water meters and the prescribed water and sewerage connection fees, sewerage system is blocked as a result of inadequate water, project is prone to misuse, underutilization and vandalism, deterioration of the infrastructure due to poor workmanship and maintenance.

If KISIP continues implementing projects without adequate community engagement and coordination with other key stakeholders such as NCWSC, the projects implemented will not meet the needs of the targeted beneficiaries, there will be increased conflicts between KISIP and

communities, misuse of funds due to poor workmanship and failure to fully complete the projects, duplication by other agencies. KISIP's model does not address the holistic development of the settlement thereby creating more problems than it solves. For instance, providing drainage channels without solid waste management options leading residents dumping solid wastes in these channels. As a result, the channels are clogged with stagnant water which are a breeding ground for mosquitoes.

6.3.2 Incremental Approach

This entails starting with the existing infrastructure and making small improvements over time no matter how inconsequential it may seem. Ideally KISIP should have first identified the infrastructure that was available such as community water points and the water infrastructure laid by the community with the aim of making improvements towards improved water supply. At this point KISIP should have worked closely with NCWSC to first ensure that the settlement was receiving a reliable water supply even before expanding on the existing water infrastructure. To increase water reliability they could have also explored water storage and harvesting options and other sources of water such as a borehole. Only then would they embark on expanding the water infrastructure after achieving the objective of a reliable water supply.

The same also applies for waste water infrastructure such as drainage channels and sewer lines. The sewer lines were constructed without considering that they needed adequate water to function properly. They should have first explored the idea of community ablution blocks connected to a reliable water source and after improving the water supply, they should have then moved on to connect each household to the sewer network.

To enhance community ownership of the project, KISIP should have taken more time in sensitizing the community and engaging them in thorough discussions about the intended projects from inception to completion. A door-to-door sensitization approach should have been attempted to ensure that majority of residents were engaged.

6.3.3 Redevelopment

It is planning for the settlements following acceptable minimum planning standards as prescribed in policy documents, laws and by-laws. This is contained in the Physical planning Act, Physical planning handbook, the building code, NCCG by-laws, zoning regulations, National Land policy. Firstly with this approach security of land tenure must be guaranteed with residents having valid ownership documents such as title deeds and leaseholds.

A neighborhood plan should then be prepared considering the following the steps: Identifying the issues, Visioning and brainstorming, generating the Options using the sustainability framework, draft the neighborhood plan, consultations and submission, independent examination and holding a referendum and adoption.

The resultant neighborhood is characterized by secure land tenure, buildings that adhere to building standards, adequate provision of requisite infrastructure including water and wastewater utilities.

6.4 Areas for Further Research

Water shortage is increasingly becoming a common phenomenon in Kenya. It is high time Kenyans living in urban areas intensify tapping rain water which is free of charge and can be used in a variety of ways.

This will greatly reduce incidences of flooding and will as well complement water supply system. As such, more resources and efforts should be dedicated towards research on how best to harvest this water and investigate if the water is safe for human consumption.

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APPENDICES

APPENDIX 1

ROLE OF INFRASTRUCTURE IMPROVEMENT PROGRAMMES IN WATER AND WASTEWATER SERVICE PROVISION IN INFORMAL SETTLEMENTS: A CASE STUDY OF KISIP PROJECT IN KCC VILLAGE, NAIROBI COUNTY

HOUSEHOLD QUESTIONNAIRE

Please note that the information contained in this questionnaire shall be treated with confidentiality and shall be used for academic purposes only.

SECTION A. PERSONAL INFORMATION		
No.	Questions	Answers
01	Name of the respondent <i>(Optional)</i>	
02	Please indicate your gender	01 = Male (___) 02= Female (___)
03	Please indicate your age	<i>(Record number of years)</i>
04	Please indicate the highest level of education attained?	01. Tertiary 02. Secondary _ _ _ _ 03. Primary 04. None of the above
05	Please indicate your employment	01. Civil servant 02. private company 03. self employed _ _ _ _ 04. jobless 05. Casuals 99. Others (specify)
06	Please indicate the number of persons in your household	<i>(Record number of persons)</i>
07	Indicate your household monthly income	<i>(Record amount in Kshs)</i>
08	Number of years lived in the unit	<i>(Record number of years)</i>
09	Please indicate ownership status of your land	01 = freehold title 02 = leasehold title 03 = share certificate _ _ _ _ 04= Rented 05 = allotment letter 99 = Others specify

SECTION B: Situational analysis on water and wastewater in the study area
Water

No.	Questions	Answers																													
		<u>Before KISIP intervention</u>	<u>After KISIP intervention</u>																												
WATER																															
10	What are the main sources of water supply in your household for domestic purposes	Borehole NCWSC piped water Vendors Rain water River Wells	Borehole NCWSC piped water Vendors Rain water River Wells																												
11	How reliable is your source of water supply? No. of days in a week?	Borehole NCWSC piped water Vendors Rain water River Wells	Borehole NCWSC piped water Vendors Rain water River Wells																												
12	How far is the water source from your house	In the house Outside the house (in Meters)	In the house Outside the house (in Meters)																												
13	How many days in a week do you get water supply from NWSC pipeline mains?	<table border="1"> <thead> <tr> <th>Source</th> <th>No of Days</th> </tr> </thead> <tbody> <tr><td>Borehole</td><td></td></tr> <tr><td>NCWSC piped water</td><td></td></tr> <tr><td>Vendors</td><td></td></tr> <tr><td>Rain water</td><td></td></tr> <tr><td>River</td><td></td></tr> <tr><td>Wells</td><td></td></tr> </tbody> </table>	Source	No of Days	Borehole		NCWSC piped water		Vendors		Rain water		River		Wells		<table border="1"> <thead> <tr> <th>SOURCE</th> <th>No of Days</th> </tr> </thead> <tbody> <tr><td>Borehole</td><td></td></tr> <tr><td>NCWSC piped water</td><td></td></tr> <tr><td>Vendors</td><td></td></tr> <tr><td>Rain water</td><td></td></tr> <tr><td>River</td><td></td></tr> <tr><td>Wells</td><td></td></tr> </tbody> </table>	SOURCE	No of Days	Borehole		NCWSC piped water		Vendors		Rain water		River		Wells	
Source	No of Days																														
Borehole																															
NCWSC piped water																															
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Borehole																															
NCWSC piped water																															
Vendors																															
Rain water																															
River																															
Wells																															
14	How much water do you use per day?																														
15	How much do you pay for water	<i>(Record Amount in Ksh)</i> Daily? Monthly?	<i>(Record Amount in Ksh)</i> Daily? Monthly?																												
WASTE WATER																															
16	Please state the main mode of wastewater disposal for your household	1) NCWSC 2) Septic tank 3) pit latrine 4) Communal ablution 5) others (specify)	1) NCWSC 2) Septic tank 3) pit latrine 4) Communal ablution 5) others (specify)																												
17	Comment on the drainage systems in the area and their conditions																														
18	In your opinion, are there incidences of water related diseases in this area																														
19	What challenges do you face in accessing water and waste water services																														

20	In your own opinion, has KISIP improved water and waste water service provision?	
21	If yes, what are the indicators of this improvement?	

<i>SECTION C: Issues in the planning, implementation and management of the KISIP project at KCC village</i>		
No.	Questions	Answers
22	Are you aware of KISIP?	
23	In your opinion, What issues has KISIP addressed in KCC village?	
24	Were you involved in KISIP projects in KCC Village?	
25	If yes, in what ways were you most involved	
26	Did the project affect you in any way? (Please explain)	
27	In your opinion, what are the opportunities arising from the implementation of KISIP projects?	
28	In your opinion, what are the challenges arising from the implementation of KISIP projects?	
29	What are the challenges of managing KISIP projects after implementation?	

<i>SECTION D: Roles, attitudes and perception of stakeholders on KISIP project at KCC village</i>		
No.	Questions	Answers
30	What was your role during project implementation by KISIP?	
31	Who in the village was involved in the project during implementation in the water and waste water services?	
32	Who in the village is involved in the management of water and wastewater services?	

33	In your opinion, do you think the implementors of KISIP project involved the residents adequately?	
34	Who do you think is the most influential group or organization to communicate about water and wastewater issues in the village?	
35	How best could the project be implemented to ensure its sustainability	
36	Who in your opinion should implement such projects	
37	How would you assess KISIP's performance in water and waste water service improvement project in KCC	01. Excellent 02. Good 03. Fair 04. Poor

SECTION E: Strategies to improve sustainability of water and wastewater infrastructure services in KCC village

No.	Questions	Answers
38	In your own opinion, do you think KISIP project has improved water and waste water service provision in KCC village?	
39	What gaps can you identify in the implementation of KISIP's water and waste water service provision project in KCC village?	
40	What improvements can you propose to ensure efficient and sustainable water and waste water infrastructure services in KCC Village?	

Thank you for your cooperation..!!!

APPENDIX 2

SURVEY ON WATER AND WASTE WATER SERVICE IMPROVEMENT
THE PUBLIC HEALTH OFFICER

As part of the a Master's degree research project of the University of Nairobi, this survey is being conducted to obtain views on water and waste water service improvement in KCC Village. I would thus appreciate if you could answer a few questions. All responses will be considered confidential for compiling the final report.

1. Give a general comment on the communities' practices and beliefs towards water and sanitation and how it affects their health
2. How would you assess the present status of water related diseases in the village (adults and children)?
3. Are you aware of any recent improvements made to water and waste water services in KCC Village? If so, explain whether there were any improvements made to the service.
4. How would you assess the quality, quantity and consistency of water provided in KCC Village?
 - a) Quality
 - b) Quantity
 - c) Consistency
5. Suggest ways households can use to improve the management of water and waste water service infrastructure?

SURVEY ON WATER AND WASTE WATER SERVICE IMPROVEMENT
KISIP OFFICER

As part of the a Master's degree research project of the University of Nairobi, this survey is being conducted to obtain views on water and waste water service improvement in KCC Village. I would thus appreciate if you could answer a few questions. All responses will be considered confidential for compiling the final report.

1. What is your main priority program/what is your area of specialty in KCC Village?
2. Which institutions have you been collaborating with?
3. Who are your funding partners?
4. Comment on the extent of your project in KCC Village
5. How effective is your approach of targeting the poor households?
6. Kindly enumerate the range of technical options of water and waste water service provision available in KCC Village?
7. What constraints deter the achievement of sustainable water and waste water service provision in KCC Village?
8. What priority actions have been implemented or are planned to be undertaken to mitigate the challenges?
9. What are some of previous actions to improve water and waste water service provision that have worked well in KCC Village?
10. How were local residents involved?
11. What specific areas would you recommend for an intervention to be focused on and why?
12. What do you think households could do to improve the management of water and waste water service provision in KCC Village?
13. What do you think the City authorities could do to improve the management of water and waste water service provision in KCC Village?
14. Suggest other parties that you think should be involved in improving the management of water and waste water service provision in KCC Village?

SURVEY ON WATER AND WASTE WATER SERVICE IMPROVEMENT

NAIROBI CITY COUNTY

As part of the a Master's degree research project of the University of Nairobi, this survey is being conducted to obtain views on water and waste water service improvement in KCC Village. I would thus appreciate if you could answer a few questions. All responses will be considered confidential for compiling the final report.

1. What municipal services do you provide in KCC Village?
2. How would you assess the water and waste water service provision situation in the village?
3. What best practices on management of water and waste water do you promote in this village?
4. Kindly give recommendations regarding improvements to community water and waste water issues

SURVEY ON WATER AND WASTE WATER SERVICE IMPROVEMENT
KISIP OFFICER

NCWSC

As part of the a Master's degree research project of the University of Nairobi, this survey is being conducted to obtain views on water and waste water service improvement in KCC Village. I would thus appreciate if you could answer a few questions. All responses will be considered confidential for compiling the final report.

1. How would you assess access to water and waste water service in the village?
2. How would you assess water and waste water service provision situation during the dry season?
3. What is being done to promote sustainable water and waste water services in KCC Village?
4. Is the storage capacity of the tanks which supply the village sufficient?
5. How long would water last during a water shortage?
6. Have there been complaints about water quality?
7. How do geology, topography and hydrology affect water and waste water service provision in the village?
8. What other challenges do you face in the provision of water and waste water service provision
9. What counter measures do you apply to curb these challenges
10. Suggest ways community can be involved in promoting sustainable water and waste water service provision

APPENDIX 6

WATER HARVESTING MODEL

