EFFECTS OF WATER SCARCITY ON HOUSEHOLD'S LIVELIHOOD IN SELECTED INFORMAL SETTLEMENTS IN KITALE TOWN, TRANS NZOIA COUNTY, KENYA

BY

FRANCIS MWANIKI NZIOKA

Research Dissertation Is Submitted in Partial Fulfillment of the Requirement for the Award of Masters in Development Studies (MDS) at St. Paul's University

JUNE 2018

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Supervisor: Dr. Nason Vundi

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DECLARATION

Declaration by the candidate

This research report is my original work and has not been presented for the award of a master's degree in any other Institution. No part of this project may be produced without permission of the author and or the St. Paul's University Limuru.

FRANCIS MWANIKI NZIOKA Sign…… Date……

REG No, MDS/LMR/4575/13

Declaration by supervisor

This research report has been submitted with my approval at St. Paul's University Limuru supervisor

Dr. Nason Vundi Sign…… Date……..

Lecturer St. Paul's University Limuru

DEDICATION

This research report was dedicated to my wife Rev. Judith Mwaniki, my Children: Hosea, Cornelius, Stephen, JohnWesley and Friends for according me conducive and ample time during my study.

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My sincere gratitude goes to St. Paul's University for granting me a chance to study and research with them. Secondly, I want to extend my thanks to my supervisor Dr. Nason Vundi for his expert guidance and friendly assistance, suggestions in the critical stages of my research. I would like also to acknowledge my wife, Children and friends for their consistent prayers and moral support throughout my study. Lastly, I would like to acknowledge the community and leaders in Kitale informal settlements for their corporation during my study, May the Lord bless them.

ABSTRACT

The purpose of this study was to investigate effects of water scarcity on household's livelihood in selected informal settlements in Kitale town. The study was based on the following specific objectives: To identify the effect of water sources on household's livelihoods; to establish the effect of water management practices; to assess' the effect of water stakeholders and to establish mitigation measures on household's livelihoods in selected informal settlement in Kitale town. The study was guided and informed by game theory and neoclassical theory. The study adopted a descriptive survey design. The target population was 1600 household and 320 households were sampled to represent the population. Primary data collected in this study was quantitative and qualitative. Data collected was analyzed by the use of descriptive statistics using frequencies and percentages. The findings were presented using tables. From the findings, majority of the respondents indicated that water drawn from shallow wells caused health problems. On water management practices and household livelihoods, majority of the respondents indicated that they did not have piped water in their households. Majority of the respondents when asked on whether NZOWASCO supplied piped water in their village, cumulatively they said that the company did not perform well in their role of providing water in the village. It was therefore concluded that; water sources had significant effect on household livelihoods. Water management practices had significant effect on household livelihoods; and statistically there was a significant relationship between measures to water scarcity and household livelihood. The study recommends that the community, county government and water agencies should protect and safeguard water sources in the study area. There is evidence to show that these can contribute to water scarcity and diseases if they are not protected. The water distrubtion company should review their water pricing downwards so that the consumers can access it an affordable price.(pro-poor tariffs). The water distribution chain should increase the number of water kiosks to bring it closer to the consumers. This will lower the water prices since the longer the distance from the kiosk, the higher the price. The study recommends that NZOWASCO, Water service trust fund, Lake Victoria Water Service Board and NGOs should make an effort to see that there is piped water and deep drilled wells in the selected informal settlements so as to reach as many households as possible. All stakeholders especially the non-state actors should invest heavily in water resources to cushion members of the public in the informal settlements from water scarcity which impacts on their livelihoods directly. The study recommends that the county government, through ministry of Water and Irrigation and non-state actors need to increase levels of awareness on Rain Water Harvesting and good storage within the area to ensure constant supply of water at household levels. There is also need to consider removing tax attached to storage containers to lower the price for affordability in many households.

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LIST OF ABBREVIATIONS AND ACRONYMS

CGTN	County government of Trans-Nzoia
FAO	Food and Agriculture Organization
GT	Game Theory
KEWASNET	Kenya Water and Sanitation Civil Society Network
KNA	Kenya News Agency
MDGs	Millennium Development Goals
NGOs	Non- Governmental Organization
NWSS	National Water Services Strategy
NZOWASCO	Nzoia water and sewage company
OCHA	Office for the coordination of humanitarian Affairs
SDGs	Sustainable Development goals
SSA	Sub-Saharan Africa
SSPs	Small Service Providers
UN	United Nations
UNDP	United Nations Development Program
UNICEF	United Nations International Children's Emergency Fund
WASCOs	Water Services Companies
WASREB	Water Services Regulatory Board
WGF	Water Governance Facility
WHO	World Health Organization
WSPs	Water Service Providers
WSRS	Water Sector Reform Secretariat
WSTF	Water Services Trust Fund
WWAP	World Water Assessment Programme
WRMA	water resource management authority

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Water is vital for life and a key catalyst to socio-economic development as well as maintenance of environmental integrity and healthy ecosystems in any region. It is an essential resource for sustaining life as well as central to agriculture and rural development, and is intrinsically linked to global challenges of food insecurity and poverty, climate change adaptation and mitigation, as well as degradation and depletion of natural resources that affect the livelihoods of millions of people across the world.

Water is our most precious resource. Humans, plants, and animals are made up of mostly water. According to the World Bank, (2010) report, water is a scarce resource with multiple interwoven uses that range from drinking water, energy, irrigation, manufacturing things, transport of people and goods among others. The report further states that, more than one-sixth of the Worlds' population does not have access to safe drinking water, with 80% living in rural areas thus access to water cannot not be guaranteed globally.

A lack of water has driven up the use of wastewater for agricultural production in poor urban and rural communities. More than 10% of people worldwide consume foods irrigated by wastewater that can contain chemicals or disease-causing organisms (FAO, 2010). This situation is evident in urban areas and in particular slum areas where people usually farm vegetables along the sewer lines and dumping sites.

Water scarcity underscores the need for better water management. Good water management also reduces breeding sites for such insects like mosquitoes that can

transmit diseases and prevents the spread of water-borne infections. It forces people to rely on unsafe sources of drinking water.

It also means they cannot bathe or clean their clothes and homes properly and this situation affects women and girls most. It affects all social and economic sectors and threatens the sustainability of the natural resources base while posing great inconveniences and health risk for whole communities, but often with the greatest burden on women and girls. It is directly linked to poverty levels in the society today (IWMI, 2005).

Water scarcity already affects every continent. Around 1.2 billion people, or almost one fifth of the world's population, live in areas of physical scarcity and 500 million people are approaching this situation. Another 1.6 billion people, or almost one quarter of the world's population, face economic water shortage (World Water Assessment Programme, WWAP, 2012). The situation is only expected to worsen as a result of the population growth, climate change, investment and management shortfalls, and inefficient use of existing resources restricting the amount of water available to people. It is estimated that by 2025, 1.8 billion people will live in countries or regions with absolute water scarcity, with almost half of the world living in conditions of water stress (WWAP, 2012).

Every day in rural communities and poor urban centers throughout sub-Saharan Africa, hundreds of millions of people suffer from lack of access to clean, safe water. Women and young girls, who are the major role players in accessing and carrying water, are prevented from doing income-generating work or attending school, as the majority of their day is often spent walking miles for their daily water needs. The implications of

lack of clean water and access to adequate sanitation are widespread. Young children die from dehydration and malnutrition, results of suffering from diarrheal illnesses that could be prevented by clean water and good hygiene (Metwally et al., 2006).

Among the challenges facing sub-Saharan Africa, provision of safe water supply – as well as adequate sanitation – is of the highest priority. Even where there is water, the quality is often poor, leading to exposure to water-borne diseases. The Human Development Report 2006 stresses that the crisis in water and sanitation is above all a crisis for the poor. It further states that almost two in three people lacking access to clean water survive on less than US$2 a day, with one in three living on less than US$1 a day (UNDP 2006). Moreover, "the poorest people not only get access to less water, and to less clean water, but they also pay some of the world's highest prices" (Ibid: 7). The latter applies particularly to the urban poor, mainly because they are often forced to buy water from private water vendors (see e.g. Kjellén & McGranahan 2006).

According to UN-Habitat (2007), the urban poor get their water by queuing for hours to collect water from standpipes or illegal connections. Others buy their water from vendors who can charge up to twenty times more for water than the price paid by their wealthier neighbours. As such, not only do the poor suffer financially; they also suffer poor health from using unsafe water and poor sanitation facilities. It is estimated that "at one or more of the main diseases associated with inadequate water and sanitation" (Ibid: 6). A survey conducted in Nairobi's informal settlements revealed that the prevalence of diarrhoea among children is 32%, while the infant and child mortality is 35%. The prevalence of diarrhoea was found to be double the rate for Nairobi and the national average (APHRC 2002).

Improved access to safe and affordable water, especially to the urban poor, is likely to have an impact on their livelihood, directly or indirectly, in at least three ways (UN Habitat 2006). First, it has a positive impact on health (and, as a consequence, nutrition), which increases time and energy to invest in productive activities. Second, closer proximity of water sources and increased quantity available reduces the time necessary to fetch water. And third, improvements are especially relevant for women, who are traditionally responsible for looking after ill relatives, and for fetching water for the whole household. In other words, improved access to safe and affordable water at them household and individual level is likely (1) to reduce the time spent on fetching or queuing for water, water-borne diseases, 4 child morbidity, expenditure on water, and water-related conflicts; (2) to increase the girl-child's school attendance - because girls are sometimes forced to be late or miss school to help their mothers fetch water; and (3) to improve household's health conditions.

Studies done in Kenya confirmed these general observations. For instance, households in the highlands of Western Kenya with improved access to water reported time savings, improved health, cleaner clothes, as well as increased production of tea seedlings, milk and vegetables (Were et al. 2006). In Kibera – a large informal settlement in Nairobi – women's income-generating activities were negatively affected when they had to spent more hours on fetching water, while some activities had to be curtailed when water was scarce or unaffordable (Crow & Odaba 2010). In another study among slum dwellers in Nairobi (Kimani et al. 2007), it was found that water was provided mainly by private vendors. The prevalence of water-borne diseases appeared to be very high, while hygiene was compromised during water shortage periods. These people were found to

be more vulnerable to morbidity and mortality as a consequence of poor access to water and sanitation services.

Water scarcity is the current struggle that Kenya faces; to supply clean water to its population. The human population depends heavily on water resources, not only as drinking water but also for crops, agriculture and livestock and fishing (UNEP, 2005). For decades, scarcity of water resources in the country has continued to be a major draw-back in the development sectors such as agriculture, tourism, energy and manufacturing. Currently there is a declining trend in available freshwater attributed to various factors including the uneven distribution of water resources, catchment degradation, water pollution, climate variability and the increasing water demand due to increase in human and livestock populations. The available freshwater resource per capita stands at less than 647 m3, which is much less than the recommended 1000 m3 per capita per annum benchmarked by UN (WRMA, 2009).

Water scarcity has become a major constraint to socio-economic development and a threat to livelihood in increasing parts of the world (Liu et al., 2017). Globally, about 1.7 billion people lack access to sufficient clean and safe drinking water. World Resource Institute (2017) gives a more elaborate report on the same: changing climate; population growth, depletion of the ground water; ignoring of natural infrastructure and poor water management. It is therefore visible that, problems emanating from water scarcity have both immediate and long-term consequences. One of the outstanding pillars in SDGs is to reduce severe poverty. However, efforts to reduce poverty are compromised by the same problem of water scarcity. Further, the ecosystems are neither spared due to poor

means of earning a living in poverty prone areas; for example, charcoal burning and cultivation alongside water catchment areas (World Resource Institute, 2017).

According to the World Economic Forum's 2015 global risk report, the Global Water Crisis is now the number one global risk based on its harmful impacts on the human population (Dao, 2015). According to Bartram and Cairncross (2010), approximately 2.4 million deaths globally could be prevented each year if every person had access to clean drinking water. In developing countries water scarcity, contribute to nearly half of all people's sufferings. This is largely due to the many diseases caused by consuming un-safe water. School going children may also suffer because of water scarcity. It is therefore, in the interest of this study to expose whether some of the mentioned outcomes are applicable in the perspective of the informal settlements in Kenya and particularly Kitale town

Water Governance Facility (WGF, 2012) explains that the most vulnerable in a world of greater water scarcity are poor people living in the informal settlements and those in rural areas whose livelihoods are dependent upon rain fed agriculture or the availability of grass and water for grazing animals. Based on report of UN-HABITAT, about 33% of the urban population in the under-developed world in 2012 (863 million people) lived in the informal settlements. The percentage of population living in the informal settlements was the highest in Sub-Saharan Africa (61.7%), followed by South Asia (35%), Southeast Asia (31%), East Asia (28.2%), West Asia (24.6%), Oceania (24.1%), Latin America and the Caribbean (23.5%), and North Africa (13.3%)(UN HABITAT 2003). Among individual countries, the percentage of urban dwellers staying in the

informal settlements in 2009 was the highest in the Central African Republic (95.9%). The world's largest informal settlements is in Mexico City.

Kenya's yearly informal settlement growth rate is approximately 7% and is one of the uppermost in the entire world and there is a likelihood of doubling up in the next 30 years if not constructively intervened (UN HABITAT, 2003). Informal are usually dense settlements. About 60 to 80 percent of Kenya's urban population lives in the informal settlements. In Nairobi, informal settlements cover just 6% of the total residential land area, yet house 60% of the city's population (IRIN, 2013). The difficulties of water scarcity is often assessed through meteorological, agricultural or hydrological measures (Steinmann, Hayes and Cavalcnti, 2005; Wilhite 2009). The importance of those effects can also be estimated through quantification of water deficits or reduction of production yields in relation to agricultural activities and domestic use. It is against this background that the study sought to investigate water scarcity and socio-economic effects on Household's livelihood within selected Lukhuna, Lavington, Shanti and Forkland informal settlements in Kitale Town, Kenya.

1.2 Problem Statement

Studies indicate that most of the world's 1.2 billion poor people, two thirds of whom are women, live in water scarce countries and do not have access to safe and reliable supplies of water for productive and domestic uses (IFAD, 2001). The bulk of these rural poor people are dependent on agriculture for their livelihoods and live in sub-Saharan Africa and South Asia, the regions which are also home to most of the world's water poor. One third of the world's population is currently experiencing some kind of physical or economic water scarcity. A growing competition for water from different

sectors, including industry, agriculture, power generation, domestic use, and the environment, is making it difficult for poor people to access this scarce resource for productive, consumptive and social uses (IFAD, 2007). In water-scarce regions and countries, inequity in access to water resources is increasing because of competition for limited resources, and this particularly affects poor rural people, especially women.

Water scarcity is the current struggle that Kenya faces; to supply clean water to its population. The human population depends heavily on water resources, not only as drinking water but also for crops, agriculture and livestock and fishing (UNEP, 2005). For decades, scarcity of water resources in the country has continued to be a major draw-back in the development sectors such as agriculture, tourism, energy and manufacturing. Currently there is a declining trend in available freshwater attributed to various factors including the uneven distribution of water resources, catchment degradation, water pollution, climate variability and the increasing water demand due to increase in human and livestock populations. The available freshwater resource per capita stands at less than 647 m^3, which is much less than the recommended 1000 m^3 per capita per annum benchmarked by UN (WRMA, 2009). Despite the fact The Constitution of Kenya, 2010 in Chapter 5, section 43 on economic and social rights, subsection (b) states that which states "Every person has the right to accessible and adequate housing, and to a reasonable standard of sanitation," accessibility to water which a key component in sanitation, the current water situation in Kitale town informal settlements is wanting. The area has scarcity of water supply in many times of the year leaving the community in this area to turn to unsafe sources like shallow wells and open streams for their water needs. This study therefore was geared towards finding out to

investigate water scarcity and socioeconomic effects on household's livelihood in the informal settlements at Kitale Town.

1.3 Overall Objective

The main objective of the study was to assess water scarcity and socio-economic effects on Household's livelihood within selected informal settlements in Kitale Town, Kenya.

Specific objectives of the study

i. To identify the effect of water sources on household's livelihoods in selected informal settlement at Kitale town.

ii. To establish the effect of water management practices on household's livelihoods in selected informal settlement at Kitale town.

iii. To assess' the effect of water stakeholders on household's livelihoods in selected informal settlement at Kitale town.

iv. To establish mitigation measures on household's livelihoods in selected informal settlement at Kitale town.

1.4 Research Questions

i. What is the effect of water sources on household's livelihoods in selected informal settlement at Kitale town?

ii. What is the effect of water management practices on household's livelihoods in selected informal settlement at Kitale town?

iii. What is the effect of water stakeholder participation on household's livelihoods in selected informal settlement at Kitale town?

iv. What is the effect of mitigation measures on household's livelihoods in selected informal settlement at Kitale town?

1.5 Justification of the Study

The results of this study would be of great benefit to various stakeholders. For instance, research findings may help the Ministry of water and natural resource at national level and relevant water provision agencies, also by informing them about the activities done by different levels of management authority practices leading to water scarcity and how to prevent future occurrence. This will ensure water sustainability for the future thus reducing the challenges of water supply.

Findings from the study would also provide input in the future planning by the government due to increased population and environmental management of the natural resources especially water catchment areas. In addition, the findings could equip the County government with knowledge and strategies suitable to improve scarcity of water supply in the informal settlements. The findings may also act as a basis of discussion during strategic plan from the ministry of Water in the informal settlements in Kitale town. Lastly, the findings are revelation to water agencies to come up with urgent solutions that are drawn from challenges of inadequate water supply to curb the problem. The residents were aware of what should be done to solve their water shortage problem. This was a stepping-stone and a booster of water scarcity interventions.

1.6 Scope of the Study

The study was restricted to Kitale town, Trans-Nzoia County, specifically in the selected informal settlements in Kitale town. The study focused on water scarcity and socio-

economic resultants in households within selected informal settlements in Kitale town. The informal settlements that were covered by the study were; Shanti, Lukhuna, Lavington and Forkland. The study was carried out between January 2017 and March 2018. The study targeted a population of 1600 of the total household.

1.7 Limitation of the Study

The time allocated for the research was limited and therefore the study was only based in the four selected informal settlements in Kitale town. The study was limited to training of research assistants in terms of time and money, communication problems as the informal settlement dwellers sometimes use Sheng language and coded communication besides hostile environment. However, the researcher encountered the limitations by having a budget which helped in training the research assistants. The training included the (Nyumba Kumi) Leaders and Village elders who helped to encounter the problem of suspicions and communication.

OPERATIONAL DEFINITION OF TERMS

Informal Settlement Areas where groups of housing units have been constructed on land that the occupants have no legal claim.

Water Scarcity is the lack of adequate supply of water resources to meet the demands of water usage within an area.

Infrastructure The basic equipment and structures (such as pipes, vulvas and tanks) necessary for people to get store water.

Household livelihood the sum of ways in which an individual/group obtains things necessary for his/her life, be it in good or bad seasons. It mainly includes basic needs such as: food, shelter, clothing, health and Education (OCHA 2010)

Poverty- is defined by a household income below one dollar a day

Socio-economic is a field of study that examines social and economic factors whether single or combines influence water scarcity.

Water management practices: are a set of voluntary practices designed to minimize negative effects of forest cover being key to environment and water resources

Water source- these are catchment areas where water can be gotten from. They include; springs boreholes and wells.

Water stakeholder participation- the players who invest in water sources, transmission and distribution, maintenance and protection.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The main aim of this literature review was to understand what other writers have written about water scarcity and Socio-economic effects on household's livelihood in the selected informal settlements. Different Authors have carried out studies on implication of Socio-economic effects of water scarcity in the informal settlements. The chapter reviewed publications, research papers, journals, books and other write-ups.

2.2 Informal Settlement Defined

Until 2002, there was no internationally agreed definition and concept of the informal settlement. Many countries in the world define the informal settlement differently. Efforts have been made for years to establish measures with which do delineate the major problem areas. For example, it means favela (Brazil), Basti (Bangladesh), Ghetto (USA). These various names indicate that there is no universal definition since these areas are viewed differently from one place to another. Each of these words carries negative connotations. Thus, the word informal settlement implies some form of precarious housing (Sori, 2012).

The concept of informal Settlement is sometimes used to mean slums and it is therefore important to address the definition that is used for this study. UN-HABITAT (2003,p.3) defines informal settlements as urban households where a group of individuals are living under the same roof and where the households dwellers usually are suffering from one or more of the following: (i)Limited access to safe water at an affordable price and in sufficient amounts (ii) Lack of private or public toilets, and these are usually

shared by an unreasonable number of people(iii)Lack of security that prevents the tenants from forced evictions(iv)More than three people sharing the same room and (v) Limited protection against extreme climate conditions.

2.3 Water Scarcity

Water encompasses every aspect of our daily lives. Although many communities manage to get it by different means, it is necessary to all human beings and animals at large. Without it, there will be no life to all living things. Water availability is linked between having access to clean affordable water and being able to develop into a place where the most basic necessities are obviously fulfilled. Water is a prerequisite for development and these chapters two will show how lack of water has terrible consequences. On the most basic level, water scarcity can cause death by; dehydration, diseases and famine.

2.4 Water Situation

2.4.1 Global Perspective

The meaning of water scarcity has varied as well as to the advancement of the studies. White (2012) stated that, there is no agreement on how the word water scarcity should be redefined. In general, water scarcity is related with imbalances between supply and demand, deprivation of earth surface, underground water quality and different access to water. FAO (2008) described that, in general water scarcity is the imbalance between water availability and demand in an area. Adding to that, water scarcity can also be defined as a situation where water availability in a country or in an area is less than 1000m3/person/year, in some parts of the world even less than 500m3/person/year,

which could be considered severe water scarcity. Meanwhile, the threshold of water use is 2000m3/person/year, which can indicate that the area is having water stress, since in this condition an area could face big problems when drought occurs (Kundzewic et al., 2007).

The Millennium Development Goal Number seven elaborates on drinking safe clean water that was somehow achieved worldwide in 2010. The main goal was to supply the percentage of the global population without sustainable access to safe water. 48 under developed states did not hit the goal, but substantial growth has been made with at least 42 per cent of the present population in those countries, got access to enhanced safe drinking water since 1990. Rapid geographic, socio-cultural and economic inequalities continue, not only between rural and urban areas but also in towns and cities where people live in low-income state. The informal or illegal settlements normally have less access to improved sources of drinking water than other residential areas.

2.4.2 Water Situation in Kenya

Like other countries in sub-Saharan Africa, Kenya's socio-economic development goals highly dependents on availability of enough quality water. Unfortunately, the country suffers from water scarcity including water pollution, thus requires a lot of sanitation to make it fit for human consumption. Surface waters resources cover only 2 per cent of the total surface area. The climate varies from tropical along the Kenyan coast of the Indian Ocean to arid in the interior. Two thirds of the country is covered by semi-desert or desert land, Per capital available Water in Kenya is about 650 m3/person/year. A future projection shows that by 2025, per capita water availability will drop to 235m3/person/year as a result of population growth. The level of water scarcity in some

regions is a serious limiting factor for development activities. Consequently, the need to change the scattered structures and functioning of the Water management system in Kenya has risen.

The government's long-term objective is to ensure that all Kenyans have access to clean potable water and that water is available for key economic activities (Kenya 2006). In 2002, major reforms were initiated with the revision of the Water Act in Kenya, which defines clear roles for the different actors involved in the decentralized institutional framework that separates policy formulation from regulation and services provision. Where possible, the participation of stakeholders in the decision-making processes was promoted by involving communities and other actors such as NGOs, community organizations and the private sector.

The water sector reforms implemented in Kenya under the Water Act 2002 of the Laws of Kenya were established in order to allow the realization of the long-term objective of ensuring that all Kenyans have access to clean potable water and that it is available for key economic activities. Under the Act, autonomous water and sanitation (or sewerage) companies popularly known as WASCOs were given the responsibility to provide water and sanitation services especially within urban areas through local authorities. The WASCOs current operate within the jurisdiction and oversight of the Water Services Boards and are generally instrumental in their registration, incorporation and monitoring. The Act required that a Water Services Board enter into a contract with a Water Service Provider (WASP) through a Service Provision Agreement.

In 2009, water services boards undertook to develop urban water supplies infrastructure, while the National Water Conservation and Pipeline Corporation provided water

schemes in rural areas. The major works were on expansion and upgrading of Water in Kenya supply systems. To provide clean water to households, the Kenya Government continues to maintain water purification points across the country. To improve availability of water to more Kenyans in rural areas, the Government of Kenya has constructed major dams such as Chemususu, Badasa, Kiserian and others in Koibatek, Marsabit, Kajiado and Kitui counties.

2.5 Access to Main Sources of Water Supply

Water is critical to human life and is undeniable fact hence without it; the dignity of human life is lost. Access to water sources means different things depending on the region. For instance, the concept as perceived in the developed world countries may not be the same as how it is defined in the developing countries. In the developed world countries, access to water sources may imply having optimal access, that is, various taps inside the house, connected to a network, which is regularly maintained by the government authority. In the context of developing countries, access to water source is based on the UN's definition of 20-50 litres per an individual per day. According to Human Development Report (2016), having access to water sources is staying within one kilometer from the nearest improved water source.

2.6 Water Management Practices Leading to Water Scarcity

Poor management of water supply is one of the factors responsible for water scarcity. In Kenya for many years, there has been an increased need for (i) funding, (ii) management and (iii) development of water resources because of the increasing population as well as the way the country is increasing use of water for agriculture and domestic use. However, the actions taken have not been effective because organizations in charge of

managing water resources have failed in multiple ways. Key among them is the mismanagement through water development funds, weak water allocation practices, growing pollution, and increasing degradation of rivers, lakes, wetlands and their catchments.

2.7 Water Scarcity and Livelihoods

One's livelihood may be defined as the sum of ways in which an individual obtains things necessary for his or her life, be it in good or bad seasons. These necessities of life mainly include the basic needs like food, water, shelter, clothing, health care and education (Uchenna, 2012). Some of the relevant livelihood activities include: farming crop and livestock production, fishing, hunting, bartering, and other endeavors related to income generating activities (including off-farm work).

A livelihood may also be viewed as comprising capabilities, assets (stores, resources, claims and access) and activities that are needed for a means of living. Livelihoods is considered sustainable if at all it meets its current needs, is able to cope and recover from crisis, and improves its capabilities and assets that provide more sustainable livelihood opportunities for future generation (OCHA 2010). According to Scones' (2009)–livelihood resources entail the basic material and social relations as well as tangible and intangible assets that individuals utilize for meeting their livelihoods.

A livelihoods approach makes the household the centre of the analysis, focusing on an integrated view of the importance of all its forms of capital such as physical, financial, human and natural as well as social (Zwarteveen, 2006). The physical capital involves improving household, decision-making and removing uncertainty through better management of improving existing livelihood systems. On the other hand, social capital

is characterized by emphasis on the role of poor households in the decision-making processes and the importance of ensuring access to issues such as water rights for the poor, as opposed to establishing water users associations (WUAs) to improve water management. Lastly, in terms of the natural capital, the livelihoods approach complements establishment of new water resources through enhanced training in catchment protection (Uchenna, 2012). Many households in rural areas and in particular in SSA including Kenya tend to have little physical and financial capital. Their key assets include natural and labour capital assets such as land and their jobs. They might also possess a fair amount of social capital, which may take the form of kinship ties.

Rural women play pivotal roles in almost every aspect of our society from time immemorial. They have made important contributions in creating access to human, natural, financial, physical and social capital for making their livelihood sustainable (World Bank, 2007). In rural areas, interest of resource poor women in income-generating activities is high and they are involved in various non-farm income activities.

Women play a very important role in socio – economic development of any society. This is so mainly because of their primary career role in the family. However, as revealed by the World Bank (2006), women are more vulnerable than men. For instance, they are more likely to be affected by poverty than men especially because of their unequal access to economic opportunities which arises from lack of resources including credit facilities, land ownership, lack of access to education, cultural practices, minimal participation in decision making processes, poorly distributed infrastructure, poor health facilities, and high levels of HIV/AIDS infections.

One major silent constraint to socio- economic development, which should be fully recognized in many developing countries as a powerful tool and vital resource for development, is water (World Bank, 2006). Lack of access to, and in fact, ownership of land is also one of the key constraints affecting women's access to water as well as a key reason for the greater poverty of female-headed households (UN Water, 2005). Accessibility to clean water is essential to enable women and girls to pursue education, generate income, and construct and manage water and sanitation facilities which are crucial to providing women with productive resources and enabling economic empowerment.

2.7.1 Domestic Uses and water related Jobs

Water is very precious and critical to virtually all livelihoods especially for the poor (Stedman, 2014). Water is and can be viewed as not only a commodity but also a natural resource. According to Martya Sen (as quoted in Njoh, 2012) water is one of the human entitlements, here implying one's purchasing power for food. A typical urban household's uses water for drinking and sanitation. However, in rural area, water is used for a wide range of activities including irrigation, domestic use, home garden, trees and other vegetation as well as livestock. Other productive uses include fishing, harvesting of aquatic plants and animals, and variety of other enterprises such as brick making. Therefore, the withdrawal of water or water scarcity affects many households both economically and environmentally in a number of ways. For instance, water scarcity is often manifested by the increase of health problems due to water pollution and water born -diseases.

Water and Livelihoods are unavoidably linked on various levels, be it from an economic, social or environmental perspective. According to Say et al. (2014), without adequate water, there would be no food to eat, no clothes to wear among other things. This is partly the reason why provision of safe and adequate water supply is and should be of the highest priority in SSA. According to the report by United Nations World Water Assessment Programme (WWAP), more than one billion jobs or livelihood opportunities representing more than 40% of the world's total active workforce are heavily dependent on water (WWAP, 2016). These opportunities are found in about eight sectors including forestry, agriculture, fisheries, power generation, mining and resource extraction, water supply, as well as in different industries such as textiles, food and pharmaceuticals (ibid). The report further states that another billion employment opportunities which represent more than one third of the world's total active workforce, are more likely to be moderately water-dependent like the examples of recreation, construction, transportation and manufacture processing industries. This means that about 80% of the job opportunities of the world's labour force are dependent upon having access to an adequate supply of water and water-related services. Although the report by WWAP (2016) is not directly associated with water scarcity in the context of informal settlements, it clearly confirms that water scarcity may have negative effects on people's livelihoods.

The Human Development Report (2014) reveals that water scarcity is above all crisis for the low income earners. The report further indicates that approximately two in three people do not have access to clean water, survive on less than US$2 a day, with one in three living on less than US$1 a day (UNDP 2006). Furthermore, the poorest of the poor

not only get access to less water, but also pay some of the highest prices especially in the context of the urban poor, mainly as a result of having to get water from private water vendors (Sy, et al., 2014).

While studying the various challenges of water supply and sanitation in the context of uncontrolled residential developments, Maina (2014) explains that lack of clean water and sanitation has a direct impact on labour productivity. The author cites the case of Peru which suffered a cholera epidemic in 1991 where it was observed that it not only led to deaths of thousands of people but also caused the loss of $232 million in terms of GDP in just one year.

2.7.2 Impacts on Health

Apart from affecting people's jobs, water scarcity may also interfere with people's health after carrying a detailed analysis of Africa's water crisis and its effects on Public Health both in Urban and Rural areas. The author highlighted that the high prevalence of water-related disease in Africa is one of the greatest challenges related to water scarcity in Africa. Several diseases are associated with water scarcity. These include waterborne diseases especially those diseases transmitted through contact with water, and water-borne diseases (Adewole & Fafure, 2012). The waterborne diseases are often caused by pathogens which live in water that people drink. The main types of waterborne diseases include viruses, parasites, bacteria and protozoa. Most of these diseases are associated with gastrointestinal problems especially diarrhea, though ingestion of contaminated water or foods in case unsafe water is used to clean it, or when hands that have come into contact with contaminated water touch the foods. Megan (2015) as cited by

Adewole (2012) explains that diarrhea diseases are strongly linked to regions with insufficient water and sanitation such as informal settlements.

According to one study by Water Aid (2008), the combined effects of water scarcity as a driver of diseases including, diarrhea, typically malnutrition, endemic cholera and respiratory infections, make water the biggest killer of young children especially those under the age of five years and recommends for good sanitation as one of the most cost-effective major public health intervention that should be considered to control death of children.

According to the report by United Nations, water is critical not only for life but also for livelihoods, yet billions of people worldwide suffer from disease, poverty and a lack of dignity as well as opportunity because they cannot have access to water which is a basic resource. The report estimates that about 4,400 children under the age of 5 around the world die every day, having fallen sick due to scarce and unclean water. The report indicates that five times as many children die annually of diarrhea as of HIV/AIDS. Water is also a crisis for women and children, because they bear the burden of collecting water. In some areas particularly in rural area, women are forced to walk for long distances, nearly 10 kilometers to access water source which may be contaminated (Seager, 2015). School children may also drop out of school because they have to assist their parents fetch water. This applies especially to the girl child. As a result, many school days are often lost increasing the cycle of poverty.

Ayeni (2014) reveals that girls and Women tend to bear the most burden of water scarcity, risking both their dignity and personal safety. Using the Case of Cholera in Makoko in Nigeria, the author explains that water scarcity can affect health in two major

ways. First, it compromises the physiological systems, which sustain health. Secondly, woman's mental health affects the energy they can deploy in seeking health care on behalf of their children and other household members. Furthermore, women may be forced to fetch water from other sources, which may be contaminated. Ayeni also argued that being primary collectors of water for domestic consumption, women as opposed to men are more likely to be exposed to water-borne diseases hence directly affecting their health especially their reproduction leading to high infant mortality and birth defects (Ayeni, 2014). The author gives the example of severe Rheumatism problem, which is partly attributed to constantly carrying heavy water containers by women using their waists, heads or back. The author adds that pain and psychological stress associated with having to wait for water is also considerable, especially for vulnerable groups like elderly, disabled and pregnant women. This wait may also cause health complications especially in terms of increased livelihood for contracting urinary tract infection and chronic constipation.

2.7.3 Impacts on School Going Children

Studies indicate that water scarcity impacts negatively on school going children and education in general. Using data collected by international agencies, it was established that water scarcity was responsible for low enrolment of children in schools-particularly girls and this was partly attributed to the time they spend searching for potable water (Chociej & Adeel, 2012).

Using the case of Nigeria, Ebiye and Zejiao (2010) observed that less privileged children might often be seen with empty containers, searching for potable water from streams or queuing to purchase it from water vendors, while their privileged

counterparts mainly from the rich families are in schools. The study provides insightful information though it lacks empirical evidence.

According to Enoch and Agbazue (2011), women tend to be more vulnerable to social vices and criminal attacks, which are associated with water scarcity, which compel them to travel far from their homes in search of water for their daily sustenance. The authors state that their aspiration for academic empowerment are often compromised by unpleasant experiences which women and girls may encounter in their search for this precious commodity, water.

2.7.3 Affordability and Accessibility

The other issue associated with water scarcity is affordability and accessibility to water sources. This increases consumption of other commodities and services by the poor household hence consuming less than the required amount of water for good hygiene, impacting on the members' health and labour productivity within the household (Darkey & Kariuki, 2013). As Sy et al. (2014, p.23).Water scarcity is manifested by the situation where people are seen carry heavy pots of water several kilometers every day to meet their households needs.

The issue of prices for obtaining water is significant to accessibility and often depends on whether existing extraction rates are sustainable. Water prices and Tariffs need to be based on the full price of water, which includes source development, purchase of raw water, treatment, and distribution costs (OCHA, 2010).

2.7.4 Time wastage in search of water

The issue of time as it relates to water scarcity also explains why it affects people livelihood. In typical African country, most people especially women spend the better part of their day searching and transporting water and this may be worse particularly during dry seasons. Studies in Africa (such as Pickering & Davis, 2012; Madulu, 2012) have estimated that a typical woman spends from 1 to 4 hours per day in search of water. A study in Ghana established that rural men spent only a third of their time and one quarter of the energy that rural women spent on load carrying hence recommends for the need to reduce women's transport loads in order to freeing them to use their time and energy for existing productive activities as well as for new economic activities.

In their study about Freshwater Availability and Water Fetching Distance Affecting Child in Sub-Saharan Africa, Pickering and Davis (2012) established that water affected people's livelihood by increasing time spent fetching or searching for water, which negatively impacts on people's health. The authors used data from almost 200 000 Demographic and Health Surveys that were carried out in 26 countries. Specific objective of the study was to find out if there was any relationship between household walk time to water source and child health outcomes. From the study, the authors established that, time spent walking to a household's main water source significantly determined under-five year child health. The authors notices that a 15-min decrease in one-way walk time to search and access water was associated with a 41% average relative decrease in diarrhea prevalence hence recommended that, a reduction in time spent in search of water should be prioritized in Africa if sustainable development is to be achieved.

Maina (2014) observes that in poor setting (including informal settlements), the time of the day spent on the search has significantly increased in the past decade. The author argues that coupled with the socio-cultural practiced, water scarcity has transferred the burden of fetching water to the poor girls and women in the poor settings. The author asserts that women and girls tend to fetch water 4-6 times a day in many Kenyan urban centers translating to 112 minutes that the poor households' settings spent in search of water per day.

Conducted study about water Scarcity and Economic Productivity of Women using a case study of Kibauni Division, Machakos County, Mwinzi, (2014) found out that women and young girls spent a lot of time in search of water for domestic use. In particular, they usually walk long distance to collect water from rivers which in most cases are full of parasites and bacteria for domestic use. The study was mainly relied on data from 360 respondents that were selected systematically. From the data collected mainly using questionnaires, focus group discussions and key informants the author observed that women and girls spend a lot of time that could have been invested elsewhere especially in a more productive economic activities, hence concluded that the waste of time in search of water was a major factor that compromised their livelihood. The findings were useful for the current study especially as background information.

2.7.5 Measures to alleviate the Problem of Water Scarcity

Strategies and adaptation measures of dealing with water scarcity are often based at local, regional or national issues as opposed to international levels (Paavola & Adger, 2012). This is partly attributed to the fact that most communities exhibit various levels of vulnerabilities and adaptive capabilities and therefore are impacted differently. This is

why there exists different adaptation needs (Lotze-Campen, & Schellnhuber, 2009). Consequently, adaptation largely consists of uncoordinated action both at household and organization levels. However, it may also involve collective action exhibited at local, national, regional and international levels as well as cross-level interaction where these levels meet (World Bank, 2009).

The vulnerabilities of water scarcity occur at various scales, and hence a success and effective adaptation will depend on actions taken at different levels. Paavola and Adger (2012) have defined this. At the national level where there is formulation of climate change policy which are often geared toward vulnerable sectors and community coping mechanisms, establishment of policies and institutions, which support adaptation at community levels. Introduction of collective security arrangements including farmers' cooperatives and community-based organizations (CBOs), gives good knowledge, technology, policy, institutional and financial support for the most vulnerable groups(Lotze-Campen, & Schellnhuber, 2009).

Scholars have general agreement that different communities are affected differently by climate change and associated effects like water scarcity depending on their adaptive capacities, have developed coping strategies. This explains the region-to-region, village-to-village and household-to-household variation in coping strategies. Cooper *et al.* (2012), explain that most of the rural communities tend to cope with water scarcity and associated effects of climate change, but exhibits different strategies to climate change depending on different agro-climatic zones and expected impacts on individuals' livelihoods due to climate change.

According to Cooper *et al.* (2012) investments to improve water productivity and integrate management of land and water resources, have the potential to reduce vulnerability to both natural and human induced shocks while improving productivity. The author also gives the example of an integrated watershed management in India, which contributed to improved resilience of agricultural production and water security despite the high incidences of drought (Cooper, *et al.,* 2012).

In other African countries, especially West African nations, most communities in rural areas heavily rely on the use of shallow wells and hand-dug wells with a view of complimenting for the shortfall in water for dry-season irrigation as the case of northern Ghana, Burkina Faso and Mali (FAO, 2013). The better use of water application, Bonds, agro-forestry and rainwater harvesting have all been effective adaptation measures in other countries especially Egypt and Ghana in dealing with water scarcity (Lotze-Campen, & Schellnhuber, 2009).

Rainwater harvesting and management is probably one of the best measures that can help in dealing with water scarcity. Rain is often the primary source of water that is well known in relation to the hydrological cycle. The other sources, such as rivers, lakes and ground water are regarded as secondary sources (FAO, 2013). Rainwater harvesting (RWH) can be defined as making optimum use of rainwater especially at places where it falls in order to attain self-sufficiency in water supply (FAO, 2013). Rainwater harvesting is one of the oldest practice and has been in parts of the world for over 4000 years (Lotze-Campen, & Schellnhuber, 2009).

While studying 100 Ways to Manage Water for Smallholder Agriculture in Eastern and Southern Africa, Mati (2007) has identified various rainwater harvesting technologies,

which have been in use for many years, and new ones are being developed all the time. The author has classified these technologies as Macro-catchment technologies that typically involve the collection of runoff from large areas, which are at an appreciable distance from where it is being used. The macro-catchment technologies often handle large runoff flows often diverted from surfaces such as hillsides, roads, and rock catchments, sand as well as earth dams (Mati, 2007). The other category is the Micro-catchment technologies, which include those that collect runoff close to the growing crop and replenish the soil moisture. These technologies are mainly used for growing medium water demanding crops like maize, sorghum and groundnuts. For small-scale catchments, rainwater harvesting can be categorized according to the type of catchment surface used and, by implication, the scale of activity (Lotze-Campen & Schellnhuber, 2009).

In Kenya water supply and sanitation is characterized by low levels of access particularly in urban and informal settlement areas.. Only 9 out of 55 water service providers in Kenya provide continuous water supply. Seasonal and regional water scarcity exacerbates the difficulty to improve water supply (Mwinzi, 2014).

The government has put down many measures and various institutions in the past decade to ensure that, the community members and the entire citizen fraternity receive adequate water and sanitation services in the country. There was the establishment of the Water Sector Reform Secretariat (WSRS) whose responsibility was to cover the transitional gap during the period, which the water reform institutions were being established. Water Services Trust Fund (WSTF) was established in 2004, to provide financial assistance towards capital investment costs in areas lacking adequate facilities

which are often inhabited by the poor(Mo w I, 2007). The transfer of the central government staff and the assets were realized through the development of the transfer plan of 2005 in which the services were delegated to the (WSBs) and the (WSPs).

The draft of National Water Services Strategy (NWSS) for the period 2007/2015 was formulated in June 2007. This paper's main objective was to realize the goal of the MDG declaration and the goal in the Kenya's economic blue print Vision 2030 concerning access to safe, affordable, water and basic sanitation to the citizens of the country. NWSS defines access to safe water and basic sanitation facilities as both a human right and economic good. The strategy is also aimed at cost recovery by the WSPs to ensure sustainable water and sanitation for the entire populations especially the residents of the poor areas (MOWI, 2007).

The county government of Trans Nzoia is doing connection of Tee and Pipeline Extension of 3 Km pipeline, 50 m3 storage facility has been constructed at strategic points, Construction of a number of Water Kiosks to enable 2,500 people access piped water at a cost of 2,859,050 project which is 90% Complete, but little has been done in the informal settlement areas, hence need to address the problem with urgency (CGTN, 2016).

2.9 Theoretical Framework

2.9.1 Game Theory

Game Theory (GT), both in its non-supportive and supportiveness formed a very important contribution to the analysis of important aspects related to water resources. Since Ransmeier, GT models were developed and have been applied to various aspects of water management, such as decisions on cost and benefit allocation used in water

projects, conflicts and joint management of irrigation projects, management of groundwater aquifers, hydropower facilities, urban water supplies, wastewater treatment plants, and Tran's boundary water disputes.

World water resources face new challenges that suggest a renewed role of GT in water management. Water Scarcity, increasing populations, and major development have led to increased competition over water resources. Subsequent elevated pollution levels and Climate change is expected to unevenly affect the hydrological cycle, leading to increased variability in water supplies across time, space, and uncertainty in water allocation decisions. Future investments in water resource projects will be immense, needing much more stable rules for cost allocations among participating entities and over time. Levels of water disputes may vary from local to regional, state, and international levels. All of these suggest that while GT models and applications to water resources have advanced over the years, much more is expected.

2.9.2 The Neoclassical Theory

Adam Smith (1723-1790) and David Ricardo (1772-1823) anchored the neoclassical theory on basis created by classical theorists. Other theorists such as Alfred Marshall (1842-1924) and Vilfredo Pareto (1848-1923) later contributed on the theory. Neoclassical is a theory that focuses on how the perception of usefulness of products affects market forces: supply and demand. It suggests that because the consumer's goal is customer satisfaction, and that the organization's goal is profit maximization, the customer is ultimately in control of market forces such as price and demand.

Theoretical models (above) shows how the demand and supply of water as a product is necessary in all sectors. At the heart of neoclassical approach to ecosystem, economics

set sights to turn water into a product, which can be analyzed like any other commodity. The preliminary work is to break down water into its constituent goods and services. Once defined in terms of commodity, water can be brought into the market economy by constructing supply and demand curves for water input and market prices. The level of water protection that is considered 'optimal' depends on consumer wants (demands) and the supply costs (costs of protection and opportunity costs). Willingness to pay measures is based on consumer preferences and wants, and it is constrained by ability to pay (i.e. incomes). In the theoretical case where a proper demand curves with a range of values that can be demanded. Its intersection with the supply curve will indicate the level of protection for that water commodity which represents the most efficient allocation of resources in the society. The second stage show how economic theory and methods can be used to identify the most efficient level of water protection. The third stage is concerned with achieving this level in the most efficient way - these concepts provide the foundations for the design of water policy.

2.10 Conceptual Framework

The conceptual framework generally reveals the existing or possible relationship between the dependent variables and independent variables of the study. In this study, water scarcity and socioeconomic effects on household's livelihood in the Informal Settlements was taken as the topic where dependent variable was influenced by a number of independent variables which in the context of the study included sources of water in the area, management practices and effects of water scarcity on livelihood. The information is represented in the figure 2.1 below.

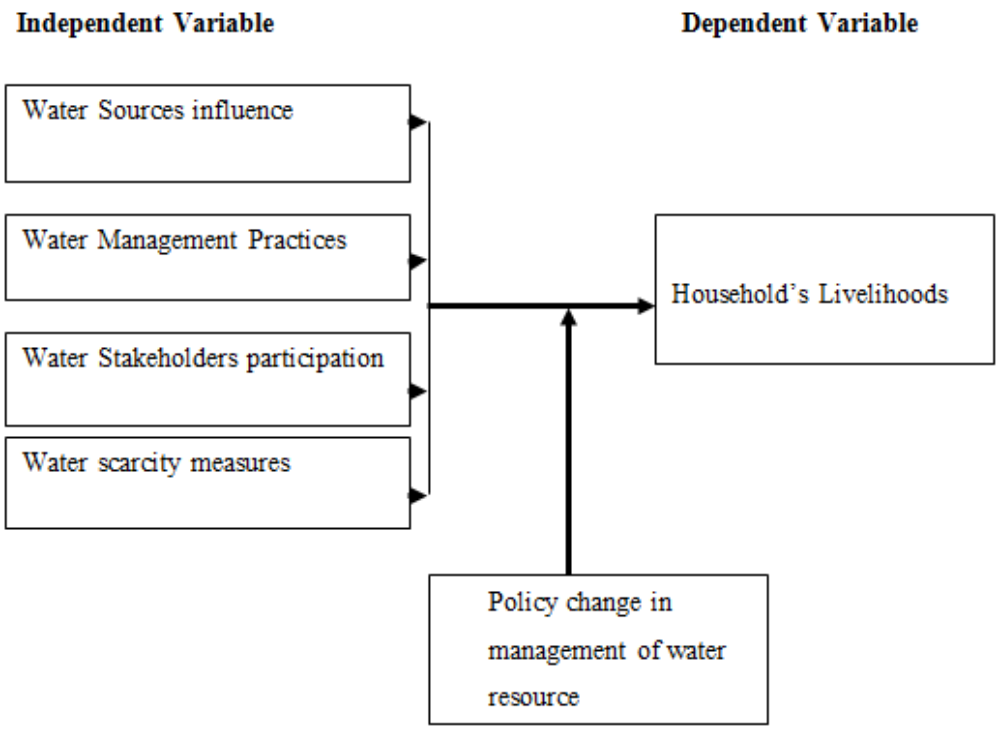


Figure 1.1 Conceptual framework for the study

From figure 2.1 above, it is clear that effects of water scarcity are a product of how it is perceived to affect people's livelihood. It is also a product of the main sources of water shortage including whether the sources are accessible, free from contamination among others. Water scarcity and socioeconomic effects are also products of existing measures put in place to alleviate the problem which are less effective. For instance, if the existing measures are effective, then complains related to water scarcity and socioeconomic effects on household's livelihood should be less. Intervening variable: include; up grading the informal settlement water projects, proper management of water resources, protection of springs and shallow wells, encourage rain water harvesting and storage, plus putting up more water Kiosks.

2.11 Summary and Research Gaps

This chapter has reviewed the literature on water scarcity and socio economic effects on household's livelihood and available strategies for improving it. Levels of water disputes may vary from local to regional, state and international levels but much more is expected. It is clear that although the subject has attracted the attention of various researchers both internationally, little is still known about the exact effects especially on household's livelihood and management practices. Studies like those of Karanja (2011), Nyangeri, and Ombongi (2007) only focused on issues of water supply ignoring the effects associated with livelihood and also water scarcity in the informal settlement. The literature reviewed left a relative gap in the art on this subject, particularly in the context of the informal settlements in Kenya, especially in Kitale town. The originality of this study is that it adds value to existing literature and may be used as a guide to policy development, Kenya Water and Sanitation Civil Society Network (KEWASNET), campaigns for the protection of water services, protection of infrastructure from vandalisms and continuously appeal to the members of the community to be responsible in the use and consumption of water plus available sanitation services. KEWASNET, 2012 covers the general view and not specific to informal settlements.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presented a detailed description of the selected research design. It describes the research strategy and methodology i.e. what was done and how it was done. The chapter comprised of several subsections, which are presented in the following order.

3.2 Research Design

Bhattacherjee (2012) articulates a research design as a comprehensive plan for data collection in an empirical research project which specifies the data collection; process, among other ingredients, of achieving the objectives of research project. This study applied a survey research design; Method that focuses on designing the data collection, analysis and reporting the findings in a descriptive manner (Kothari, 2017). The researcher conducted a descriptive survey in examining the socio-economic effects of water scarcity on selected households in the informal settlement; Kitale town. This was for obtaining adequate and relevant information within a short time. Quantitative techniques and frequencies were used for data analysis presented in charts and tables.

3.3 Study Area

The study was conducted in the informal settlement in Kitale Town located in Trans Nzoia County and is at an altitude of 1896 m above sea level. There are four identified village estates covered in this research study, three of them are in Matisi sub-location which has 5881 households and according to KNBS, 2017 projection, it has a population of 29,939 people with 11.059 Km^2 and a density of 2,033 people per square kilometer.

The other village estate is in Namanjalala sub-location with 5,881 households and according to KNBS 2017 projection, it has a population of 25,219 within 13.759Km^2 and a density population of 1,383 per square kilometer.

3.4 Target Population

According to Ritchie and Lewis (2003), target population is the entire aggregation of respondents that meet the designed set of criteria. The study covered within the informal settlements in Kitale Town. The informal settlements were divided into four areas: Lavington, Lukhuna, Forkland and Shanti. The study targeted community and household heads. The study was on water scarcity and social economic effects on household in the selected informal settlement areas in Kitale Town. The table below shows how the targeted population was drawn.

Table 4.1 Target population of the study

Informal selected estates	Target population
Lavington	300
Lukhuna	450
Forkland	500
Shanti	350
Total	1600

(Source: Research Data, 2018)

3.5 Sample Procedure and Sample Size

3.5.1 Sample Procedure

This study applied stratified and simple random sampling techniques. Stratified sampling was used to select a sample from the informal settlement dwellers. According

to Oso and Onen (2005), stratified sampling technique is a technique that identifies subgroups in the population and their proportions and select from each village estate to form a sample. The researcher applied stratified simple random sampling to divide the population into stratus, and the required parameter was randomly selected from each stratum i.e. Shanty, Lavington, Lukhuna and Forkland. According to census of Kenya National Bureau of Statistics projection (2017), out of 1600 target Population, a sample size was identified and respondents selected after obtaining their consent to participate in the study. Simple random sampling technique was used to select 320 out of the target population.

3.5.2 Sample Size

Mugenda and Mugenda, define sample size as a small group obtained from the accessible population. The researcher has targeted a population of 1,600 and with an aid of Yamen formula, calculated respondents of 320 whom he used to collect data from the four village estates.

The study used Yamen formula (1960) to calculate the sample size of the target population within the selected informal settlements in Kitale town, Trans-Nzoia County. The equation for the formula was-

$n = N / (1 + Ne^2)$ 1600/ (1+ 0.0025* 1600) n= Sample size =320

Where n = Number of samples,

N = Total population

e = Error tolerance

To arrive at specific number of respondents in each stratum the figure was rounded to the nearest one as indicated by Table 3.2 below;

Table 4.2 Target population of the study

Estates respondents	Target population	Sample size
Lavington	300	80
Lukhuna	450	80
Forkland	500	80
Shanti	350	80
Total	1600	320

(Source: Research Data, 2018)

The 320 respondents were shared equally among the four villages hence each village had a sample of 80 households. To determine the household to be used for the sample, systematic sampling technique was used, where every fifth house from the first household, was picked.

3.6 Research Instruments

The overall aim of this study was to examine water scarcity and socio-economic effects of selected household's in the informal settlement, Kitale town. The following data collection tools were used. The survey comprised of both open and closed ended questions, where the open ended captured the most important and additional insights not captured through close-ended questions

The researcher used questionnaire to collect the data. Questionnaire is a research tool that gathers data over a large sample (Kombo and Tromp, 2006). The questionnaire is

the most appropriate research tool as it allowed the researcher to collect information from a large sample with diverse background; the findings remain confidential, saved time and since they were presented in paper format there were no opportunity for bias.

3.7 Validity and Reliability of Research Instruments

3.7.1 Reliability

Reliability of an instrument is the degree of consistency with which a research instrument measures whatever it is intended to measure and yields consistent results. It thus refers to the extent to which findings can be replicated by another researcher (Silverman 2005). According to Kerlinger (1999), reliability is a measure of how consistent the results from a test are. The study used test retest technique to ascertain research instruments reliability. Kerlinger,(2000).

3.7.2 Validity

The term validity means the accuracy and meaningfulness of inferences, which are built on research results (Mugenda 1999). The study applied content validity as a measure of the degree to which data obtained from the research instruments meaningfully and accurately reflected the theoretical concept. Mugenda (1999)

3.8 Data Collection Procedure

The researcher personally administered the research tools after a prior visit that assisted in refining timings of distribution of questionnaires. It also provided a rough picture of the respondents' expectations. The researcher agreed with the respondents when the research instruments were to be administered and specifically dates of collecting the

filled questionnaires. Adequate time was given to the respondents to respond to the questionnaire. The exercise was undertaken between July 2017 and March 2018.

3.9 Data Analysis and Presentation

Data analysis methods depends on the research design used, nature of data collected and measurement methods. This study used descriptive survey and hence descriptive data analysis method was suitable. Descriptive analysis describes a phenomenon in statistical terms as it happens or in an ex-post-facto sense. It was therefore analysed both qualitatively and quantitatively using the Statistical Package for Social Scientists (SPSS) version 20. The collected questionnaires were first checked for completeness and then coded as per the research questions. Qualitative data analysis was used to summarize Information gathered from interviews and secondary data into relevant themes according to the research questions. The mass of words generated by the open ended questions in the questionnaires were qualitatively and thematically analysed and added into the summary of themes.

3.10 Ethical Consideration

In this study, all efforts were made to deal with ethical issues. Clearance for research was sought from St. Paul's University and the research permit from National commission of science, technology and innovation (NACOSTI). Everyone taking part in this study was given enough information about the study so that they make an informed decision on whether to get involved in the study or not. No respondents were forced to participate. The participants were allowed to terminate their participation at any time during the study process. All information received was treated with confidentiality especially in regard to participant's personal information.

CHAPTER FOUR

DATA ANALYSIS PRESENTATION AND INTERPRETATION

4.1 Introduction

This chapter gives a comprehensive or detailed analysis of the study results. The methods used in presentation of data mainly include the use of Figures (Pie Charts and Graphs) and Tables. In addition, the chapter presents discussions of the study findings in relation to the literature reviewed in chapter two, which included both empirical studies and theoretical literature. The chapter begins with presentation of the findings according to response rate. This is followed by discussion of demographic characteristics of the respondents particularly their genders, period lived in the Area, education levels, and marital status. The rest of the findings are presented and discussed in relation to the study objectives.

4.2 Response Rate

The researcher administered three hundred and twenty questionnaires (320), to randomly selected households in Shanti, Lukhuna, Lavington, and Forkland informal settlements. From these, 256 responded to and returned the questionnaires translating to a 80% response rate as presented in Table 4.1

Table 4.3 Response Rate

Questionnaires	**Frequency**	**Percentage (%)**
Returned	256	80.0
Unreturned/Spoilt	64	20.0
Total Administered	**320**	**100.0**

(Source: Research Data, 2018)

According to Dixon (2012), a response rate of 50% is deemed adequate while a response rate that is more that 70% is very good. On the same note, Mugenda and Mugenda (2012), also explain that a response rate of 50% is adequate, and that any response rate greater than 50% but not exceeding 60% is good, and one which is above 69% is very high.

4.3 Demographic Profiles of the Respondents

Demographic data such as age of respondent, level of education, respondent gender and marital status results are described below.

4.3.1 Gender of the Respondents

The gender of the respondents was sought. This was important as masculinity and feminity could affect respondents' perception of issues in relation to water scarcity and socio economic effects on household in the selected informal settlements at Kitale town. The distribution of the respondents according to their gender is as shown in Figure 4.1.

Table 44 Distribution of Respondents according to their Gender

Gender	Percentage
Male	56%
Female	44%
Total	100%

(Source: Research Data, 2018)

It is clear from Figure 4.1 above that 56% of the respondents were males as compared to 44% of the respondents who were females. This clearly shows that the male respondents dominated the study. This difference may be attributed to the rural -urban migration

which is mostly associated with men searching for employment in the urban centers, leaving their families in the rural areas. Most of these male migrants end up in the informal settlements where they can at least afford houses.

4.3.2 Period Lived in the Area

The researcher found it important to collect data on the period of stay in the areas under research. The period of stay plays a critical role in understanding the socio-economic effects of water scarcity in the informal settlement. To a larger extend the long stayed respondents are more experienced and are likely to relate on issues more than relatively less stayed residents.

Table 4.5 Period Stayed in the Area

Years	**Percent**
Below 5 Years	0.0
5-10	17.2
11-14	22.3
Above 14	60.5
Total	**100.0**

(Source: Research Data, 2018)

From the findings in Table 4.2 Above, which sought to know the period of stay of respondents, none of the respondent had stayed in the area for less than 5 years. About 17.2% had lived for 5-10 years, 22.3% have been in the area for 11-14 years while 60.5% had stayed in the area for more than 14 years. This implies that majority of the respondents had been living in the area for more than 14 years hence were experienced

enough and were equipped with enough information about the said informal settlements especially in relation to access and use of water in the area.

4.3.3 Respondents' Level of Education

This sought to give the researcher an insight of the level of education of the respondents. In interpreting the socio- economic effects of water scarcity is a crucial variable that has to be put into account. The more educated an individual is, the more likely to relate on issues more critically and determine the relationship. The findings of this investigation are presented in figure below:

Table 4.6 Respondents' Level of Education

Education level	Percentage
School leavers	32.8
Secondary school	30.9
College level	11.9
Not attended school	14

(Source: Research Data, 2018)

Majority of the respondents were primary school leavers as presented by 32.8% who stated that they held primary level of education, 30.9 % attained secondary school level of education, and 11.9% acquired college level of education while 10% were degree holders. The study also established that 14% of the respondent had not attended school at any level. Therefore, it is clear that residents of the informal settlements have relatively low level of education and this may dictate the level of knowledge that majority of the residents may have with regard to safety measures on the use of available water.

It is worth noting that although Kitale Town boasts of a string of reputable institutions of learning both the secondary and the tertiary ones; most of the residents have attained primary education level. Perhaps this may be attributed to the introduction of free primary education in 2003 and subsequent subsidization of secondary education from the year 2008 by the Government of Kenya. 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.

4.3.4 Marital Status

The researcher sought to determine which set of marital group had more challenges of water scarcity. Married group are the hardly hit by water scarcity given the size of the family. The findings are presented in Table 4.3 below.

Table 4.7 Distribution of Respondents according to their Marital Status

Marital Status	**Percentage**
Married	57.8
Separated	9.4
Widowed	5.9
Single	27.0
Total	**100.0**

(Source: Research Data, 2017)

From the data in Table 4.2 above, majority of the respondents represented by 148 of the respondents or 57.8% were married, 69 respondents or 27% were single. Some 24 respondents representing 9.4% had separated and the remaining 15 respondents or 5.9%

were widowed. This implies that most respondents are married and can relate on issues of socio economic effects of water scarcity well.

4.4.1 Water Source and health of households livelihood

The study sought to know the main sources of water for the residents of the informal settlements. It was established that residents of the selected informal settlements in part of Kitale town depend on a variety of different sources of water for their domestic uses. The findings were represented on a five scale likert of 1= strongly disagree, 2= disagree 3=neutral, 4=agree, and 5=strongly agree and recorded as in table 4.8 below:

Table 4.8 Water Source for the respondents

Statements	**1**	**2**	**3**	**4**	**5**
Water drawn from shallow wells causes health problems	22%	28%	20%	18%	12%
Our water springs are unprotected exposing us to health risks	33%	38%	8%	9%	12%
Our water source is unpredictable exposing us to health risks	22%	30%	24%	18%	7%
Our water sources makes us sick all the time	18%	25%	15%	25%	16%

(Source: Research Data, 2017)

From the table 4.8, it was observed that majority of the respondents 28% agreed water drawn from shallow wells caused health problems, 20% of the respondents remained non-committal while, 22% strongly agreed on the same while 18% and 12% disagreed and strongly disagreed respectively on the same. On whether the springs were protected thus posing health hazards, majority did indeed did agree and strongly agree being 38%

and 33% respectively representing over a 50% affirmation. On the predictability of the water sources, again over 50% were in the affirmative. On whether the water sources made them sick all the time, 25% agreed with 18% strongly agreed. Comparing the number of respondents who remained neutral, disagree in and strongly disagreeing, they were more than those in the affirmative. This could have meant that they were not sure whether their sickness was due to water sources.

When respondents were asked a similar question from the interview schedule, One of the respondents remarked that:

> *"Here, we do not have enough water especially the tap water or good borehole water. The few available sources are expensive and out of reach for many of us. We are therefore forced to collect water from the spring and use it for domestic purposes like cooking and bathing. During the rainy season, my family depends a lot on rainwater for all domestic chores including drinking but when it is not available, we are forced to go to the nearest spring* "(Female respondents, 2017)

The various sources of water as indicated from the current study are consistent with Crow's (cited in Madulu, 2012) modes of access to water. This is clearly so because it is almost impossible to differentiate between communal water access and open access in the study area. This is partly attributed to the fact that water obtained from the spring can be viewed as communal water. In the same way, people in the community can collect water found on a plot of land belonging to an individual that has not been treated or that does not involve any investment made on it either for domestic or economic use. However, it is often the responsibility of each and every user to leave the water in a good state for the owner and other users to use when in need. Unfortunately, this is not

ease for most people leading to water scarcity. One can conclude that Crow's categorization of water sources into private ownership, communal access, open access, are not mutually exclusive. The study too agreed to a study done by Mwinzi (2014) while studying Water Scarcity and Economic Productivity of Women using a case study of Kibauni Division, Machakos County also observed that water scarcity was the major cause of health problems in the study area especially malnutrition, diarrhea and typhoid among others.

4.4.2 Water management practices and household livelihood

The researcher sought to determine whether water management boards allocate funds for repair and maintenance of water infrastructures. The findings were represented on a five scale likert of 1= strongly disagree, 2= disagree 3=neutral, 4=agree, and 5=strongly agree and recorded as in table 4.9 below:

Table 4.9 Water management practices in the area

Statements	1	2	3	4	5
I have piped water in my compound	13%	17%	0%	39%	30%
I get Piped water from kiosks which are within my reach	28%	32%	8%	15%	17%
Piped water kiosks sales water at affordable prices	11%	14%	5%	32%	38%
I access water from the kiosk anytime of the day throughout	11%	11%	18%	30%	31%
Water management authorities are playing their role effectively	8%	10%	6%	41%	35%

(Source: Research Data, 2018)

From the figure 4.9, majority of the respondents as represented by 39.00% indicated that did not have piped water in their households with another 30% strongly disagreeing too. It is only 30% of respondents who agreed to the issue of having piped water in their households. This was evidence that majority of the residents in the informal settlements in Kitale town do not have access to piped water.

On if the piped water from kiosks was within the residents reach, majority of the respondents 60% answered to the affirmative saying that indeed the water kiosks were within their reach. Only 30% said they did not have the kiosks within their reach. This was evident that the respondents had access to piped water albeit from water kiosks.

When asked to respond on affordability of the water bought from the kiosks, majority of the respondents 70% answered to the contrary. This meant that despite the fact that the water was not available any time of the day, it was also expensive in the respondents view.

On the accessibility of water at any time of the day, majority 61% of the respondents answered to the negative saying they did not access water at any time of the day. This implied that that in some cases, the pipe to the kiosks ran dry denying the consumer clean piped water from the water kiosks.

The respondents were also asked to give their general view on water management authorities on effectiveness. 76% of the respondents disagreed that they were effective in discharging their duties. This shows the extent of dissatisfaction with the consumers basing on the management team of the water service providers.

4.4.3 Water stakeholder participation and household livelihood

The researcher was keen to establish from the respondents whether water stakeholders' participation had influence on household livelihoods. The findings were represented on a five scale likert of 1= strongly disagree, 2= disagree 3=neutral, 4=agree, and 5=strongly agree and recorded as in table 4.10 below:

Table 4.10 Water stakeholders' participation in the area

Statements	**1**	**2**	**3**	**4**	**5**
NZOWASCO supplies piped water in my village	0%	7%	20%	41%	32%
NGOs have invested in water services in my village	8%	18%	45%	12%	16%
Water service trust fund invests in water services	3%	4%	25%	33%	36%
The community invests and maintains water sources	5%	9%	19%	28%	15%

(Source: Research Data, 2018)

From the table 4.10, majority of the respondents when asked on whether NZOWASCO supplied piped water in their village, 73% cumulatively said that the company did not perform their role of provision of water in their village. This was an indication that the company whose responsibility is to supply water was to all, had not prioritized to do so to informal settlements.

When asked whether there are NGOs that have invested in water resources, 45% remained neutral showing they were not away if such play exists in their villages. However, 26% of the respondents did confirm that indeed non state actors invested in water resources in their village. This was an indication that the NGOs participation had some positive impact in their village.

On water service trust fund, the majority of the respondents did not seem to know existence of this national government parastatals which is mandated to provide services to informal settlements with a whole 69% saying no and another 45% remaining non-committal. This was evidence that the members of the public in Kitale town in informal settlements did not benefit from services of this state body in provision of water services.

The study also wanted to find out if the community itself invested in the water services. Majority of the respondents 43% disagreed that the public does enough to maintain and sustain the water resources in their village. This was an indication that the community in the informal settlement does little take concern in water resources that are within their areas.

4.4.4 Measure to water scarcity on household livelihood

The study also sought to know existing measures that were put in place for the residents to deal with water scarcity in the area. It was established from the findings that residents of the selected informal settlement used various ways to ensure water supply in their households as indicated by responses on whether the households were involved in measures to ensure water supply. The findings were represented on a five scale likert of 1= strongly disagree, 2= disagree 3=neutral, 4=agree, and 5=strongly agree and recorded as in table 4.11 below:

Table 4.11 Measures to water scarcity in the area

Statements	1	2	3	4	5
Rain water harvesting	9%	45%	23%	11%	12%
Subsidized water storage facilities	12%	19%	60%	5%	4%
Intervention of water service trust fund	16%	16%	42%	14%	12%
Sinking boreholes by county governments	49%	41%	4%	5%	1%
Donors support in building water storage	38%	53%	2%	4%	4%

From the analysis, most respondents, 54% indicated that they preferred water harvesting as the best intervention to solving water scarcity. This showed that water harvesting can be an interim measure to water storage however, majority of them when asked on storage subsidies, 60% of the respondents remained neutral to subsidized water storage facilities an indication that they were not sure if this happens. The best option for water scarcity intervention according to the respondents was sinking boreholes and donors support in building water storage facilities with an accepted rate of 90% and 91% agreeing strongly to the options. This is an indication that the hope of the respondents only remains on the county government and donors. When a similar question was asked on the interview schedule, similar responses emerged with some of the views being like the ones captured below:

> *"Personally, I have bought enough water storage containers to help me keep water for future use*" (Female Respondent, 2017)
> *One of the ways in which water supply can be ensured is through controlling the use. In my household, I make sure that water available is not wasted at all"* (Female Respondent, 2017)

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of the findings, conclusions, recommendations and suggestion for further studies. The chapter was guided by the findings of the preceding chapters, objectives of the study and the questions that were to be answered by the study. The recommendations focused on the thematic areas of study which were: the sources of water supply for households in Kitale informal settlements, water management practices associated with water scarcity in the Study Area, effects of water scarcity and socio economic on household's livelihood in the Study area, and measures that should be put in place to alleviate the problem

5.2 Summary of findings

5.2.1 Water Sources management on Household's Livelihoods

From the findings, majority of the respondents indicated that water drawn from shallow wells caused health problems. On whether the springs were protected thus posing health hazards, majority did indeed did agree and strongly agreed that many water sources in the study area was not protected. On the predictability of the water sources, again over a half of the respondents were in the affirmative. On whether the water sources made them sick all the time, majority disagreed meaning that they were not sure whether their sickness was due to water sources.

5.2.2 Water management practices

On water management practices and household livelihoods, majority of the respondents indicated that they did not have piped water in their households. On if the piped water from kiosks was within the residents reach, majority of the respondents answered to the affirmative saying that indeed the water kiosks were within their reach. On the accessibility of water at any time of the day, majority of the respondents answered to the negative saying they did not access water at any time of the day. On water management authorities' effectiveness, majority of the respondents disagreed that they were effective in discharging their duties.

5.2.3 Water Stakeholders on Household's Livelihoods

Majority of the respondents when asked on whether NZOWASCO supplied piped water in their village, cumulatively they said that the company did not perform their role of provision of water in their village. When asked whether there are NGOs invested in water resources majority remained neutral showing they were not away if such play exists in their villages. On water service trust fund, the majority of the respondents did not seem to know existence of these national government parastatals which is mandated to provide services to informal settlements. The study also wanted to find out if the community itself invested in the water services. Majority of the respondents disagreed that the public does enough to maintain and sustain the water resources in their village.

5.2.4 Measures to Water Scarcity on Household's Livelihoods

From the analysis, most respondents, indicated that they preferred water harvesting as the an intervention to solving water scarcity. This showed that water harvesting can be

an interim measure to water storage however, majority of them when asked on storage subsidies, majority of the respondents remained neutral to subsidized water storage facilities an indication that they were not sure if this happens. The best option for water scarcity intervention according to the respondents was sinking boreholes and donors' support in building water storage facilities with an accepted rate of the majority agreeing strongly to the options. This is an indication that the hope of the respondents only remains on the county government and donors

5.3 Conclusion

Based on the study objectives the study concluded there was a relationship between water sources and health of household livelihood and it concluded that water sources had an effect on household livelihoods. It is also concluded that water management practices, water sources and health and measures to water scarcity had a relationship with household livelihood in the study area.

5.4 Recommendations

Based on the findings, the researcher recommended the following:

5.4.1 Water sources and health of house hold livelihoods

The study recommends that the community, county government and water agencies should protect and safeguarded water sources in the study area since there is evidence to show that they can contribute to management of water scarcity efficiently if they are protected.

Public health officers should carry out water safety measures from the shallow wells.

There is need for the selected informal settlement to be upgraded especially with a focus of improving access to water supply.

There is need to protect shallow wells and other water sources to avoid contamination. Closely related to this is the need for sensitization of the community on better hygiene especially hand washing practices to avoid spread of water related diseases. The responsible government institutions such as the ministry of Public Health and Sanitation need to ensure enforcement of the public health policies and laws in order to protect the people from being exposed to hazards such as contaminated water sources.

Proper management of water resources should be prioritized in the area in order to improve on its accessibility. In particular, there is need for solid management in place. More funds should be directed towards repair and maintenance of water related infrastructure.

5.4.2 Water management practices and household livelihood

The water distrubtion company should review the water pricing downwards so that the consumers can access it at affordable price. This can be done by National Government removing the attached taxes on storage tanks, hence lowering the price. The water distribution chain should increase the number of water kiosks to bring it closer to the consumer. This lower the water prices since the longer the distance from the kiosk, the higher the price.

Water managing companies should make sure that water kiosk have water throughout for the house hold to access throughout the day instead of water running dry after some time.

The water management board should either be changed or retrained to give them capacity in water resource management for them to give better services to the residents in the informal settlements.

5.4.3 Water Stakeholder and House Hold Livelihoods

From the study findings, the study recommends that NZOWASCO, Water service trust fund, lake victoria water service board and NGOs should make an effort to see that there is piped water in villages so as to reach as many households livelihoods.

All stakeholders especially the non-state actors should invest heavily in water resources to cushion members of the public in informal ssettlements from water scarcity which impacts on their livelihoods directly.

The goverment to activate the water service trust fund to provide relief of clean water to the informal public as an intervention to water scarcity.

The community should be sensitized to mantain and sustain the water resources within their area as a stop gap measure to water scarcity in the informal settlement.

5.4.4 Measures to water scarcity and house hold livelihoods

The study recommends that the county government, government through ministry of Water and Irrigation, non-state actors need to increase levels of awareness of Rain Water Harvesting within the area to ensure constant supply of water at household levels.

There is need to encourage water harvesting and storage in order to deal with the current water scarcity in the study area. There is also need to consider subsiding on the prices of water storage containers to help as many households as possible (pro-poor tariffs).This

can be done by National Government removing the attached taxes on storage tanks, hence lowering the price.

It was also recommended that water service trust fund to chip in and health in improving water bodies among the livelihoods.

There is need for the selected informal settlement to be upgraded especially with a focus of improving access to water supply. Consideration should be made on subsidizing the prices of water so that most households can afford. Access to water could also be enhanced if the residents are empowered economically through income generating projects. There is also need for review of existing water policies in order to create enabling environment for service delivery especially in the informal settlements.

5.4 Areas for further Research

The following are suggestions for further research study: A study should be done to investigate determinants of unsustainable water resources in informal settlements in Kenya. Studies too need to be done in other informal settlement areas to find out the effect on the family households. Further research in future should include comparison of water scarcity on political participation of the informal settlement dwellers.

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Appendix I: Research Questionnaire

Dear respondent,

I am a student at St. Paul's University taking master's degree in development studies. I am conducting research on: water scarcity and socio-economic effects on selected households in the informal settlement, Kitale town, Trans Nzoia County. I therefore request you to kindly complete the questionnaire below to assist me collect data. Your information alongside others will help me in my research and will be used strictly for academic purposes and will be treated as confidential, therefore, do not write your name on the questionnaire.

Kindly tick where appropriate or write your response in the spaces provided

SECTION A: Personal data

1. Gender: (a) Male [ ] (b) Female [ ]

2. Your position in related field

(a) Government Official [ ] (b) NGO official [ ] (c) Dweller [ ]

3. For how long have lived in this area?

(a) Less than 5 years [ ] (b) 5-10 years [ ] (c) 11-14 years [ ]

(d) > 14 years [ ]

4. Your level of education:

(a) University [ ] (b) College [ ] (c) Secondary [ ] (d) Primary [ ]

(e) No School [ ]

5. Marital status: (a) Married [ ] (b) Single [ ] (c) Separated [ ] (d) Widowed [ ]

6. What is your household consumption of water per day?

Consumption of water in liters per day	Response
1-20	
21-30	
30 and above	

Section B: Water Sources and Household Livelihood

What are the main sources of water supply for households in the selected informal settlements- Kitale town (Tick in the appropriate Box)

1) (a) What are the main source of water in the area?

a) Pipeline Water Kiosks [ ]

b) Shallow wells [ ]

c) Bore holes [ ]

d) Water Springs [ ]

(b) Which sources are mostly used?

---

c. Water Source and health of households

To what extent do you agree or disagree to the following statement of water source and its effect on health of the households in the area? Use a five scale likert of 1= strongly disagree, 2= disagree 3=neutral, 4=agree, and 5=strongly agree

Statements	5	4	3	2	1
Water drawn from shallow wells causes health problems					
Our water springs are unprotected exposing us to health risks					
Our water source is unpredictable exposing us to health risks					
Our water sources makes us sick all the time					

3) (a) Does water management boards allocate funds for repair and maintenance of water sources? Yes [ ] No [ ]

(b) If yes, is the allocation given to informal settlement sufficient?

Section C: Water Management Practices and Household Livelihoods

To what extent do the following water management practice influence water availability in your village? Use five scale likert of 1= strongly disagree, 2= disagree 3=neutral, 4=agree, and 5=strongly agree is used to give responses.

Statements	5	4	3	2	1
I have piped water in my compound					
I get Piped water from kiosks which are within my reach					
Piped water kiosks sales water at affordable prices					
I access water from the kiosk anytime of the day throughout					
Water management authorities are playing their role effectively					

3) (a) Do you think the management of water supply contributes to water scarcity?

Yes [ ] No [ ]

(b) If yes how does it contribute to water scarcity?

Section D: Water Stakeholders and Households Livelihoods

To what extent do agree to the following statements on water stakeholders/ companies/organisation/agencies involved in water supply or investment in your area. Use a likert scale of 1-strongly agree, 2-agree, 3 neutral, 4-disagree, 5-strongly disagree

Statements	5	4	3	2	1
NZOWASCO supplies piped water in my village					
NGOs have invested in water services in my village					
Water service trust fund invests in water services					
The community invests and maintains water sources					

SECTION E: **Household Socio-Economic Effects**

To what extent do you agree to the following statements on the effect of water scarcity on households' livelihood in the selected informal settlements, Kitale town? Use five scale likert of 1= strongly disagree, 2= disagree 3=neutral, 4=agree, and 5=strongly agree

Statements	5	4	3	2	1
I waste a lot time looking for water which I should use to work					
I spend a lot money on treatment due to waterborne diseases					
I have lost business like hotels due to water scarcity					
Water scarcity leads into social evils					

Section F: Measures to Water Scarcity in the Informal Settlements

Use a five scale likert of 1= strongly disagree, 2= disagree 3=neutral, 4=agree, and 5=strongly agree

Statements	**5**	**4**	**3**	**2**	**1**
Rain water harvesting					
Subsidized water storage facilities					
Intervention of water service trust fund					
Sinking boreholes by county governments					

Donors support in building water storage tanks to households					

Thank you for filling the questionnaire

Appendix II interview guide

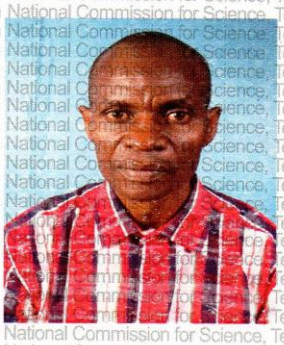
Please respond to the following question

1. Where do get your water from?
2. Do you know any organisations that have helped access clean water?
3. Do have piped water in your home?
4. Has water service trust fund assisted you with water supply at any time?
5. What do you think can be done to ensure you have water throughout

Appendix III: Permit

THIS IS TO CERTIFY THAT:
MR. FRANCIS MWANIKI NZIOKA
of ST PAULS UNIVERSITY, 4176-30200 KITALE,has been permitted to conduct research in *Transnzoia County*
on the topic: *SOCIO-ECONOMIC EFFECTS OF WATER SCARCITY AMONG DWELLERS IN THE INFORMAL SETTLEMENT, KITALE TOWN, KENYA*
for the period ending:
27th March,2018

Permit No : NACOSTI/P/17/77994/15619
Date Of Issue : 30th March,2017
Fee Recieved :Ksh 1000



.....
Applicant's Signature

.....
Director General
National Commission for Science, Technology & Innovation

CONDITIONS

1. You must report to the County Commissioner and the County Education Officer of the area before embarking on your research. Failure to do that may lead to the cancellation of your permit.
2. Government Officer will not be interviewed without prior appointment.
3. No questionnaire will be used unless it has been approved.
4. Excavation, filming and collection of biological specimens are subject to further permission from the relevant Government Ministries.
5. You are required to submit at least two(2) hard copies and one (1) soft copy of your final report.
6. The Government of Kenya reserves the right to modify the conditions of this permit including its cancellation without notice

REPUBLIC OF KENYA

NACOSTI

National Commission for Science, Technology and Innovation

RESEACH CLEARANCE PERMIT

Serial No.A 13554

CONDITIONS: see back page

Appendix III: Letter from NCSTI



NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone: 254 20-2213471,
2241349,3310571,2219420
Fax:+254-20-3,8345,318249
Email:dg@nacosti.go.ke
Website: www.nacosti.go.ke
when replying please quote

6th Floor, Utalii House
Uhuru Highway
P.O. Box 30623-00100
NAIROBI-KENYA

Ref. No. **NACOSTI/P/17/77994/15619** Date **30th March, 2017**

Francis Mwaniki Nzioka
St. Pauls University
P.O. Private Bag - 00217
LIMURU.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"Socio-economic effects of water scarcity among dwellers in the informal settlement, Kitale town, Kenya."*** I am pleased to inform you that you have been authorized to undertake research in **Trans Nzoia County** for the period ending **27th March, 2018.**

You are advised to report to **the County Commissioner and the County Director of Education, Trans Nzoia County** before embarking on the research project.

On completion of the research, you are expected to submit **two hard copies and one soft copy in pdf** of the research report/thesis to our office.

BONIFACE WANYAMA
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Trans Nzoia County.

The County Director of Education
Trans Nzoia County.

Appendix IV: Letter from County Commissioner

THE PRESIDENCY

Telephone: 054 – 30020
Fax No: 054 – **30030**

MINISTRY OF INTERIOR AND COORDINATION OF NATIONAL GOVERNMENT

COUNTY COMMISSIONER'S OFFICE
TRANS NZOIA COUNTY
P.O BOX 11 - 30200
KITALE

E-mail: cctransnzoiacounty@yahoo.com
When replying please quote

TNZC/CONF/ED.12/2/VOL.II/187

2nd May, 2017

TO WHOM IT MAY CONCERN

RESEARCH AUTHORIZATION

This is to inform you that **Mr. Francis Mwaniki Nzioka of St. Pauls University, Kitale** has been authorized by National Commission for Science, Technology and Innovation to carry out research on **"Socio-Economic effects of water scarcity among dwellers in the informal settlement, Kitale Town "** in **Trans Nzoia County for** a period ending **27th March, 2018.**

Kindly accord him the necessary assistance he may require.

COUNTY COMMISSIONER
TRANS-NZOIA COUNTY
P. O. Box 11 - 30200 KITALE

MUSA OKANGO
FOR: COUNTY COMMISSIONER
TRANS NZOIA COUNTY

Appendix V: Letter for the county director of Education Trans-Nzoia

MINISTRY OF EDUCATION
State Department of Basic Education

Telegrams: .....
Telephone: Kitale 054-31653 – 30200
Fax: 054-31109
Email: transnzoiacde@gmail.com
When replying please quote:

County Director of Education,
Trans Nzoia,
P.O. Box 2024 – 30200
KITALE.

Ref. No. TNZ/CNT/CDE/R.GEN/1/VOL.II/28

Date: **2nd May, 2017**

TO WHOM IT MAY CONCERN

RE: RESEARCH AUTHORIZATION – FRANCIS MWANIKI NZIOKA

The above named has authority to carry out research on **"Socio-Economic Effects of water scarcity among dwellers in the informal settlement, Kitale Town Kenya in Trans-Nzoia County"** for a period ending 27th March, 2018

This is therefore to authorize the person to collect data and/or carry out activities related to this particular exercise in Trans-Nzoia County. Whoever may be concerned is requested to co-operate and assist accordingly.

Thank you.

For: COUNTY DIRECTOR OF EDUCATION
TRANS-NZOIA
P. O. Box 2024-30200, KITALE
Tel: 020-2640448

DIXON O. OGONYA
COUNTY DIRECTOR OF EDUCATION
TRANS-NZOIA