UNIVERSITY OF NAIROBI

AN ASSESSMENT OF THE PROVISION OF WATER SERVICES TO INFORMAL SETTLEMENTS IN NYERI MUNICIPALITY URBAN LOCATIONS.

NDWIGA MOSES MUTURI

B42/82132/2012

A project submitted in fulfillment for the Postgraduate Diploma in Housing Administration in the Department of Real Estate and Construction Management in the University of Nairobi.

October, 2013
DECLARATION
I, the undersigned declare this research project is my own original work and has not been presented in any other institution.

Signature: ________________________ Date: ________________________

Moses Muturi

Declaration by supervisor
This research project has been submitted for Examination with our approval as Supervisors in the Department of Real Estate and Construction Management, University of Nairobi.

Signature: ________________________ Date: ________________________

Dr. Mary Kimani

Signature: ________________________ Date: ________________________

Mr. Dennis Muthama
ACKNOWLEDGEMENT

I am grateful to Almighty God for His abundant blessings and provision of good health throughout the period of undertaking my studies. The Ministry of housing is greatly appreciated for the financial support in paying the fees for this course. I also appreciate the support from the lecturers and staff at the School of Built Environment, University of Nairobi. Special thanks to my supervisors, Dr. Mary Kimani and Mr. Dennis Muthama for the technical and professional guidance throughout this study.

To my lovely daughter, Angel, I thank you for persevering and understanding throughout the many days I was not able to be with you despite your tender age.

My late wife Jackie, you left a void that is hard to fill but we shall fulfill all you would have wished us to.

Finally, my fiancée, Grace, thank you for your love, support, understanding, and prayers.
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<td>NWMP</td>
<td>National Water Management Plan</td>
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<tr>
<td>KNBS</td>
<td>Kenya National Bureau of Statistics</td>
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<tr>
<td>WCED</td>
<td>World Commission on Environment and Development</td>
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<td>GOK</td>
<td>Government of Kenya</td>
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<td>UNCSD</td>
<td>United Nations Commission on Sustainable Development</td>
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<td>NWSS</td>
<td>National Water Services Strategy</td>
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<td>EMP</td>
<td>Environmental Management Plan</td>
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<td>LA</td>
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<td>Sector Wide Approach to Planning</td>
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<td>WASREB</td>
<td>Water Services Regulatory Board</td>
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<td>NYEWASCO</td>
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ABSTRACT

The main aim of the study was to examine water provision in informal settlements in Nyeri town. The objectives of the study were; to identify the current water sources in Nyeri’s informal settlements, assess the current levels of mains provision in the informal settlements, to identify and suggest ways of ensuring a sustainable method(s) of providing water services to the informal settlements within the municipality.

The provision of this crucial service particularly in informal settlements is a major challenge and cannot be expanded at the desired rate. Therefore there is a need for new approaches to improving water provision in the informal settlements.

Multi-stage sampling design was used. The design included cluster, stratified and random sampling. In stratified sampling, respondents were grouped into three distinct categories including landlords/owners, residents and officials of Nyeri Water and Sewerage Company (considered as key informants). From these distinct categories, each stratum was then sampled as an independent sub-population. Sampling was further done by geographically clustered sampling using the four (informal settlements) locations of interest. For purposes of this study, only Ngangarithi, Kiawara, Witemere and Githwariga settlements were sampled.

Sustainable provision of basic services such as water in urban centres in such a manner as to ensure attainment of continual satisfaction of human needs without discrimination is the main objective of public services provision. Such an undertaking should be environmentally non-degrading, technically appropriate, economically and ecologically viable and socially acceptable. The services should be affordable, accessible, adequate and of desired quality.
CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of the Study

Urbanization is the physical growth of urban areas as a result of rural migration and suburban concentration into cities, particularly the very large ones. Today approximately 15% of the world population lives in cities. According to UN estimates, by 2015 about 20% of the population will live in cities with more than 5 million populations, (UN-HABITAT, 2004).

Urbanization processes in most developing countries are intensifying. However, two, in particular, are posing unprecedented problems for governments and local authorities rapid urban population growth and the urbanization of poverty.

In the face of rapid population growth, escalating poverty and inadequate institutional capacity, the cities and towns of the developing world are unable to provide the necessary infrastructure, housing and employment opportunities. Consequently, a growing proportion of the urban population is living in ‘housing poverty’ in slums and informal settlements (UN-HABITAT, 2006b).

These are characterized by inadequate housing conditions; deficient urban services (water supply, sanitation, drainage, solid waste disposal, and roads and footpaths); insanitary and dehumanizing living conditions; extremely high densities (of both people and dwellings); and, frequently, long travel distances to job opportunities. Tens of millions of slum dwellers live under constant threat of eviction, in contravention of their rights and with no recourse to due process of law. The proliferation and expansion of slums and informal settlements is thus presenting a major challenge to city and municipal authorities in developing countries, as well as to the international community.

In this study, urbanization is taken to mean the rate at which the urban proportion is increasing. Cities in the developing counties tend to be centres of poverty. The poor live in slums in very poor conditions and are the most vulnerable to the vagaries of urbanization (UNHABITAT, 2004).
Informal settlements refer to “... residential areas where housing is not in compliance with current planning and building regulations, that is, unauthorized housing”. (United Nations Commission on Sustainable Development, 1996: 67). They represent some of the most troubling problems facing developing countries today as “the spatial manifestations of urban poverty, social exclusion, and inappropriate government policies” (Sclar and Northridge 1981: 23).

As a result of rapid urbanization, the majority of urban residents in sub-Saharan Africa live in informal settlements often characterized by a lack of basic services such as water and sewerage. Consequently, the urban poor often use inexpensive pit latrines and at the same time may draw domestic water from nearby wells. Overcrowding in slums limits the adequate distance between wells and pit latrines so that micro-organisms migrate from latrines to water sources. Sanitary practices in these overcrowded slums are also poor, leading to contamination of these wells (UN-HABITAT 2004).

Most informal settlements are faced with a myriad of problems ranging from inadequate infrastructure, poor sanitation, noise pollution, water pollution and poor water disposal system (GoK, 2001). Since construction is informal and unguided by urban planning, there is a near total absence of formal street grids, numbered streets, sewage network, electricity, or telephones. Even if these resources are present, they are likely to be disorganized, old or inferior. Informal settlements also tend to lack basic services present in more formally organized settlements, including policing, medical services and fire fighting (GoK, 2009). In most studies informal settlements and slums take different meanings however for purposes of this study the two mean the same thing.

Urban expansion and the growth of informal settlements (or slums) therefore places great pressure on already struggling social services such as education, water and sanitation. Slums place great pressure on the environment and are often highly polluted. They also pose challenges to security and social cohesion.

An adequate supply of safe drinking water is universally recognized as a basic human need. Yet millions of people in the developing world do not have ready access to adequate and safe water. By 1996, the number of people without access to safe water
in urban areas was rising sharply in developing countries as a result of rapid urbanization, much of which was occurring in peri-urban and in informal settlement areas.

Informal settlement residents constitute between 40% and 70% of the population in all major urban centers in Kenya (UN-HABITAT 2004). These settlements are characterized by poor water and sanitation service provision. In its current National Water Services Strategy (NWSS) the government aims at achieving the millennium development goal number 7 by fast tracking affordable and sustainable access to safe water in the settlements of the urban poor. This will be achieved through defining national standards for low-cost technologies and increasing number of public/communal outlets under formal service provision. In addition, the Government of Kenya (GoK) has responded to the Vision 2030 and the recommendation of the “Kenya Economic Recovery for Wealth and Employment Creation (2003-2007)”, by commencing a water sector reform program with a particular emphasis on the poor equally recommended by the Poverty Reduction Strategy Paper (PRSP) which has led to a new institutional and legal framework and a Sector Wide Approach to Planning (SWAP) in the sector.

Kenya’s annual informal settlements growth rate of 5%, is the highest in the world and it is likely to double in the next 30 years if positive intervention measures are not put in place (UNDP, 2007). According to UN-Habitat (2003), the experience in these slums shows a strong link that people living in poverty are trapped in their present (World Economic and Social Survey, 2008) situation because they are excluded from the rest of the society. Unfortunately, they are not empowered to allow them to make any significant contribution to community building (United Nations Population Division, 1998; Mutisya, 2010), pushing Nairobi city to the verge of sinking into abyss as the weight of mushrooming slums takes its toll.

Only about one-quarter of the households in Kenya’s informal settlements have access to water and a private toilet facility. Thus the majority of slum dwellers rely on shared toilet facilities. An additional 6 percent are even worse off; as they have no access to toilets and have to use open areas and/or “flying toilets” (i.e. plastic bags that are tied up and then flung away). Water service providers perceive service provision to the poor as commercially unattractive leading to informal providers who
are organized in cartels, profiting from their monopoly power by distorting competition and creating artificial shortages.

The rapid urbanization with its densification of population in the settlements has a particular huge and negative impact on the living conditions of the population. Therefore, although access in rural areas is lower and the proportion of the poor is higher than in the urban areas, a particular focus on the settlements of the urban poor is important and justified particularly access to water.

Access to water in informal settlements as an area of academic research has been widely studied with contributions including (Ilahi, 2000), on the quality of water and its implications, (Crow & McPike, 2009; page 205) on household work and access to water, (Thomson et al., 2001) on how long people spend collecting water.

Other studies that have tackled this subject are: (Majale, 1998), which provides an insight into the state of infrastructure in informal settlements and establishes the supply systems to which inhabitants of informal settlements have access to (water kiosks, communal water points, itinerant water vendors and on-plot connections). (Ben Crow et al., 2013), using global positioning systems (GPS) loggers to measure the time taken to collect water in two informal settlements in Kenyan cities. (Mutisya and Yarime, 2011) on the three main concerns of slum dwellers with water that is; access, cost and quality. (Ahlers, Schwartz, & Perez Guida, 2012), on informal sector works.

From the above literature review what is lacking is a comprehensive analysis of the extent of water services provision in informal settlements. It is this that the study attempts to tackle using the case of water provision in the informal settlements of Nyeri municipality.

1.2 Statement of the Problem.

Informal settlements resulting from rapid urbanization are considered a challenge for the much needed expansion of basic services. This is especially true for water services which cannot be expanded at the desired rate. Thus the need for a new approach to improving water provision in informal settlements.
Nyeri town has witnessed increased rural – urban migration as a result of its agro-based industries whose main source of raw materials is the county’s vast agricultural produce.

The rapid expansion of industrial and commercial activities has directly contributed to the acute shortage of housing and the subsequent development of sub-standard housing which has led to proliferation of informal settlements which in turn have accelerated environmental degradation. Based on the above situation, the Municipal Council of Nyeri is faced with the challenging task of providing vital services such as water to all. With the limited resources (financial and technical) at their disposal, it has become difficult to cater for the whole population. The lack of accurate statistics on the rate of rural- urban migration and resulting informal settlements proliferation within the town coupled with lack of accurate information on existing capacity of the water service providers to meet the rising demand for water and sanitation services creates a challenge in planning for the provision of services such as water especially in the informal settlements. This study is therefore appropriate, as there is need to understand the extent of water services shortage in urban informal settlements in Nyeri Municipality. It assesses the current situation of water services in the informal settlements with an aim of finding out the gaps and the possibilities for improvements.
1.3.0 Objectives of the Study

1.3.1 General Objective
The main aim of the study is to examine water service provision in informal settlements in Nyeri town.

1.3.2 Specific Objectives
1. To identify the current water sources in Nyeri’s informal settlements.
2. To assess the current levels of mains water provision in the informal settlements.

1.3.3 Research Questions
1. What are the current sources of water in Nyeri’s informal settlements?
2. What are the current levels of mains provision in the informal settlements in Nyeri town?

1.3.4 Scope of the Study
Physical scope: The study concentrated on Nyeri Municipality specifically the study focused on the informal estates of Thunguma, Majengo, Ruring’u and Kamakwa.

Conceptual scope: The study sought to look at the provision of water within informal urban settlements. Thus its arguments were premised on urbanization, informal settlements and water provision concepts.

1.4.0 Justification for the Study
Urbanization has been growing in developing countries at much faster rate than in developed Nations. In the developing countries, the level of urbanization increased from 25.4% in 1970 to 33.6 per cent in 1990 and it is expected to hit 57% by the year 2025. The urban population in the developing countries is growing by 3.6% a year compared to industrialized regions where the urban population is growing by only 0.8% a year. UNCHS (Habitat) 2001. This rapid expansion, has led to the slums and squatter settlements (informal settlements) proliferation as towns and cities increase in size.
In Kenya, the problem of urban housing is characterized by an acute shortage in the number of dwellings, overcrowding in the existing urban stock as well as the existence of substandard human settlements such as slums and squatter settlements. As a result the provision of infrastructural facilities and other social services has not adequately satisfied the demands of the growing population. (National Housing Policy for Kenya, 2004).

The rapid urbanization with its densification of population in the informal settlements has a particular huge and negative impact on the living conditions of the population a particular focus on the settlements of the urban poor is important and justified particularly for provision of water.
CHAPTER TWO
LITERATURE REVIEW

2.0 Informal Settlements

The rapid expansion of cities throughout the world has been accompanied by equally rapid growth of informal settlements. Informal settlements develop as the formal housing market is unable to cater for the number of migrants, many of whom are extremely poor. It is estimated that by 2030, nearly five billion people will be living in urban areas, which compares to 3.2 billion in 2007. Slum conditions are defined by the UN as lacking at least one of the basic conditions of decent housing: adequate sanitation, improved water supply, durable housing or adequate living space. Although the proportion of urban dwellers living in slums appears to be falling, the absolute number is rising rapidly. This expansion is occurring quickest in the world’s poorest regions such as Southern Asia and sub-Saharan Africa (www.wikipedia.org).

2.1 Causes of Urban Informal Settlements

The spread of slum or squatter settlements has been described as “…..an emancipation of normal urban growth processes under historically unprecedented conditions” (www.wikipedia.org). This is because rural to urban migration has increased the number of urban dwellers at such a high rate that urban squatter settlements have been created in some urban areas of the world due to lack of proper housing (Obudho, 1988:56). Obudho (1988) asserts that rapid rates of urbanization have increased the rates of rural-urban migration and most of these immigrants reside in slums and squatter settlements.

It is also important to note that in many large African cities, zoning laws and building codes have been completely ignored by people erecting shelters on private land or land zoned as institutions or open space (Obudho, 1982). Syagga et al., 2001, argue that 60% of all urban growth can be attributed to natural growth. However, this situation is quite different across the third world, particularly when placed within the spectrum of national incomes.

As a result of rapid urbanization in a context of economic constraints, the majority of urban residents in sub-Saharan Africa live in slums often characterized by lack of
basic services such as water and sewerage. Consequently, the urban poor in informal settlements often use inexpensive pit latrines and at the same time may draw domestic water from nearby wells, leading to contamination and subsequent water borne diseases.

2.2 Water as a resource
Water is a finite and life sustaining resource and covers about 70 % of the physical environment, fresh water resources are scarce and unevenly distributed. The amount of water available globally is about 1.4 billion cubic kilometres. Of this amount, 97 % is saline, and is in seas and oceans and is a habitat to diverse marine ecosystems. Of the 3 % fresh water, only less than 1 % is found in lakes and rivers, supporting all our developmental activities. About 2 % of the available fresh water resources is locked up in glacial ice at the poles (www.village – foundations.org3, 2009). The fresh water in rivers and lakes thus needs to be managed well for our sustenance and that of future generations. Globally fresh water is becoming an endangered resource. In the past, there was little or no water pollution and most of the rivers and lakes were in a pristine state. In modern times, water pollution is on the increase and quality deterioration is evident in many water bodies. Adequate freshwater of good quality, is vital for the survival of all living organisms and the smooth functioning of ecosystems, communities, and economies. But the quality of the world’s water is increasingly threatened as human populations grow, industrial and agricultural activities expand, and as climate change threatens to cause major alterations of the hydrologic cycle. Poor water quality threatens the health of people and ecosystems, reduces the availability of safe water for drinking and other uses, and limits economic productivity and development opportunities. Action must now be taken to conserve and protect our water resources by preventing water pollution, treating waters that are already contaminated, and restoring the quality and health of rivers, lakes, aquifers and wetlands. This will ensure that our waters meet the broadest possible range of human and ecosystem needs and uses.

www.tcd.ie4, 2010).

Funding of the water sector has been relatively low in many sub-Saharan countries. This is indicative of the low priority the sector is given compared to other sectors. For example, the Kenya budget of financial year 2013/2014 has allocated only 6% of the total budget to Environmental Protection, Water and Housing sector and out of this, the water subsector will take the least amount of funds, (The National Treasury, 2013).

2.3 Water situation in Kenya

In Kenya the spatial and temporal distribution of water is skewed, with Arid and Semi Arid Lands (ASAL) receiving flash rains that end up as little conserved runoff. Population growth and proportionate demand for food in the higher potential areas has resulted in migration to lower potential and ecologically fragile areas and converting them to agricultural land.

Kenya’s annual water availability has been estimated to be about 647 m$^3$ per capita of water (NWMP, 1992) and is expected to drop to about 250 m$^3$ per capita in 2030 when population is expected grow to 64 million (NLCPD, 2010). Countries with less than 1,000 m$^3$ per capita of water are regarded as water scarce thus Kenya which has a population of about 38 million (KNBS, 2009), is a water scarce nation which faces enormous challenges in managing its limited water resources. Sustainable integrated water resources management is critical because poor water quality can aggravate water scarcity.

Water provision in Kenya is not progressing fast enough and according to a desired standard in order to be certain that the MDGs for water and sanitation (Target 7) will be reached by 2015 (RoK, 2008).

According to (RoK, 2010), Kenya has limited renewable water supply and is classified as a water scarce country. This situation coupled with unregulated urban growth and lack of effective urban services provision, planning and urban migration contributes to challenges in urban water services provision as people crowd into cities.

There are several challenges which need to be tackled in order to up-scale present efforts in Kenya. One of these is the concentration on the service provision to the poor, especially in the settlements of the urban setting. Another challenge is to offer
appropriate technology and management concepts fulfilling human rights for sustainability.

2.4 Water Quality Management
Adequate freshwater of good quality, is vital for the survival of all living organisms and the smooth functioning of ecosystems, communities, and economies. But the quality of the world’s water is increasingly threatened as human populations grow, industrial and agricultural activities expand, and as climate change threatens to cause major alterations of the hydrologic cycle. Poor water quality threatens the health of people and ecosystems, reduces the availability of safe water for drinking and other uses, and limits economic productivity and development opportunities. Action must now be taken to conserve and protect our water resources by preventing water pollution, treating waters that are already contaminated, and restoring the quality and health of rivers, lakes, aquifers and wetlands. This will ensure that our waters meet the broadest possible range of human and ecosystem needs and uses (National Water Quality Management Strategy (NWQMS) (2012 – 2016)

2.5 Challenges facing water quality management in Kenya
Human activities such as agriculture, industry, and mining, disposal of human waste, population growth and urbanization impact negatively on water quality. Some of the major challenges affecting water quality in Kenya are:

i. Inadequate measures to control pollution from point and non-point sources.

ii. Inadequate enforcement capacity by institutions mandated to control pollution and enforce water quality standards.

iii. Lack of incentives to polluters and low compliance.

iv. Inadequate water quality data for planning and decision making.

v. Inadequate allocation of financial resources.

vi. Inadequate human resource capacity.

vii. Research gaps in water quality.

viii. Scarcity of potable water.
ix. Dilapidated potable water distribution network.

x. Dilapidated/inadequate sewerage system.

xi. Poor land use practices including unplanned urbanization.

xii. Conflicting laws and policies.

xiii. Inadequate documentation and dissemination of available information.

2.6 Water Service Provision in Nyeri Informal Settlements

All informal settlements face a host of environmental health and sanitation problems. The poor sanitary conditions related to solid and liquid waste management. In most of the informal settlements, the solid wastes and refuse are placed in the open spaces existing in the areas (Fernandez, 1998). Even in the cases where dumping sites are provided, most municipal and urban areas authorities lack the capacity to clear the dumping sites on a regular basis. The disposal of liquid waste in informal settlements is mainly through pit latrines and other on-site methods, which are shared by a number of families and are the source of considerable pollution. Many overflow into open drains and pollute ground water sources (GOK, 2003).

As the prospect of affordable housing becomes less likely for most African households, let alone the urban poor, there is also evidence of deterioration in their housing conditions. According to Mbogua (1994), the majority of urban dwellers, especially those living in squatter settlements have no access to basic services like sanitation, potable water, waste disposal, health and educational services. The reasons for this he attributes to limited financial resources, poor management at local and central government level, rural –urban migration and high unemployment. This has contributed to inadequate infrastructural provision and environmental degradation. This is evidenced in the deterioration of the housing conditions and lack of water provision in these areas,(Awatona,1994).

Kitunka (1993) says that the majority of urban houses are built in informal or squatter settlements that are rapidly increasing in density. Upgrading programmes have enabled a fortunate minority to benefit from potable water supplies, electricity and
communal sanitation, but for the most part these settlements have very little access to basic services.

The absence of safe drinking water and poor environmental conditions in informal settlements contributes to high rates of diseases and infant mortality. In slum areas and other low-income areas, facilities such as public or private standpipes, wells (with or without a pump), and water vendors are the main source of water supply. This shows that less people enjoy piped water supply into their houses (Drakakis-Smith, 1996).

In Nyeri town, the main water supplier is Nyeri Water and Sanitation Company (NYEWASCO) which provides piped water in the following two main services, piped water supply (domestic and industrial).

NYEWASCO is a private company that was incorporated on 23rd September 1997 in accordance with the companies Act 486 of the laws of Kenya. Operations of the company commenced on 1st July 1998.

The company (NYEWASCO) has a primary responsibility to provide clean water and sewerage services to the residents of Nyeri Municipality in a financially sustainable manner and within government regulations.

NYEWASCO’s production capacity is 25,000m³ of water per day with connections of about 20,000 customers. About 35,000 people are served with sewerage services mainly within the built up areas and the central business district. This area is approximately 20 km². Effluent quality and monitoring is done regularly. The informal settlements are however not adequately provided with water and sewerage services and the situation in these settlements in terms of the services is pathetic.

2.7.0. Policy and Legislative Framework
This part of the study analyses the existing policy and legal framework and their relationship with the study.

2.7.1 The Constitution of Kenya, 2010
The Constitution of Kenya, 2010 in chapter one, article one recognizes the sovereignty of the people. Subsection one states that “All sovereign power belongs to
the people of Kenya and shall be exercised in accordance with this Constitution”.

Chapter four of the Constitution of Kenya 2010 covers the bill of rights. Article 19 section two states that “The purpose of recognizing and protecting human rights and fundamental freedoms is to preserve the dignity of individuals and communities and to promote social justice and the realization of the potential of all human beings”

Chapter 5, section 43 on economic and social rights, subsection (b) states that “Every person has the right to accessible and adequate housing, and to a reasonable standard of sanitation”. Therefore, it is clear that access to adequate housing and to a reasonable standard of sanitation is a right enshrined in the constitution which is the supreme law of the land.

Provision of decent and quality housing with accompanying services such as water and sanitation is therefore an obligation of the state through its agencies. Thus there is sufficient justification for provision of quality and adequate water and sanitation services that complete the definition of adequate housing.

2.7.2 The National Housing Policy in Kenya

In Kenya, the government’s interventions for the housing sector have been through the formulation of Sessional Paper No.5 on Housing Policy of 1966/67 which was a National Strategy for Shelter to the year 2000 and other measures contained in successive National Development Plans.

Currently, the housing sector is guided by Sessional Paper No.3 on National Housing Policy for Kenya of 2004. The policy highlights problems in the housing sector which are manifested in overcrowding, slums and proliferation of informal settlements especially in peri – urban areas. These problems are manifested in itself in poor quality of housing and lack of basic services such as drinking water.

The policy recognizes that the essence of ‘informal’ or ‘spontaneous’ or ‘squatter’ settlements is that it is without secure tenure and/or is unplanned. The problems of ‘squatters’ and informal’ settlements continue to present a challenge for development in Kenya. A large proportion of Kenya’s population has no decent homes, and lives as ‘squatters’ or in slums and other squalid places (RoK, 2004)
One key objective of this policy is to promote the development and ownership of housing that is functional, healthy, aesthetically pleasant and environmentally friendly. Provision of adequate water services is one of the ways and means of achieving this objective.

The policy also aims at enabling the poor to access housing and basic services and infrastructure necessary for a healthy living environment especially in urban areas. One of the most important basic services is water and therefore the National housing policy is crucial for planning for water services especially in informal residential settlements.

The main goal of the policy is to facilitate the provision of adequate shelter and a healthy living environment at an affordable cost to all socio economic groups in Kenya in order to foster sustainable human settlements and taking into account key upgrading components that cover among others provision of basic infrastructural facilities and services of the target community.

2.7.3 Water Act (Cap 372) 2002
An Act of Parliament to provide for the management, conservation, use and control of water resources and for the acquisition and regulation of rights to use water; to provide for the regulation and management of water supply and sewerage services; to repeal the Water Act (Cap. 372) and certain provisions of the Local Government Act; and for related purposes. The Act provides guidelines on the utilization of water and water resources in the country.

The Act aims at improving the living standards of people by ensuring proper access to water services. It provides for the management and development of water resources and water supply and sewerage development, with the objective of conserving, protecting available water resources and allocate in a suitable and economic manner as well as supplying water in sufficient quantities to meet the various water needs while ensuring safe disposal of water.

This Act therefore clearly outlines methods and ways of ensuring that water is availed to all and its provision is ensured and managed adequately and sustainably.
2.7.4 Environmental Management and Co-ordination Act of 1999 (EMCA)

The uncoordinated planning resulted in poor waste management, too many slums, high poverty levels and unclean production. The Act harmonizes all sectoral Acts and is expected to address the issue of sustainable development, which is critical in recognition of Kenya’s policy aimed at becoming industrialized by the year 2020 (RoK, 1999).

The Act establishes the National Environmental Council, the National Environmental Management Authority (NEMA) and the provincial and district environmental committees to monitor pollution and other environmental issues. It also creates an environmental tribunal to handle cases and complains on environmental degradation. The Act gives the minister for Environment and Natural resources compelling powers to safeguard the environment and compels local authorities, industrialists and individuals to seek licenses, which can only be approved if an applicant has installed necessary disposal equipment.

The Environmental Management and coordination Act therefore addresses sustainability of the environment which has a profound effect on provision of basic services like water which is directly affected by the policies governing the environment in any given place.

2.7.5 The National Land Policy

The National Land Policy’s vision is to guide the country towards efficient, sustainable and equitable use of land for prosperity and posterity.

Among the key areas of concern identified in this policy is informal settlements and the policy clearly states that “squatters and informal settlements present a challenge for land planning and development”.(The National Land Policy,2006)

To policy proposes a raft of measures to deal with the difficulties experienced and caused by squatters and informal settlements. These measures include some of the following:

a) Take an inventory of genuine squatters and people living in informal settlements.
b) Determine whether the land occupied by squatters is suitable for human settlement.

c) Facilitate planning of land found to be suitable for human settlement.

d) Ensure that land subject to informal settlement is developed in an ordered and sustainable manner.

All these measures will be crucial in managing and planning informal settlements and facilitating provision of basic services such as water and sanitation among others.

2.7.6 Land Act, 2012

The Act on part IX deals with settlement programmes for providing access to land to squatters, persons displaced by natural causes, development projects, conservation, internal conflicts or such causes that may lead to movement and displacement. These settlements are important since they avert proliferation of informal settlements since such people would in most instances end up in informal settlements.

In Part II on management of public land, the Act stresses on the importance of evaluation of all parcels of public land based on land capability, classification, land resources and overall potential for use, and resource evaluation data for land use planning.

The Act thus emphasizes that public land shall not be allocated unless it has been planned, surveyed and serviced. Planning will enable provision of basic social services and infrastructure.
Adequate water supply is not possible in informal settlements hence the need for innovative approaches.

**Innovative Approaches**
- Communal water points
- Subsidized costing
- Expansion and rehabilitation of existing infrastructure

**Quality**
- Measures
  - Affordability (due to subsidized costs)
  - Accessibility (ease of access from the communal points)
  - Increased water volumes

**Accessibility**
- Distance to the source

**Affordability**
- Cost per unit

**Provisional Outcomes**

**Effects on Livelihoods**
- Health
  - Reduced waterborne diseases
  - Healthier and more productive population
- Environment
  - Sustainable and clean environment
- Neighborhood
  - Socially just neighborhood

**Source:** Author, 2013
2.7.7 Conceptual Framework

The figure above is a representation of a model of sustainable water provision framework. The framework based on adequate water supply which in turn should translate to affordability, accessibility and water quality should be applied. The effects on livelihoods should be:

a) **Health**

- Reduced waterborne diseases
- Healthier and more productive population

b) **Environment**

- Sustainable and clean environment

c) **Neighborhood**

- Socially just neighborhood

Sustainable provision of basic services like water in urban centres in such a manner as to ensure attainment of continual satisfaction of human needs without discrimination is the main objective of public services provision. Such an undertaking should be environmentally non-degrading, technically appropriate, economically and ecologically viable and socially acceptable.

Water service provision in informal settlements should be informed by laws for example the Kenya Constitution, 2010 which in Chapter 5, section 43 on economic and social rights, subsection (b) states that “Every person has the right to accessible and adequate housing, and to a reasonable standard of sanitation”. Policies, institutional and legal frameworks should also guide the process of providing water services to the informal settlements.

This should guarantee adequate water supply which should be of high quality, affordable and accessible in terms of distance to the source and convenience for the users.

The effects of adequate provision on the livelhoods should be felt on areas such as health; in terms of reduced waterborne diseases, healthier and more productive population; environment; Sustainable and clean environment and neighborhood in terms of a socially just neighborhood

However, in some instances or in case adequate supply is not possible in the informal settlements, there is a need for innovative approaches such as communal water points, subsidized costing and expansion and rehabilitation of existing infrastructure. This will result to increased water volumes in the informal settlements, accessibility and
affordability and eventually lead to positive effects on livelihoods such as health; in terms of reduced waterborne diseases, healthier and more productive population; environment; Sustainable and clean environment and neighborhood in terms of a socially just neighborhood.

The 1992 Rio declaration, which resulted in the formulation of agenda 21, in chapter 7 summarizes the environmental interactions, which are required in the urban environment under the heading “promoting sustainable human settlement development”. It stresses on promoting the integrated provision of environmental infrastructure: water, sanitation, drainage, hazardous and solid waste management and capacity-building for human settlement development (Johnson, 1993; Quarrie, 1992)

For provision of water services to achieve social equity and affordability, the providers should apply; tariff structure policy and social income support policy. For tariff structure, water should be charged at a very low price for the essential amount of water for drinking, domestic and sanitation purposes (Noe Wah Chan, 2012).

Accessibility on the other hand refers to the degree to which a product or service or environment is available to as many people as possible. (World Water Assessment Programme (WWAP), 2010)

In order to improve the urban environment, Agenda 21 emphasizes the importance of action at city level and states that:

“…..Because of so many problems and solutions being addressed by Agenda 21 have the roots in local authorities, the participation and co-operation of local authorities, will be a determining factor in fulfilling its objectives” (Quarrie, 1992)

The development of sustainability in an urban context must satisfy the following requirements: equity, social justice and human rights; basic human needs; social and ethnic self-determination; environmental awareness and integrity; and awareness of inter linkages across both space and time, (Ronan, et al., 1996)

This ensures that there is proper provision of basic services to the residents including water and a sustainable environment in Nyeri Municipality. The components of an ideal model for water provision are illustrated in the figure below.
CHAPTER THREE
METHODOLOGY AND AREA OF STUDY

3.0 Field Data Collection Methods
Data related to the study topic (subject) was collected from the field for analysis and interpretation in order to provide the expected findings from the study.

3.1 Preliminary Field Survey
A reconnaissance survey was done to familiarize with the study area in terms of population size, municipality boundaries and other logistical aspects for the study. The household population was obtained from the District Statistics Office. This formed the target study population from which the sample population was drawn.

Table 3.0: Population Distribution by Administrative Units in the urban Division of Nyeri Municipality

<table>
<thead>
<tr>
<th>NO.</th>
<th>SUB/LOC</th>
<th>VILLAGE</th>
<th>MALE</th>
<th>FEMALE</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>KAMAKWA</td>
<td>Kamakwa Ngangarithi</td>
<td>2,864</td>
<td>3,084</td>
<td>5,948</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2,564</td>
<td>2,817</td>
<td>5,381</td>
</tr>
<tr>
<td>2</td>
<td>THUNGUMA</td>
<td>Kangemi Game Rock</td>
<td>1,936</td>
<td>2,211</td>
<td>4,147</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Muringato</td>
<td>536</td>
<td>535</td>
<td>1,071</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>304</td>
<td>332</td>
<td>636</td>
</tr>
<tr>
<td>3</td>
<td>MAJENGO</td>
<td>King’ong’o Witemere</td>
<td>2,140</td>
<td>2,172</td>
<td>4,312</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kiawara</td>
<td>843</td>
<td>776</td>
<td>1,619</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Upper Chania Hospital Quarters</td>
<td>1,647</td>
<td>1,606</td>
<td>3,253</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Majengo</td>
<td>352</td>
<td>295</td>
<td>647</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Blue valley Hospital Quarters</td>
<td>1,754</td>
<td>1,960</td>
<td>3,714</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Asian Quarters</td>
<td>147</td>
<td>229</td>
<td>376</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kimathi</td>
<td>430</td>
<td>521</td>
<td>951</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>233</td>
<td>293</td>
<td>526</td>
</tr>
</tbody>
</table>

For purposes of this study, only Ngangarithi, Kiawara, Witemere and Githwariga settlements were sampled. This was because of convenience, limitation of time and budgetary constraints.

3.2.0 The Study Area

This section covers a detailed description of the study area and provides baseline information regarding the area under study.

3.2.1 Socio-Economic attributes

Nyeri County is a large County with varied socio – economic attributes. This section briefly highlights key attributes as it concerns the study.

3.2.1.1 Economy

Nyeri Municipality is hosted by a largely an agricultural area with 53% of the residents engaged in agricultural production, tea coffee and dairy being on the forefront. The largest formal employer is the Government with various sectors of the
service industry including retail, hospitality, banking, insurance, religious bodies especially the Roman Catholic Church and professional bodies also being major employers.

The main industrial plants are the Coca-cola bottling plant, tea factories, milk processing and packaging factories and a number of maize mills. Tourism is also significant but has not yet been fully explored and exploited.

3.2.1.2 Infrastructure

Nyeri Municipality is served by a network of roads. Only a few roads are tarmacked and they require regular maintenance as do street lighting, sidewalk paving and packing services. Water provision is in most parts of the Municipality is sufficient except in the informal settlements.

The 5th Sector performance impact report for the year 2010/211 released by Water Services Regulatory Board (WASREB), on 27th September 2012 ranked the Nyeri Water and Sanitation Company (NYEWASCO) as the best urban water services provider in Kenya, (NYEWASCO 2012). The company is ISO Certified, that is ISO 17025 on calibration of laboratory equipments and water metres.

Electricity provision is limited to the formal settlements and is illegally done in the informal settlements.

3.2.1.3 Housing

Real estate in Nyeri Municipality is yet to gain momentum. Currently the demand for housing far outstrips the supply and this has been exacerbated by establishment of satellite campuses of leading Universities in Kenya such as Kenya Methodist University, St. Paul’s University, Kenyatta University, University of Nairobi and the elevation of Kimathi Technical College to a fully fledged university. With these institutions there has been an increase in the population within the municipality with a rise in demand of houses since most of these learning institutions do not offer accommodation facilities. As a result therefore, there have been construction of
substandard structures to satisfy this demand as is evident in areas like Kamakwa, skuta, Kangemi, King’ong’o and other areas.

3.2.1.4 Labour Force and Unemployment

The Municipality hosts an ever increasing labour force. The labour force comprises population aged 15-65 years. This high population coupled with low absorption into gainful employment has caused increase in unemployment that have at times led to formation of criminal gangs which have been the main causes of insecurity in the municipality. Most of the people are engaged in the informal sector also commonly referred to as the jua kali sector with the rest in commercial and private sector. Development of programs and projects that will foster job creation and absorb the large untapped labour force is long overdue as such will not only spark development but also reduce insecurity and lead to growth.

3.2.1.5 Education

The Municipality boasts of a string of reputable institutions of learning both the secondary and the tertiary ones. There are reputable secondary schools within the municipality like Nyeri High School, Mt. Kenya academy and a many reputable primary schools both private and public. The Municipality also hosts several institutions of higher learning like Dedan Kimathi University of Technology, Kenya Methodist University-Nyeri Campus, The University of Nairobi extra mural centre, Kenyatta University-Nyeri campus St. Paul’s University-Nyeri campus, Kenya Medical Training College and Nyeri technical training college. Despite all these, the transition levels after secondary schools are low and upgrading of colleges in the county into University centers without developing other colleges has not made the situation better.

3.2.1.6 Investments

There is a presence of several corporations in the municipality most of which are branches of Nairobi based companies. These include commercial banks, insurance companies, supermarkets and others like the Mt. Kenya bottlers and Sameer Africa.
3.3 Research Methodology

This section covers the methodology applied in undertaking the research for the study.

3.3.1 Research Design

According to Arleck and Settle (1995), it is seldom necessary to sample more than 10% of the population provided that the resulting sample is not less than 30 and not more than 1000 units. They recommended adequate sample sizes in relation to respective populations. Where a population of 1,000 is considered for the study, they recommended a sample of 100. For a population of 5,000 they recommended a sample of between 100-500 while for a population greater than 10,000 a sample of between 200-1,000 is considered adequate. Due to the limited time and financial resources available for the research a sample size of 160 respondents was selected as a representative of the entire population.

The selection of these areas; Ngangarithi, Kiawara, Witemere and Githwariga informal settlements was informed by the fact that they represented the characteristics of informal settlements as defined in this study and were easily accessible due to proximity and the financial cost of undertaking the research in these settlements was minimal.

In sampling design, multi stage sampling design was used. The design included cluster, stratified and random sampling. In stratified sampling, respondents were grouped into three distinct categories including landlords/owners, residents and officials of Nyeri Water and Sanitation Company (considered as key informants). From these distinct categories, each stratum was then sampled as an independent subpopulation. Sampling was further done by geographically clustered sampling using the four (informal settlements) locations of interest.

3.3.2 Data collection instruments

3.3.2.1 Questionnaire

In primary data collection, structured and semi-structured questionnaires have been used for household survey. The questionnaires covered a wide range of issues on socio economic status of the households, causes of their movement into their present homes, where they came from, their views on provision of services like water and
sanitation. Several questionnaires were administered in the four urban municipality locations namely: Kamakwa, Thunguma, Majengo and Ruring’u.

### 3.3.2.2 Interview schedules

An interview schedule was administered to a sample of key informants. It was administered to the chief technical officer of Nyeri Water and Sewerage Company. These interviews were aimed at providing information on the causes of urban informal settlements, their environmental impacts and the respondents perceived amelioration measures to the problem within the municipality.

Secondary data was gathered from Nyeri Municipal Council records, published and unpublished literature, legislation, policy statements, and government documents.

### 3.2.2.3 Participatory, Observation and Photography

Direct observations was be used inorder to come up with clear picture of the overall informal settlements and the resulting environmental conditions in Witemere, Thunguma, Majengo and Kiawara settlements. The observation technique was categorically keen on housing structures; water supply, electricity accessibility and congestion/overcrowding of households. Direct observation was done alongside with photography.

### 3.2.2.4 Data Analysis and Presentation

The collected data from questionnaires and interviews was analyzed by use of Statistical Package for Social Scientists (SPSS) version 13.0-computer package for easy, fast processing and analysis. The analyzed data was presented by use of frequency tables. Various inferences were made from the analysis for the purpose of verification and testing to confirm the assumptions of the study. Data was also presented by means of discussion and explanation of the study findings. Here all the data findings from both the household and Nyewasco staff and other respondents was combined in the final stages of presentation and from which conclusions were made.
CHAPTER FOUR
DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.0 Introduction
This chapter provides a detailed analysis of the research findings. The methods used in presentation of data include the use of tables and charts.

4.1 Demographic characteristics of the respondents
This section presents the demographic characteristics of the respondents involved in the study. The characteristics include Gender (male and female), Age (categorized by 9 year difference with a start point of 18 years and above of age), level of education (primary, secondary, university and others). The researcher was keen to select respondents that will help in meeting the objectives of the study and those that deal mostly with examining water and sanitation service provision in informal settlements. The study was conducted in Nyeri town where structured questionnaires and interviews were administered to the respondents.

A total of 160 questionnaires were issued and administered. From these, 146 questionnaires were responded to and returned translating to a 91.25% response rate.
Table 4.1: Respondents attributes

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Classifications</th>
<th>percentage</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tenure status</td>
<td>Owner tenants</td>
<td>33.6</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>Owner tenants</td>
<td>66.4</td>
<td>97</td>
</tr>
<tr>
<td>Age</td>
<td>Below 30</td>
<td>37.67</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>31 – 40</td>
<td>15.75</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>41 – 50</td>
<td>21.91</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>51 and above</td>
<td>24.67</td>
<td>36</td>
</tr>
<tr>
<td>Gender</td>
<td>Male</td>
<td>56.16</td>
<td>82</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>43.84</td>
<td>64</td>
</tr>
<tr>
<td>Education level</td>
<td>Primary</td>
<td>35.616</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td>Secondary</td>
<td>41.095</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>University</td>
<td>8.219</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>15.067</td>
<td>22</td>
</tr>
<tr>
<td>Period lived in the area(in years)</td>
<td>0 - 3</td>
<td>20.55</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>4 - 6</td>
<td>26.02</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td>7 – 9</td>
<td>15.08</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Above 10</td>
<td>38.35</td>
<td>56</td>
</tr>
</tbody>
</table>

Source: Field Survey 2013
From the table, it is observed that majority 97 (66.4%) of the respondents were tenants as compared to 49 (33.6%) of the respondents who were owners. Clearly tenant respondents outweighed the owners. Owners are more likely to strive and seek for solution to permanent water sources while tenants may make do with the situation since their tenure is most likely temporary.

Majority 82 (56.16%) of the respondents were male as compared to 64(43.84%) of the respondents who were female. This can be explained by the fact that rural -urban migration in search of employment mostly affects men who are the majority heads of households, leaving their families behind (in the rural areas). Most of these male migrants end up in the informal settlements where they can afford houses. This explains the high number of males in these settlements as compared to females. Classifying the respondents into their genders was important since issues of water in terms of adequacy, quality and accessibility which are the main objectives of this study affect and are viewed by both genders differently.

The table shows that majority 41.095% of the respondents had completed secondary education, 35 % of the respondents had received a primary education, and 8 % of the respondents had a university degree and 15 % the respondents represented others. The Municipality boasts of a string of reputable institutions of learning both the secondary and the tertiary ones. With the introduction of free primary education in 2003 and subsequent subsidization of secondary education from the year 2008 by the Government of Kenya, access to and levels of education have gone high in the Municipality. An educated population is more likely to deal with issues of public service such as water since they are more enlightened and more aware of their basic rights compared with an uneducated population.

On the number of years lived in the informal settlements, 38.35% of the respondents had lived there for more than 10 years. This group mostly comprised those who owned the houses/plots they occupied as compared to tenants. The longer the period of occupancy, the more likely the residents are to organize themselves on major services such as water.
PART B

4.2: Sources of Water
Table shows the various sources of water in the four informal settlements that were considered for this study.

Table 4.2: Sources of water

<table>
<thead>
<tr>
<th>Source</th>
<th>frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nyewasco</td>
<td>23</td>
<td>15.75</td>
</tr>
<tr>
<td>Water vendors</td>
<td>43</td>
<td>29.46</td>
</tr>
<tr>
<td>Self help water association</td>
<td>61</td>
<td>41.78</td>
</tr>
<tr>
<td>River</td>
<td>19</td>
<td>13.01</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>146</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

**Source: Field Survey 2013**

Majority of the respondents, 41.78% are supplied with water by self help groups. These are groups of people organized into registered groups who have organized themselves and have connected water to their members’ houses. Most of these were found to be the owners of the houses or plots they occupied.

Another section of the respondents, 13.01% got their water from the river (river Chania). All these were from Witemere, an informal settlement that borders Chania river. Their source of water is convenient to them in a number of ways. For example, in terms of accessibility and affordability since they access the water free of charge.

Water vendors also play a part in providing water to residents in these informal settlements. They constituted 29.46% of the total water provision.

The Nyeri Water and Sewerage Company (Nyewasco), also has a presence in these informal settlements and 15.75% of the respondents sampled are supplied with water by the company.
4.3: Payment for services rendered

The table below shows levels of payment of water services classified into the four categories of sources of water in the four informal settlements.

Table 4.3: Payment for services rendered

<table>
<thead>
<tr>
<th>Source</th>
<th>frequency</th>
<th>Yes</th>
<th>No</th>
<th>Percentage for Yes</th>
<th>Percentage for No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nyewasco</td>
<td>23</td>
<td>7</td>
<td>16</td>
<td>30.43</td>
<td>47.83</td>
</tr>
<tr>
<td>Water vendors</td>
<td>43</td>
<td>40</td>
<td>3</td>
<td>93.02</td>
<td>6.98</td>
</tr>
<tr>
<td>Self help water association</td>
<td>61</td>
<td>59</td>
<td>2</td>
<td>96.72</td>
<td>3.28</td>
</tr>
<tr>
<td>River</td>
<td>19</td>
<td>0</td>
<td>19</td>
<td>0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Field Survey 2013

On payment of water services classified by the various sources, a large percentage of those supplied by self help groups and water vendors pay for the services. Their payment rate was at 93.02% and 96.72 respectively. Respondents who were being supplied by Nyewasco had the lowest level of payment, at 30.43% while those whose source of water was the river (Chania) did not pay for the water (0%).
Table 4.4: Water accessibility, affordability, quality and adequacy.

<table>
<thead>
<tr>
<th>Source</th>
<th>Freq uency</th>
<th>Adequate</th>
<th>Quality (hygienically clean and treated)</th>
<th>Accessibility</th>
<th>Affordability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Nyewasco</td>
<td>23</td>
<td>16</td>
<td>7</td>
<td>16</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(69.57%)</td>
<td>(30.43%)</td>
<td>(87%)</td>
<td>(13%)</td>
</tr>
<tr>
<td>Water vendors (kiosks)</td>
<td>43</td>
<td>30</td>
<td>13</td>
<td>30</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(69.77%)</td>
<td>(30.23%)</td>
<td>(69.77%)</td>
<td>(30.23%)</td>
</tr>
<tr>
<td>Self-help water associations</td>
<td>61</td>
<td>50</td>
<td>14</td>
<td>50</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(81.97%)</td>
<td>(26.32%)</td>
<td>(81.97%)</td>
<td>(26.32%)</td>
</tr>
<tr>
<td>River</td>
<td>19</td>
<td>14</td>
<td>5</td>
<td>14</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(73.68%)</td>
<td>(26.32%)</td>
<td>(73.68%)</td>
<td>(26.32%)</td>
</tr>
<tr>
<td>Total</td>
<td>146</td>
<td>105</td>
<td>41</td>
<td>105</td>
<td>41</td>
</tr>
</tbody>
</table>

**Source:** Field Survey 2013

From the table above, the following conclusions were made:

On water adequacy, 69.57% of respondents whose source of water was Nyewasco felt that the water was not adequate compared to 30.43% of respondents who felt it was adequate.

Majority of respondents whose source of water was water kiosks, self-help associations and rivers felt that the water was adequate. These were at 83.7%, 86.88%, and 73.68% respectively.

On water quality, 87% of respondents whose source was Nyewasco were satisfied, respondents whose source of water was self-help associations followed with a rating of 81.97%. The respondents whose source of water was water vendors or water kiosks rated their satisfaction at 69.77% with those who got their water from the river giving the lowest rating on quality at 26.32%.

On accessibility, 78.3% of respondents whose source of water was Nyewasco rated the service accessible with only 21.7% of respondents rating the Nyewasco supply as not accessible. The highest rating on accessibility was from the respondents whose source of water was the river, that is at 89.47%. The rest, 11.53% gave reasons that could affect accessing water from the river such as; time of the day and weather...
conditions. For example, during the night, fetching water from the river may be difficult because of factors such as insecurity. A total of 76.74% of respondents whose source of water was water vendors (kiosks), rated the service as accessible. 63.93% of the respondents from self-help water associations rated the service provision accessible.

Nyeri water and Sewerage services has a daily water production of 27,000m$^3$ against a daily demand of 14,000m$^3$. On the other hand, the connection levels in the informal settlements is very low. For example, in Witemere there are only 98 connections against an approximated 1000 households. This clearly indicates that the problem is not lack of capacity but the approach that has not included informal settlements in the planning for water provision.
CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction
This study aimed to assess the provision of water service to the informal settlements in Nyeri town (Municipality). The assessment was done by reviewing the current levels of water provision in urban informal settlements in Nyeri. The study also looked at the ways of providing water and sanitation services to the informal settlements in Nyeri Municipality.

5.1 Conclusions
The following conclusions are made based on the study findings

5.1.1 Methods of water provision
Four sources of water provision were identified namely:

- Nyeri water and sewerage services (Nyewasco).
- Self – help associations.
- Water vendors (kiosks) and
- Chania River.

Nyeri Water and Sanitation Company (NYEWASCO) charges its customers through monthly bills based on usage. The tariffs are determined by consultants who are engaged to work out the rates after assessing various inputs provided by the water company such as the overhead costs of running the company. These tariffs however must be approved by Water Services Regulatory Board (WASREB) before they become effective.
There are also settlements where the residents draw their water directly from the river especially residents of Witemere that borders river chania. In some areas especially Kiawara there were a few cases of water vendors who sell water using jerricans. These vendors buy water from Nyeri Water and Sanitation Services which they later sell to the residents.

There was also a possibility of illegal connections in some settlements.

5.1.2 Challenges encountered by the residents of informal settlements in accessing water.
Challenges encountered by the residents of informal settlements in accessing water in Nyeri town' as cited by respondents included the following:

- Lack of infrastructure such as pipes, communal water points
- Low income resulting from unemployment/underemployment and the
- Bureaucracy involved in organizing themselves to get connection from the Nyeri water and Sanitation Company(NYEWASCO)

5.1.3 Strategies to manage challenges on accessing water in informal settlements.
Among the strategies identified to manage challenges on accessing and or providing water to the residents of the informal settlements in Nyeri town included:

- Provision of communal water points where residents could buy water at subsidized rates in order to maintain the system.
- Sourcing funds from international communities and donors for provision of the required infrastructure.
- Rehabilitation of the existing system in order to cater for the people living in the informal settlements.

- Connecting the residents at subsidized rates would help boost accessibility, adequate, quality and affordable water by the residents of informal residents. This is because the cost of connection is the major deterrent to most residents since it is way out of reach of most residents.

### 5.2.0 Recommendations

The following recommendations were made based on the study findings:

i. There is need for provision of communal water points in the informal settlements of Nyeri town.

ii. There is need for sourcing funds from international communities to subsidise the connection costs.

iii. There is need for upgrading the current/existing system inorder to ensure that it has capacity to serve all residents.
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Hlongwane, a.b., molefe, s.f.s., motsilili, d.s.n. And tshabalala, z.m., 1993: the phenomenon of informal housing in soweto, vista university, soweto. Paper read at students’ geographical conference, university of natal, durban.


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APPENDIX 1

QUESTIONNAIRE

My name is Moses Muturi Ndewga, a postgraduate student at the University of Nairobi undertaking a study on assessment of the provision of water and sanitation services in Nyeri town’s informal settlements in partial fulfillment of my postgraduate diploma in Housing Administration in the Department of Real Estate and Construction management. Any help accorded in answering this questionnaire will be highly appreciated.

Thank you

Please indicate the nature of occupation (Owner/ Tenant) __________

Section A (tick on the appropriate box)

1. What is your age bracket?

- Below 30
- 31-40
- 41-50
- 51 years and above

2. What is your gender?

- Male
- Female

3. What is your highest level of Education?

- Primary
- Secondary
- University
- others (specify)

4. For how long have you lived in this area?

- Less than 3 years
- 4-6
- 7-9
- above 10
PART B

5. Which is your source of water?

<table>
<thead>
<tr>
<th>Source</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nyewasco</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water vendors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self help water association</td>
<td></td>
<td></td>
</tr>
<tr>
<td>River</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6. Do you pay for these services?

<table>
<thead>
<tr>
<th>Source</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nyewasco</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water vendors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self help water association</td>
<td></td>
<td></td>
</tr>
<tr>
<td>River</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
What is your rating of the services based on the following parameters

<table>
<thead>
<tr>
<th>Source</th>
<th>Frequency</th>
<th>Adequate</th>
<th>Quality (hygienically clean and treated)</th>
<th>Accessibility</th>
<th>Affordability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td></td>
<td>Yes</td>
<td>No</td>
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<td></td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Nyewasco
Water vendors (kiosks)
Self-help water associations
River
Total

PART C: NYEWASCO OFFICE

What is the total number of connections in the municipality?

.................................................................

What is the level of connection in the informal settlements?

<table>
<thead>
<tr>
<th>Area</th>
<th>No. of connections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ngangarithi</td>
<td></td>
</tr>
<tr>
<td>Witemere</td>
<td></td>
</tr>
<tr>
<td>Kiawara</td>
<td></td>
</tr>
<tr>
<td>Githwariga</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
</tr>
</tbody>
</table>
What is the daily production capacity of water?

What is the daily water demand?

What determinants do you apply in costing water?

What recommendations would you give for ensuring provision to the informal settlements?
## APPENDIX II: TIME FRAME

<table>
<thead>
<tr>
<th>No.</th>
<th>Activity</th>
<th>Duration</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td>Data collection</td>
<td>1 Month</td>
<td>April, 2013</td>
</tr>
<tr>
<td>3.</td>
<td>Data analysis and writing chapter 4</td>
<td>1 Month</td>
<td>May, 2013</td>
</tr>
<tr>
<td>5.</td>
<td>Submission of draft report for examination</td>
<td>½ Month</td>
<td>June 2013</td>
</tr>
<tr>
<td>6.</td>
<td>Final draft submission and presentation</td>
<td>1 Month</td>
<td>July, 2013</td>
</tr>
</tbody>
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