INTEGRATION OF GREEN PRACTICES IN UPGRADING INFORMAL SETTLEMENTS IN ELDORET TOWN, KENYA

BY

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A THESIS SUBMITTED IN PARTIAL FULFILMENT FOR THE REQUIREMENT OF THE AWARD OF DOCTOR OF PHILOSOPHY DEGREE IN DEVELOPMENT STUDIES, SCHOOL OF ARTS AND SOCIAL SCIENCES, MOI UNIVERSITY

2020

DECLARATION

Declaration by the Candidate

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DEDICATION

This work is dedicated to my dear husband Wilberforce, my daughters Charity, Joy and Hope, my mother Beatrice and all my brothers and sisters.

ACKNOWLEDGEMENT

For any piece of work to be of quality, one expects input from a number of contributors. First, I thank the almighty God for his love, care, protection and provision in my entire life.

I am grateful and indebted to my two supervisors Prof Leonard Mulongo and Dr Alice Kurgat. Their constructive suggestions, criticisms and corrections strengthened the work in many respects, in terms of both content and organisation

I also wish to thank my friends within and outside the University, for the discussions and criticisms they provided in shaping this thesis. I am particularly grateful to the PhD class of 2014 for their inspirations, discussion, arguments and advice and to Caroline Lusige for the constant friendship she offered.

Finally I would like to thank my husband Wilberforce, who through his encouragement, prayers and moral support kept me on track.

ABSTRACT

The various initiatives being undertaken by stakeholders in upgrading of informal settlements (IS) in major cities in Africa cannot be underestimated. Through these initiatives, a lot has been achieved in terms of infrastructure provision and land tenure regularization. In spite of these interventions, the conditions within the informal settlements have continued to deteriorate. As evidenced on the ground however, a lot needs to be done towards integration of green practices (GP) in order to realise sustainable settlements. This study examined the integration of GP in upgrading of informal settlements in Eldoret town. The specific objectives of the study were to: Examine green practices being employed, evaluate integration processes, assess the impact and determine the dynamics of implementation of GP. The study was anchored on the Triple Bottom Model on sustainability. Based on the pragmatic philosophical underpinning, the study adopted mixed methods approach utilizing concurrent triangulation design. Using multi stage, purposive and simple random sampling techniques, and a sample size of 370 respondents was selected from a target population of 9958. Data collection instruments included questionnaires, interview schedules, observation, document reviews and focus group discussions (FGD). Quantitative data was analyzed through descriptive statistics such as frequencies, percentages and mean. Inferential statistics employed were; Analysis of Variance (ANOVA), Chi–square test and the logit regression model. Qualitative data was analyzed through thematic analysis. The findings of the study showed that IS residents practice various green practices that include; use of electricity, energy saving bulbs, gas for cooking, solar, charcoal when using improved cooking jikos, reuse of water, prompt repairing of taps, use of rainwater, reducing, reusing, and recycling of waste. However, it was found out through the FGD and interviews that the county government of Uasin Gishu has come up with a water policy on rain water harvesting but there was no written policy on green waste management to support reuse, reduce and recycling of waste. Further, IS upgrading is carried out by various stakeholders who carry out various forms of upgrading activities. ANOVA results for various items tested showed statistically significant difference in the rating by the three settlements. For example, there was a statistically significant difference in the mean ratings for ‘use of solar that had led to reduced electricity bills’ at ($F(2,354) = 9.150$, $P = 0.000 < 0.05$ at the 0.05 alpha level. Further, Chi-Square values were statistically significant for all the items tested at $p = 0.000 < 0.05$, indicating all the variables tested were key on implementation of GP. The logit regression model showed that households with green energy and green water practice were highly likely to be employing green practices after upgrading. However, green waste was not highly associated with green practice. The study concludes that green practices have been employed to some extent, various stakeholders are involved in different projects during the upgrading process, adoption of green practices is associated with several benefits but its integration is affected by factors such as high initial cost and lack of maintenance. The study recommends a multidimensional approach given the heterogeneity that exists in integration of GP in the three settlements. Proper policies, infrastructural developments for GP should be integrated in the planning and upgrading processes. Harmonized participation of all stakeholders in financial and actual implementation of the initiatives to increase use, access and adoption of green practices is critical.

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LIST OF ABBREVIATIONS

AFDB : Africa Development Bank

CBOs : Community Based Organizations

CFL : Compact Fluorescent Light

CIDP **:** County Integrated Development Plan

COHRE : Centre on Housing Rights and Evictions

FBOs : Faith Based Organizations

GDP : Gross Domestic Product

GHG : Green House Gas

ICLEI : International Council for Local Environmental Initiatives

IS : Informal Settlement

KENSUP : Kenya Slum Upgrading Program

KISIP : Kenya Informal Settlement Improvement Project

LED : Light Emitting Diodes

LEED : Leadership in Energy and Environmental Design

MDGs : Millennium Development Goals

NEMA : National Environmental Management Authority

NGO : Non- Governmental Organisation.

PRSP : Poverty Reduction Strategy Paper

SEC : Settlement Executive Committee

SGDs : Sustainable Development Goals

UNDP : United Nations Development Programme

UNEP : United Nations Environment Programme

WCED : World Commission on Environment and Development

OPERATIONAL DEFINITION OF TERMS

Development - Overall advancement of communities' living standards towards meeting the basic needs.

Energy Efficiency –this is the ability to produce or better outcome for less energy use

Green Economy – This is the development resulting in improved social equity and human well-being, maximum utilization of resources and at the same time, reducing environmental risks and ecological scarcities through integration of green practices in informal settlement upgrading.

Green Energy – It refers to practices such as use of electricity and solar for lighting, use of electricity and gas for cooking and use of energy saving bulbs.

Green Growth – It is the maximization of opportunities from economic growth through managing natural assets efficiently, building resilience and sustainably.

Green practices - Environmentally friendly and energy efficient strategies like renewable energy, rain water harvesting and proper waste management.

Green Waste – Refers to a shift from less-preferred waste treatment and disposal methods towards the three R's: Reduce, Reuse and Recycle

Green Water – It includes practices such as rain water harvesting, immediate repair of pipes and water recycling.

Household - Refers to the basic unit of a society where individuals both cooperate and compete for resources.

Informal Settlement - These are settlements located within cities with inadequate housing, inaccessible water, energy inefficiency and poor waste management

Informal Settlement Upgrading – The physical, economic, social, and environmental improvements undertaken by various stakeholders

Integration – To combine two or more practices in upgrading

***Jiko* -** Cooking Stove

***Jua Kali* -** Informal Sector

Medium Sized Towns – towns that are larger than small towns but smaller than cities

***Mitumba* -** Second hand clothes

***Muungano wa Wanavijiji* -** Community Group

Recycle – This is when new materials are processed from waste products

Settlement Executive Committee (SEC) - This is a settlement committee made up of representative of stakeholders within the settlement under KENSUP and KISIP

Sustainability – The ability to use resources without affecting its future use

Sustainable Development – can be described in terms of three dimensions; economic, environmental and social.

Upgrading – Improving basic services like electricity, water and waste management, sewage disposal and sanitation.

CHAPTER ONE: INTRODUCTION

1.1 Overview

This chapter presents the framework from which the study is based. It seeks to bring to the core, the concept of informal settlement upgrading strategies and how development actors and governments worldwide have been adopting various appropriate strategies like green practices for sustainable urban settlements. Other key issues discussed in this chapter include: the background of the study, statement of the problem, objectives, research questions, justification, significance of the study, scope of the study, limitation of the study and theoretical/ conceptual framework.

1.2 Background of the Study

Globally, informal settlements have become an unavoidable reality especially for transitional societies. United Nations (2014) cited that over 50% of the world population live in cities and the urban population is projected to increase by another 2.5 billion in 2050 and constitute 66% of the global population (Shen, 2011). While the populations of the most developed nations seem to be steady, the African and Asian urban populations, most of which are in slums or squatter settlement, are growing exponentially. It is projected that over the next four decades, 86% of the world's population growth will occur in Asia and Africa (UNPD DESA, 2011). By 2050, it is projected that urban population in Asia will rise from 1.9 billion to 3.3 billion, while the urban population in Africa will account for 1.2 billion from its current 414 million people. Thus, India, China, Nigeria, USA and Indonesia were projected to produce 497, 341, 200, 103 and 92 million people respectively by 2050 (UNDESA, 2011). The rapid population growth is one of the major causes of the growth of informal settlements as witnessed in Asia and Sub-Saharan Africa whereby Sub-Saharan Africa has 55 per cent

of the urban population living in informal settlements (UN, 2013; 2015). Total urban population living in informal settlements in Asia and Latin America is 30 percent and 20 percent respectively while North Africa has the lowest rate of 11 percent (UN, 2015).

In Kenya, there are approximately 2,000 urban low income settlements and it is estimated that approximately eight million people live in these settlements and that 52% of all low-income settlements are unplanned (Maji Data, 2015). Kibera which is situated in the capital city of Kenya is considered as the second largest slum in Africa. In Kenya, the level of urbanization is estimated to be 50 % by 2030, (UNDAF, 2018). According to the 2019 Kenya Population and Housing Census (KNBS, 2020), Eldoret Town, one of the medium sized towns in Kenya and the capital Uasin Gishu County, is currently the fastest growing town in Kenya and it is the fifth most populated urban area after Nairobi, Mombasa, Nakuru and Ruiru. It is currently inhabited by 475,716 dwellers and it's projected that the town will be home to 584,782 people in 2030. Rapid urbanisation is inevitable and needs to be guided by effective urban planning and practices (Ng'etich *et al*, 2014). Informal settlements act as entry points into the urban environment for those in search of better prospects. Consequently, the mushrooming of the informal settlements exerts pressure on housing and other basic services. In addition, the inhabitable state of these informal settlements pose environmental and health hazards to both the informal settlement dwellers and the rest of the population.

Informal settlements are a menace and governments practise informal settlement upgrading to improve the livelihoods of informal settlement dwellers (UN, 2003). These upgrades are done in several ways like through complete demolishing, construction of formal housing, eviction or improvement of existing infrastructure

through partnership with international institutions such as the World Bank, UN Habitat and other donor organisations. In Kenya, the Kenya Slum Upgrading Programme (KENSUP) was adopted to improve the livelihoods of the informal settlement dwellers to fulfil the Millennium Development Goals (MDGs) Goal 7. Governments have the mandate to seek for effective ways to overcome the challenges associated with the explosion of informal settlements through the maximum utilization of resources while reducing environmental risks as stipulated in the Sustainable Development Goals (SDGs) (AFDB, 2013).

1.2.2 Informal Settlement and Upgrading Strategies

Informal settlements are defined as settlements whereby squatters assert land rights or occupy land for exploitation on land which is not registered in their names or land legally owned by other individuals or government land (Kibwana, 2000). In Kenya, there exists no official definition of informal settlements or slums, and these terms are used interchangeably (HABITAT, 2003). In this study, the term ‘informal settlement’ will be interchangeably used with the term 'slum'.

According to Cronin (2012), an informal settlement is a consolidated area of the city with limited access to urban services characterized by poor living conditions, spontaneous built environment and generally composed of a population with low socio-economic means. (United Nations Centre for Human Settlement, (UNCHS) 2001a) defined informal settlement as “a term used to describe a wide range of low-income settlements with poor human living conditions”. This study adopted the operational definition of the United Nations Expert Group (UN Habitat, 2007) which defined informal settlement as an area that combines to various extents, the following

characteristics: poor structural quality of housing; overcrowding; insecure residential status; inadequate access to sanitation and other infrastructure; and inadequate access to safe water. Thus, informal settlement in this study refers to a settlement which has the above characteristics and viewed as a den for vices such as crimes, drug abuse, urban poverty and illiteracy which have been a threat to development.

Further, the upgrading of informal settlements consists of physical, social, economic, organizational and environmental improvements undertaken cooperatively and locally among citizens, community groups, businesses, and local authorities (Cities Alliance, 2012). Kessler (2000), opines that "upgrading of informal settlement customarily provides a package of improvements in streets, footpaths and drainage, proper solid waste collection, street lights for security and electricity to homes".

According to the World Bank Report 1999-2001, the upgrading approaches might differ in dealing with deficiencies within informal settlements. Upgrading involves improved basic services such as water management, sanitation, sewage disposal, waste management and electricity. Other actions may include the legalization and regularization of property rights which is the provision of security of tenure (UN-Habitat, 2003). This study adopts the upgrading of informal settlement to include improvement of basic services, that is, water, waste management and energy.

1.2.3 Green Practices and Sustainable Development

Globally, there is a rise in attention on tackling the emergence and proliferation of informal settlements across cities. The 3rd United Nations (UN) Conference in June 1996 led to the Istanbul Declaration on Human Settlements and therefore marked a

significant turning point in the global policy discourse on the need to ensure adequate shelter for all. This policy agenda was given attention within the framework of the Millennium Development Goals (MDGs) provided under Goal 7 Target 11, to significantly improve the lives of over 100 million slum dwellers by the year 2020 (UN Habitat, 2003). More recently, the Sustainable Development Goals (SDGs) adopted in September 2015, includes SDG number 11, which calls upon countries to ensure that cities are safe, more inclusive, sustainable and resilient.

Adopting green practices is the pathway to achieving Sustainable Development Goals while addressing challenges in the informal settlements. Green is a catchall term referring to resource protection and practices which emphasizes certain core concepts, such as resource efficiency (notably balancing consumption with nature‘s ability to replenish these resources while defending the natural systems that humans and alternative species rely upon **(**Carley *et al*., 2011). Green also refers to certain policy topics in different sectors, including activities and technology associated with transport, recycling and waste management, and pollution prevention, efficiently produced and consumed energy that is clean and other environmental services.

Going green and adopting various environmental management techniques and green practices provides an alternative paradigm that offers the promise of development while protecting the earth’s environment and in turn, contributing to poverty alleviation and addressing the challenges of urbanization especially in informal settlements (Hadi 2015). According to *Going Green Sustainable Resource Guide 2008 – 2015* by Middletown Thrall Library (2008), green practices are practices that can lead to more environmentally friendly and ecologically responsible decisions and lifestyles, which

can help protect the environment and sustain its natural resources for current and future generations. It is also defined as the practices supporting environmentalism while utilizing the resources (Green Times, 2013). This study adopted green practices to include strategies that were integrated in upgrading of informal settlement to ensure sustainability. It is more than the provision of housing, water, and electricity to include more environmentally friendly and energy efficient housing connected to strategies of using renewable energy, using rain water harvesting and proper waste management (UN-HABITAT, 2012).

There are many dimensions of green practices which include: Green planning and design, green open space, green waste, green transportation, green water, green energy, green building and green community (Hadi, 2015). This study adopted; green energy, green water and green waste dimensions in the upgrading of informal settlements in Eldoret.

The main terms associated with green practices include green growth or green economy. A green economy is an economy that results in improved human wellbeing and social equity, while significantly reducing environmental risks and ecological scarcities (UNEP, 2011, OECD, 2011, UN-ESCAP *et al*., 2010). Green growth as a framework for achieving sustainable development has been recognized by various international organizations and many governments are developing policies to integrate the concept into their development plans and Kenya has not been left behind from embracing the concept of green growth.

1.2.4 Informal Settlement in Kenya

Kenya, like other transitional societies, has undergone an increase in its urban population in the recent past. This has posed a great challenge to urban economies leading to inability to cope with the increase in demand for essential services such as housing, health and education. This has resulted in the rise of Kenyan urban dwellers who languish in poverty and reside in overcrowded informal settlements that lack basic amenities so as to sustain a minimum level of living (Mgele, 2014). In Kenya, there are approximately 2,000 urban low income settlements and it is estimated that approximately eight million people live in these settlements and that 52% of all low-income settlements are unplanned (Maji Data, 2015).

According to the 2019 Kenya Population and Housing Census (KNBS, 2019), Nairobi which is the capital and largest city of Kenya, has more than 4.397 million inhabitants, about 200 informal settlements and home to 60% of its population occupying just 6% of the land (APHRC, 2014). UNDP (2011) projects the city will have a population of 6.1 million by 2025. Informal settlements can be categorized into poor settlements in unplanned areas and those that arise out of illegal sub-divisions of either government or private land. Mostly, these settlements are characterized by lack of access to secure, adequate and affordable water and sanitation services, low income, inadequate housing, insecure land tenure, poor environmental conditions, and high crime rates (UN Habitat, 2008). Nairobi is host to a number of informal settlements including Kibera, Mathare and Mukuru Kwa Njenga among others. Kibera is the second largest informal settlement in Africa with a population of just over 170,000 inhabitants (UN-Habitat, 2014). Rapid growth of informal settlements in Kenya can be linked to the rise in income disparities, urban poverty and high costs of urban living, lack of housing due to

increasing rates of rural-to-urban migration and poor investment in low-income housing.

Eldoret town, one of the medium sized towns in Kenya, has witnessed an unprecedented increase in urban population especially in the informal settlements, over the past years. This is attributed to rural-urban migration, devolution and urban agglomeration among other factors. Informal settlements areas with high population concentration include; Langas, Munyaka, Huruma, Maili Nne and Kamukunji. These settlements are characterized by inadequate access to sanitation, inadequate access to safe water, overcrowding and insecure residential standing, poor infrastructure, poor structural quality of housing, lack of energy. Intense overcrowding and complete lack of infrastructure presents the greatest physical challenges to upgrading (CIDP 2013).

1.3 Statement of the Problem

Globally, informal settlements have become an unavoidable reality especially for transitional societies. Informal settlements provide an entry point of access into the urban environment for newcomers in search of better prospects. In Africa and other developing economies the situation is dire with several attempts aimed at resolving these challenges. Eldoret Town is one of the medium sized towns and currently the fastest growing town in Kenya. The town is the fifth most populated urban area after Nairobi, Mombasa, Nakuru and Kisumu. The rapid urbanisation in growing towns is inevitable and has resulted into the mushrooming of the informal settlements that have contributed to serious development challenges of substandard housing, inadequate water, poor sewerage and sanitation facilities, inefficient energy, lack of educational and health facilities. Consequently, the inhabitable state of these informal settlements

pose environmental and health hazards to both the informal settlement dwellers and the rest of the population. The rise of the challenges within informal settlements has led to both local and international bodies trying to mitigate the effects and this has led to upgrading programmes which are aimed at improving living conditions within the settlements. While developed countries have attained meaningful achievement in integrating the green initiatives, this has been elusive for developing countries. In Kenya for instance, the government and development partners have attempted several intervention strategies both in cities and towns which include Kenya Informal Settlement Improvement Project (KISIP), Kenya Slum Upgrading Programme (KENSUP) and various small-scale initiatives with minimum success. For example, the upgrading of Kibera slum under the KENSUP has proved to be expensive and unsustainable. Although the mission was to provide better and decent housing, other numerous issues associated with informal settlements such as low income, unemployment, energy efficiency, proper water and waste management remain notably unaddressed. KISIP was implemented in Munyaka, Kamukunji and Huruma informal settlements in Eldoret. In spite of these interventions the conditions within the informal settlements have continued to deteriorate implying that the previous development paradigm ignored the improvement of the household livelihoods and minimization of environmental risks which are key pillars to sustainable urban development. One area that has not been fully exploited that could have helped in addressing these challenges is the integration of green practices in upgrading informal settlements. Green practices are workable strategies that are in line with Kenya Vision 2030 and SDGs that not only address settlement challenges but also open up opportunities for employment for the urban poor and ensure environmental sustainability. The study was informed by the above discourse and set out to examine the integration of green practices in upgrading

informal settlements in Eldoret town within Munyaka, Kamukunji and Huruma informal settlements.

1.4 Objectives of the Study

1.4.1 General Objective

The general objective of the study was to examine integration of green practices in upgrading informal settlements in Eldoret, a medium sized town in Kenya.

1.4.2 Specific Objectives

The Specific Objective of the study were to:

i. Examine the green practices employed in upgrading informal settlements in Eldoret town.
ii. Determine the integration process in upgrading informal settlements in Eldoret town.
iii. Assess the impact of green practices in sustainable informal settlements upgrading in Eldoret town.
iv. Determine the dynamics in the implementation of green practices in informal settlements upgrading in Eldoret town.

1.5 Research Questions

i. What are the green practices adopted in upgrading informal settlements in Eldoret town?
ii. What is the extent of stakeholders' involvement in upgrading informal settlements in Eldoret town?
iii. What is the impact of the integration of green practices in sustainable informal settlement upgrading in Eldoret town?

iv. What are the dynamics in the implementation of green practices in upgrading of informal settlements in Eldoret town?

1.6 Scope of the Study

Although the informal settlements challenges are widely spread in Kenyan urban centres, the scope was limited to three informal settlements namely: Munyaka, Huruma/Mwenderi and Kamukunji in Eldoret town. The three are among the selected IS in Kenya which have benefited from KENSUP, KISIP and other small scale upgrading strategies. This study was confined to 370 households, 7 Government Actors, and 57 Settlement Committee (SEC). The study was concerned with integrated green practices in the context of IS upgrading. Green practices include green energy, green water and green waste dimensions in the upgrading of informal settlements in Eldoret. This study adopts the upgrading of informal settlement to include improvement of basic services, that is, water, waste management and energy.

Further, the study was based on the philosophical and methodological foundations of pragmatism. The study timeframe was between March 2016 and November 2017.The findings would be applicable to the three informal settlements however generalization will be made to the other informal settlements in Eldoret because they have similar characteristics and challenges.

1.7 Limitations of the Study

The target population in the three informal settlements were the household heads and there was the challenge of accessing most of them during the daytime hours as they were away or were involved in other activities.

The study was also limited by inadequate financial resources therefore limiting the study coverage to only three settlements. The researcher however overcame this limitation by using existing settlement executive committees and county development officers working within the vicinity that are in close contact with the community and are custodians to information needed for the study.

There was also the problem of insecurity (because of the nature of study area where insecurity is quite high due to unemployment and mugging is a common occurrence) but this was minimized by reporting to the local administrators of the specific areas under study in order to be given further assistance and direction and they provided security for the researcher by availing local residents who acted as guides and bodyguards.

Some of the respondents were not willing to fill in the questionnaire or to provide information for fear of being victimized. Thus, much time was spent convincing them that the exercise was purely academic and that the outcome would not be used to victimise them.

In addition to evading any hostility and unwillingness by respondents to give information, the locals were well trained and used as research assistants to help get rid of language barriers encountered during individual interviews and focus group discussions.

In regard to the content and the literature review, there was shortage of local research for references related to this topic and documented materials. The study outsourced information from other international and regional related literature.

1.8 Justification of the Study

The international community is currently placing growing emphasis on development policies and practices which provides a response to various challenges like the urbanization, climate change, food and economic crises that the globe has been facing with an alternative paradigm that gives the promise of recent economic process whereas protective the earth's ecosystems and, in turn, poverty reduction.

One of such practices is adoption and integration of the green practices in informal settlement upgrading. Since informal settlements are an entry point for rural urban migrants, they provide shelter to a large number of urban poor dwellers in Kenya and they are a common phenomenon in all urban centres for instance, Eldoret town in Uasin Gishu County addressing the challenges of informal settlements through integration of green practices will contribute towards improving the livelihoods of the informal settlement dwellers. The failure of informal settlement upgrading processes would mean continued suffering of the vulnerable groups in the informal settlement.

Pragmatism was suitable because it is a philosophical underpinning for mixed methods studies, it is not fixed to any one system since it draws freely from both qualitative and quantitative assumptions. It allowed the researcher the freedom to choose the approaches, techniques and procedures that sufficiently guided the conduct of inquiry into integration of green practices in informal settlement upgrading. In addition,

pragmatic philosophy has its priorities on the practicality and application of research, to solve human problems.

1.9 Significance of the Study

The findings will be useful to the stakeholders, county government, Ministry of Housing and Urban Development, National Environment Management Authority (NEMA), physical planners and development actors interested in getting a better understanding of the role played by green practices and its implication in informal settlement upgrading. The study will give some guideline information to policy makers, urban planners, environmental advocates, Non-Governmental Organizations (NGOs) and the researchers about the integration of green practices in informal settlements upgrading. The study identified the green practices already adopted and proposed appropriate recommendations for adopting more appropriate green practices. The study will be important in providing recommendations intended to fill the gaps and identify loopholes that might have been overlooked by various stakeholders concerned with informal settlement upgrading programmes in their approaches and interventions.

1.10 Chapter Summary

Globally, the emergence and proliferation of informal settlements are a menace across cities. Eldoret town has witnessed an unprecedented increase in informal settlements population attributed to rural-urban migration, devolution and urban agglomeration. The inhabitable state of informal settlements poses environmental and health hazards. Local and international bodies have adopted informal settlement upgrading strategies to mitigate the effects and improve the living conditions of the dwellers. In spite of the interventions the conditions within the informal settlements

have continued to deteriorate. Numerous issues associated with informal settlements such as low income, unemployment, energy efficiency, proper water and waste management remain notably unaddressed. The existing projects have proved to be expensive and unsustainable without the improvement of livelihoods and minimization of environmental risks which are key pillars to sustainable urban development. This scenario could be adequately addressed through integration of green practices which are a sustainable strategy for upgrading informal settlements.

CHAPTER TWO

LITERATURE REVIEW

2.1 Overview

This chapter highlights the relevant literature review of the study. The literature review is important because it assists in conceptualizing the problem, determining the major variables and in understanding the relationship among them. It will aid in finding the origin of research on the problem and in identifying the gaps. It will also assist in getting suggestions on how to go about the study by omitting mistakes from previous research and incorporating newer effective methods. Finally, the literature review assists in conceptualizing the problem in context of previous research and how they relate to the research to be undertaken to avoid spending time in repeating what has already been done.

The foregoing discussions highlight advances in understanding green practices. Dimensions of green practices, basics of integration of green practices, informal settlement upgrading concepts, value and functionality of informal settlements, informal settlement upgrading processes and approaches, impact of integration of green practices, dynamics in implementation of green practices in informal settlement upgrading, theoretical framework and conceptual framework.

2.2 Green Practices Concepts

2.2.1 Advances in Understanding Green practices

The term “Green”, according to Carley *et al* (2011), is often used to refer to resource protection and practices which emphasise certain core concepts which include resource

efficiency (that is to say, carefully balancing consumption of resources with nature‘s ability to replenish them) and the need to protect the natural systems upon which humans and other species depend. Green can also be used to refer to certain policy topics in different sectors, including activities and technology associated with transport, recycling and waste management, and pollution prevention, efficiently produced and consumed energy that is clean and other environmental services. The term green is currently often used as a synonym for environmental sustainability. The green ambition's greatest desire is to preserve and promote efficient use of natural assets to ensure a high quality of life is maintained over the long term.

Seoul's Master Plan for Low-carbon Green Growth in Jones and Yoo (2012) defines green as attaining economic growth while minimising the burden on the ecosystem. Chicago Metropolitan Agency for Planning (2010) extends the definition to apply to activities that respond to resource scarcity issues associated primarily with water supply, energy, and climate change The Green Infrastructure Strategy of Leeds (UK) apply the green concept to optimise natural assets as a means to enhance economic vitality, environmental health and performance of the city (Leeds City Region Partnership, 2010). The term “green movements” can be traced to the middle of the 1960s, whereas the notion of “green practices” is a fairly recent concept that emerged at the end of the 20th century as a result of the growing public concern about the economic development sustainability and the increasing awareness of environmental issues like the deterioration of environmental quality and the accelerating depletion of natural resources (Dryzek *et al* 2003).

The term green practice is associated with green economy which has become popular in recent years as a result of its role in providing response to the multiple crises that the world has been facing like urbanization, climate change, food insecurity and economic crises. It provides an alternative paradigm that offers the promise of growth while protecting the earth's environment and in turn, contributing to poverty alleviation. In the recent past, the concept has received vital international attention as a tool to deal with the 2008 money crisis, likewise it is 1 of the 2 themes for the 2012 UN Conference on Sustainable Development (Rio+20). This has resulted in increasing literature especially new publications on inexperienced economy from a range of important international organizations, think tanks, national governments, non-government organisations, experts and others (AFDB, 2012).

The term green economy is often used in varied ways with varied implications. The phrase "building a sustainable economy" suggests various things to completely different individuals, however generally it refers to encouraging economic development that prioritizes maximum utilization of resources operating with nature and not against it in the quest to meet peoples' needs and rights instead of disregarding environmental concerns in the process of growing the economy (AFDB, 2012).

Burkart (2012) defines a 'green economy' as based on six main sectors: renewable energy, green buildings, clean transportation, water management, waste management and land management while considering the three pillars of sustainability which include the social, the economic and the environmental. Towards a green practice is among UNEP's key contributions to the Rio+20 concept and also the overall goal of addressing economic states in the twenty-first century. The report makes a compelling economic

and social case for investment where 2 percent of world gross domestic product is utilised in greening 10 central sectors of the economy so as to shift development and unleash public and private capital flows onto a low-carbon, resource-efficient path (UNEP, 2011). The Kenyan government is already implementing green economy related policies and practices which shows Kenya is embracing the concept of the green economy. With many governments especially in Africa currently seeking effective ways to lead their nations out of various internal and external challenges like climate change and growth of informal settlements, green economy practices have been proposed as a means for dealing with such challenges and support for sustainable development. According to the study, Green practices include strategies that are integrated in informal settlement upgrading to ensure sustainability. For example, it's not about provision of housing, water and electricity in the informal settlements but provision of more environmentally friendly and energy efficient housing connected to strategies of utilising renewable energy, rain water harvesting and proper waste management (UN-HABITAT, 2012).

It is suggested that there is a need to differentiate green technology, systems and practices from brown practices, which are associated with environmental degradation and imbalances in resource management, which will eventually produce disastrous outcomes to the ecosystem. However, in the real sense, the line between green and brown is a relative and dynamic concept (Martinez-Fernandez *et al.*, 2010) since those things which are seen as inexperienced nowadays might not be thought of inexperienced in future due to the ever changing tastes, technology or knowledge of the acceptable levels of pollution or the best levels of resource use. Eventually, as a lot of

economical materials and production processes are adopted, brown industries will become greener.

2.2.2 Dimensions of Green Practices

Going green is a multi- dimensional process and there are various practices that can be integrated in informal settlements upgrading in order to shift to a green city. Generally speaking, there exists a need for environmentally aware development actors and governments to participate at least in one of "4Rs" – reduction, reuse, recycling, and recovery (Kassaye, 2001) which can be achieved through adopting other green practices.

Figure 2.1 below presents a non-exhaustive scheme of commonly employed green cities practices suggested by Hadi (2015). They include green planning and design, green open space, green waste, green transportation, green water, green energy, green building and green community.

Source: Hadi (2015)

Figure 2:1 Dimensions of Green Practices for Green Cities

While the green practices or technologies employed to achieve sustainability in urban informal settlement upgrading are constantly changing and may differ from city to city and even town to town in a country, fundamental principles persist from which the method is derived which includes water efficiency energy, indoor environmental quality enhancement efficiency, materials efficiency, operations and maintenance optimization and waste and toxics reduction (Pushkar *et al.,* 2005). The essence of green practices is the adoption of one or more of the above dimensions for example green energy, green waste and green water.

2.2.2.1 Green Energy

Global energy demand remains to grow so as to satisfy development wants, within the context of growing populations and financial gain levels. Adopting green energy practices aims to end "energy poverty" for the estimated 1.4 billion people who currently lack access to energy and the 2.7 billion individuals who are currently using biomass would like healthier and cleaner energy sources (IEA 2010). Greening the energy sector would require enhancements in energy efficiency and a much greater supply of energy services from renewable sources, both of which will lead to reducing greenhouse gas emissions (GHG) and other types of pollution and enhancing energy security at global, national and local levels (UNEP, 2011). The Kenyan Vision 2030 aims to turn Kenya into a "newly industrialised, middle-income" country. One of the sectors that has been recognized to aid in achieving this goal is the energy sector. Kenya's energy needs are derived primarily from: wood fuel (69%), petroleum (22%) and electricity (9%). This clearly indicates that this backward energy composition is a

cause of concern for a country that plans to make leaps in development. Therefore, the government must put in place strategies that promote renewable energy.

Concern over ecologically-friendly energy is not a local phenomenon. Andreasson (2014) study on the Metro Manila informal settlement in the Philippines through an energy security review focused on three sustainability objectives, including: access to new, sustainable energy for all, uninterrupted availability and quality of supply, and acceptability from a social and environmental perspective. The study employed quantitative method of surveying the patterns of energy use of informal settlement dwellers. The study found that charcoal, fuel, firewood and eventually kerosene are the most common source of cooking fuel. The study also found that most of these people use electricity for lighting but the study pointed out that it was not the exact scenario because there are different means of obtaining electricity by informal settlers described in the same study as formal, informal and free. But the gap was that the study did not explore alternative energy options such as use of solar, which might strengthen the energy stability in the informal settlements. This study therefore resolved the void by exploring sustainability practices such as incorporating green energy into IS upgrading.

Njoroge (2016) did a study on the Influence of the Kenya Power Slum Electrification Program on the use of electricity in Munyaka Informal Settlement in Uasin Gishu County in Kenya. The study used an exploratory research design using a mixed method of quantitative and qualitative approaches. The program subsidized connections had positive effects on the use of electricity. In particular, the highly reduced cost of connection had encouraged the residents to link to the national grid, because they were in a position to afford the capital contribution laid down in the slums electrification programme. The study observed that the properly installed electricity grids have

minimized meter vandalism and manipulation as the informal settlements dwellers have been sensitive to the common good of all by taking care of the electricity grid infrastructure and thereby helping to minimize electrocution and fire cases. There are also minimal instances of unauthorized electricity connections as there are concrete electric poles. The difference with this study, however, is that the research did not analyse other renewable energy sources, such as the use of solar.

Gongera and Gicheru (2016) carried out a descriptive study to examine the awareness and adoption of green energy technologies in the Kibera slums. The results showed that there is a high degree of awareness about green energy technologies but it does not lead to high adoption. It also found that green energy is being used extensively in technology-supplied places by NGOs. However, the study did not recognize the role of all stakeholders, such as private sectors and development actors. This study therefore came to fill this gap by looking at the integration process which entails how the process was done and who did the upgrading in this case the various stakeholders since IS upgrading requires various stakeholders to be involved.

Mukwaya (2016) carried out research on urban adaptation to energy insecurity in Uganda. Results indicate that while the use of charcoal is consistent across all households, an oversized proportion of the IS populous is heavily dependent on multiple energy sources. In addition, households are burdened with increasingly high retail prices for energy, power volatility and wood shortages, and wasteful / inefficient energy usage. The study also found that energy security adaptation techniques include self-generation, adaptation of cooking practices, energy replacement and the use of improved energy technologies. Several studies have looked at energy security and

adaptation in informal settlements, but little has been done to incorporate energy saving practices into the informal settlement upgrading.

2.2.2.2 Green Waste

Greening the waste sector is moving from less-preferred waste management and disposal methods, such as burning, to the implementation of entirely different forms of land filling, including 3 Rs: reduction, reuse and recycling (UNEP, 2011). The technique is to manoeuvre upstream across the hierarchy for waste management, supported by the globally recognized Integrated Solid Waste Management (ISWM) method as shown in Figure 2.2.

Source: UNEP 2011

Figure 2.2: The Waste Management Hierarchy

The ISWM is a systematic approach towards managing all waste sources; encouraging 3Rs, segregation, the priority of waste reduction and minimisation, the incorporation of safe transport, waste handling and disposal, with the aim of optimizing the efficiency

of resource usage. This is departure from the normal approach, in which waste is primarily treated in a manner compatible with the end-of - pipe treatment (including incineration (without energy recovery) and land filling.

Greening the sector activities under ISWM include:

- Construction and maintenance of waste disposal systems, waste stream material retrieval (collection and segregation) and 3R technologies and related operations.
- Recovery of energy using waste residual energy;
- Prevention of landfill, which protects land and reduces pollution risks;
- Conservation of resources that prevent unnecessary use of resources;
- Collection and segregation of waste, ensuring proper treatment of waste;
- Recycling waste that turns waste into useful products;
- Elimination of wastes by maximizing the use of resources to reduce waste.

Integration of green waste practices therefore involves careful considerations of the above activities from waste collection to final stage of disposal.

Trasias *et al* (2016) did a study on practices, separation and disposal methods, concerns regarding solid wastes, and willingness to participate in waste separation and composting. The findings indicate that food remains and plastics formed the biggest proportion of wastes generated in households. Most households disposed general wastes by open dumping while they disposed plastics by burning. In addition, a small percentage of households conducted composting while half of the households carried out separation for some decomposable wastes. The authors pointed out that although respondents frequently reused plastics, the majority finally disposed of them in open dumping sites or burnt them in open pits. Plastics are non-biodegradable and, when

inappropriately dumped, result in clogging of drainage channels, creating water pools convenient for mosquito breeding and generating nuisance of smell.

Nirgude *et al* (2014) study found out that majority of respondents were having poor knowledge levels regarding segregation of solid waste and the common problems for waste disposal reported were non availability of dust bins and municipal vans for regular collection of solid wastes. In addition, dumping the wastes outside the house indiscriminately was preferred by the majority of the households. The results in this study clearly indicate the principal problems in the practice of solid waste disposal by informal settlement dwellers that require the adoption of sustainable practices to address the issue.

According to Waweru and Kanda (2012), on a study in Kibera informal settlement, waste reuse at the household level is carried out through the use of plastics, glass bottles, paper, card boards and cans for domestic purposes. These materials are disposed of only when they are no longer of any use to the owners. Outside the household level, there are small scale recyclers who collect the items. Small scale farmers collect the organic waste, sometimes paying a small fee, for use as organic fertilizers. The findings also indicate that solid waste disposal by burning is common practice in Kibera due to lack of access to waste disposal facilities and other residents dispose of their wastes by throwing them in open pits. The researchers point out that plastics and metal tins if not properly disposed can retain water and act as breeding grounds for insects such as mosquitoes.

Medina (2010), argues that many cities in Africa, Asia, and Latin America face serious problems managing their wastes especially in informal settlements where over one billion people live. The two major problems pointed out by the study are the insufficient collection and inappropriate final disposal of wastes with the argument that despite spending increasing resources, many cities particularly in Africa and Asia collect less than half of the waste generated. Most wastes are disposed of in open dumps, deposited on vacant land, or burned by residents in their backyards. Insufficient collection and inadequate disposal generate significant pollution problems and risks to human health and the environment.

Beamlak (2012), opines that informal workers in solid waste management (SWM) are often ignored or seen as hindrances to efficient waste management processes because little is known that these informal actors often contribute significantly to resource recovery and recycling of waste materials. Households, waste collection truck crews and informal waste collectors are the major actors playing an important role in the recovery of plastics and metals to generate additional income and this can have a very positive impact on waste management systems, especially in low and middle income countries.

Various studies have looked into how waste is disposed, knowledge on disposal practices, waste reuse, problems in managing waste, role of stakeholders in solid waste management. However few studies exist on integration of green waste practices which involves the sorting of waste at household level, reuse, proper disposal, collection and transportation, use of landfill and recycling waste management practices. Van De (2001) and Coad (2005) argue that the expression “integrated solid waste management”

is often used to suggest the inclusion of the concept of integration in all stages of waste management from generation to final disposal to ensure success in solid waste management.

2.2.2.3 Green Water

Access to clean water and proper sanitation is a human right worldwide and is important to the future of all households (UN 2010a). Connection to the water supply and sanitation facilities is a fundamental human right based on the Kenyan Constitution (ROK, 2010). The Constitution made it a priority to find sustainable solutions, in particular for urban residents with low income to enhance access to water and sanitation through sustainable practices. In Kenya, the Constitution highlights the transition in the water and sanitation sector to new quality and affordable service delivery. It also considers access to clean and adequate water and household sanitation as a fundamental human right and the county governments are responsible for providing these core services. In general, the main users of water are industries, agriculture, energy production and domestic use. As urbanisation and population growth continue to increase, water usage and demand are expected to continue to rise to alarming levels (Republic of Kenya, 2008). Ensuring access to water and sanitation for everyone is therefore necessary to guarantee human rights as enshrined in the Kenya's Constitution.

According to Mafuta (2011), access to safe drinking water and sanitation is even more restricted in the densely populated informal settlements and peri-urban areas of Africa. The delivery of water and sanitation in Africa's urban centres is characterised by deficient, aging and overloaded networks. This, combined with the degradation of the quantity and quality of water sources through poor management of wastewater and solid

waste, as well as low capacity to reuse and recycle wastewater, has resulted in inadequate water supply to serve a growing population.

Murthy (2012), argues that the primary barriers to accessing water in slums are not solely monetary or technical but also legal, institutional, and political. For instance, lack of policies linking water entitlements to land tenure compromise water access for people living in slums in cities in other low and middle-income countries, including Bangladesh, Kenya and Nigeria. In addition, lack of property rights can impede provision of this vital service even when sound public health and economic reasons exist for providing slums with access to municipal water supplies (Mudege, 2011).

2.2.3 Basics of Integration of Green Practices

New aphorism in informal settlement upgrading is "integration" which includes social integration, physical integration and juridical integration (Acioly, 2002). Social integration involves specific programs that address community needs, vocational technical training and social development. Physical integration is the transformation of settlements through opening of roads, direct public investments, connection of infrastructure networks and public services. Juridical integration means the regularization of land and resolution of land ownership issues. In addition, currently the paradigm shift is towards integration of green practices which are the pathways to attaining sustainable development goals. Green practices end up in improved human welfare and social equity whereas considerably reducing environments risks and ecological scarcities (UNEP, 2011). There is a need therefore, to explore how green practices have been integrated in the informal settlement upgrading in Kenya.

2.3 Informal Settlement and Upgrading Approaches

2.3.1 Informal Settlements Concepts

The growth of cities in transitional societies has been associated by spontaneous urbanization which is adversely affecting the future of cities. This form of urbanization leads to the growth in informal settlements and where one third of the global urban population lives today (UN Habitat, 2012; Chowdhury, 2006).

Informal settlement growth has been widely acknowledged as a manifestation of poverty, and that where poverty levels are high and urban growth rate is rapid, it is impossible to prevent informal settlement growth. Therefore, these settlements in the cities of developing countries cannot be wished away (Chowdhury, 2006). Urban expansion has become almost one with this type of unplanned urbanisation that leads to cities being unable to maximize their role in economic development, social prosperity, and generation of wealth (UN Habitat, 2012; Charumitra, 2014). Thus the challenge for every government is to find realistic and effective ways for addressing this problem.

Definitions of informal settlements vary from one country to another and depends on several factors and the main reason for which the label is intended. Informal settlement to Cronin (2012), is a consolidated area of the city with limited access to urban services characterized by poor living conditions, spontaneous built environment and generally composed of a population with low socio-economic means. UNCHS (2002) defined an informal settlement as “a term used to describe a wide range of low-income settlements and/or poor human living conditions”. The operational definition of a United Nations

Expert Group is what will be adopted for this study. To them, an informal settlement comprises of an area combining the following characteristics to various extents:

- Inadequate access to safe water;
- Inadequate access to sanitation and other infrastructure;
- Insecure residential status
- Overcrowding; and
- Poor structural quality of housing (UN-Habitat 2007).

Thus, an informal settlement in the present study refers to a settlement which is characterised by the above attributes and features.

2.3.2 The Value and Functionality of Informal Settlements

Any analysis of the prevailing situation of informal settlements by any government and especially the county governments in Kenya should be based on the reason as to why they exist and the benefits that they provide to the residents in the IS. The general perception is that informal settlements are risky and one factor that leads to their formation is that they generally act as the first point of access into the urban environment for rural urban migrants or for those moving from other parts of the city to the upcoming towns in the counties (Acioly, 2002; Pacione, 2009). The incoming migrants afford access at a very low financial cost and the barriers to entry are low. This access can be viewed as access to employment and other economic / livelihood opportunities, access to social facilities, access to the political system and the legal system and potential access to housing and infrastructure (Acioly, 2002; Nabutola, 2004). In summary informal settlements act as ‘holding places’ where individuals can access the urban environment very cheaply and be able to adopt various livelihood strategies.

2.3.3 Informal Settlement Upgrading

Informal settlement upgrading is not a new idea. It has been there as early as 1950 and the search for solutions to urban and social problems prompted by informal settlement is gaining importance in the development agenda of most countries and especially the developing countries. Narayan (2014) suggested that some of the strategic options for tackling informal settlement problems in developing countries for possible physical development options include:

- Informal settlement improvement
- Informal settlement upgrading
- Informal settlement redevelopment
- Informal settlement resettlement and
- Informal settlement clearance

This study adopted informal settlement upgrading strategy. Informal settlement improvement includes the expansion of infrastructure in informal settlements in which residents have established gradual accommodation under the informal settlement program, improvement in many essential facilities such as community latrines, drains of storm water, community taps, footpath and street lighting (Kessler, 2000; Narayan,2014). Informal redevelopment of settlements and informal renewal of settlements include the rebuilding, after the destruction of the current structures, of informal settlements. This turns informal settlements into lively city centres. Redevelopment plans ensure tenure security, increase public health and education spending, encourage self-employment with microcredit, improve skills and enhance urban and informal spatial planning. Often the areas in which informal settlements are situated are such that clearing the area is important to enhance urban planning, and rehabilitates the settlements on alternative locations. This strategy is referred to as

informal relocation. The field is evacuated and buildings are demolished and informal settlement dwellers are resettled in alternative locations. Substantial facilities like sanitation, safe and hygienic halls are provided at re-settlement sites (Narayan, 2014). In the opinion of the researcher, such a plan could fail in the long term and may contribute to the development of another shanty settlement, unless the fundamental services provided are sustainable.

According to Kessler (2000), improving informal settlements in low-income towns could suggest a great deal, but at its simplest it refers to a package of basic services, such as clean water and ample disposal of sewerage, to improve the community's wellbeing. The study observes that in situations of uncertainty and unclear tenure, it is also necessary to legalize and regularize the land. In addition, informal settlements are typically upgraded to include a package of roads, highways and drainage improvements, proper collection of solid waste, safety street lights and home electricity. Khan (2007) claims that the only focus in any construction work is physical changes. The Cities Alliance (2012) also describes improved informal settlements, consisting of changes made collectively and locally by individuals, community groups, businesses and local authorities on physical, social, economic, environmental and organizational improvements. Furthermore, because of the shortage of infrastructural facilities, the issue of informal settlements arises. This was overcome by several governments by broadening their networks and promoting the modernization of the units. The solution to enhance sanitation by sufficient water supply and waste water management is commonly referred to as informal settlement upgrading (Field and Kremmer, 2006).

The concept of informal settlement upgrading or development has emerged as an alternative to informal settlement clearance and informal settlement resettlement

programs. It has proved to be more viable (both in terms of cost and acceptability) as compared to informal settlement clearance and resettlements since the latter have proved unrealistic due to the large figure of the informal settlement population and also due to limited resources available with the public sector.

According to Cities Alliance-Cities without Informal Settlements (Cities Alliance, 2012), informal settlement upgrading benefits a city by:

- Addressing issues related to weaker sections within informal settlements. Issues of illegality, exclusion and barriers to social protection which make women and children vulnerable for exploitation.
- Enhancing the skills of informal settlement dwellers and taps vast resources because informal settlement dwellers are unable to utilize their full potential effectively and productively.
- Preventing environmental hazards and environmental degradation thereby improving sanitation conditions.
- Resulting in efficient informal settlement management lowering violence and attracting investment.
- Improving quality of life of the informal settlement dwellers through provision of appropriate residency status; improved political standing, increased safety and security.
- Most importantly, informal settlement upgrading ensures housing at large scale and at low cost.

In summary, informal settlement upgrading at the same site proves to be more effective than informal settlement relocation because it is technically and financially possible as it can be done at a manageable pace and the dwellers are willing to pay for improved

services in their own homes. In the study, informal settlement upgrading will be referred to the strategy that improves infrastructure in informal settlement areas by integrating green practices in water management, waste management and energy undertaken by various stakeholders.

2.3.4 The Evolution of Informal Settlement Upgrading

As mentioned above, informal settlement upgrading is the process of intervention in the physical, social, economic and juridical structure of an existing human settlement formed through spontaneous and unplanned processes. These settlements often conflict with existing laws, norms and regulations (Acioly, 2002).

More than three decades of upgrading shows that governments advocated the bulldozer strategies which involved eradication and eviction policies of these settlements and the relocation of families to other areas but with time many governments realized that squatters and informal settlements were not a problem but a solution. This led to a shift from eradication and eviction policies to conventional housing or sites and services schemes (Acioly, 2002).

According to Werlin (1999), John Turner's theories influenced informal settlement upgrading techniques in the 1970s and 1980s. John Turner, a renowned housing specialist, claimed that the duty of government to provide low-income people with housing could be reduced by making substantial environmental changes in public service, enabling squatters and/or informal tenants to enhance their living conditions. Because of the difficulties faced by the site and the service schemes of unavailability of suitable vacant land, informal settlement projects to develop fundamental services

such as sanitation, waste management , energy and utilities without destroying fully informal settlement areas were implemented (Pugh, 2000).

During the 1990's, as decentralization and privatization emerged as new development paradigms, it became widely acknowledged that the major role of local governments is in managing and steering urban development processes. Its mandate to undertake city-wide policies and institutional reforms is regarded as a sine-qua-non condition to tackle the problems of informal urbanization (World Bank, 1991). The 1990's provided new generations of upgrading projects within the framework of city-wide programmes like Favela Barrio in Rio de Janeiro and the Medellin Neighbourhood Upgrading Programme. The attention shifted to a package of infrastructure improvements combined with basic public services provision and the physical/spatial restructuring of the settlements followed by regularization of tenure and property rights. These interventions were geared to economic, physical, social, and juridical integration of the informal city into the current formal and official urban systems. Acioly (2002) argues that except for this integration effort and the link with housing and real estate market expansion and its improved performance, almost nothing new has been invented in the last 20 years in relation to the upgrading experiences. The failure of most of the previous informal settlement improvement projects has led to the consideration of alternative approaches to improving informal settlements in the 1990's and 2000's. The most popular approach involves improvement together with the granting of land tenure security to the residents of informal settlements in order to give them the incentive to develop their own housing (Sietchiping, 2005). Advocacy for this strategy gained impetus from the Istanbul Declaration in 1996. The Millennium Declaration Goals also included the improvement of the lives of 100 million residents

of informal settlements all over the world by the year 2020 (Sietchiping, 2005). Additionally, as part of their commitment, national governments pledged to provide, among other things, land tenure security backed by law, affordable or inexpensive housing, equity and transparency in dealing with their citizenry irrespective of gender or other attributes (Dey *et al*., 2006).

Due to ever changing dynamics and growth of informal settlement there is a paradigm shift by the current governments in embracing sustainable informal settlement upgrading interventions like green practices. This is why the study sought to examine the integration of green practices in the upgrading process of informal settlements.

2.3.5 Informal Settlement Upgrading Interventions in Kenya

According to Professor Peter M. Ngau of University of Nairobi in Kenya, extensive documentation of informal settlement issues has been done through university and non-university research. Literature ranges from popular literature, surveys, policy interventions and programs, to in depth analysis of their dynamics and socio- economic characteristics. In spite of the mentioned initiatives and the extensive literature, Kenya's response on the growth and poor condition of its informal settlement has been fragmented and uncoordinated at both national and county government level and has also varied overtime depending on the prevailing development paradigm and political ideology (Ngau, 2012).

He further opines that, in the 1960s and 1970s, there emerged direct state-led intervention and under the modernization ideology (1960s) there were attempts to produce low-income housing. Moreover, the government's main strategy was to

demolish all informal settlements. Due to this, the types of houses put up were not enough and they were too expensive for the rural urban migrants, who flocked the cities after the lifting of travel bans. In the 1970s, under basic needs and theories of growth with distribution, the focus of the government changed to site and service schemes, self-help housing and informal settlement upgrading through the help of multiple development partners for instance, the World Bank and USAID (Ngau, 2012).

Kenya, like many African nations, experienced significant economic declines in the 1980s and 1990s. Western powers promoted neo-liberal policies and introduced structural adjustment programs (SAPs) through the Britton Woods Institutions (WB and IMF). This culminated in the removal of the state from many public services according to the philosophy of state enabling and reduced position. In the 1980's, urban poverty grew, informal settlements began to spread and living conditions deteriorated. The institutional collapse, disruptive services, including law and order in the urban areas in Kenya in the 1990s. This was illustrated by an increased degree of corruption among government and state agencies; the unchecked usage by the ruling class of instruments of power, the illicit distribution of land by government officials and the growth of illegal urban gangs. The political "lands grabber" elite sought the support of the provincial government and courts to forcibly remove informal settlement residents from the allotted land, and they were subjected to major expulsions and informal settlement demolitions. In response, civic organisations, at the beginning of 1996, sponsored the emergence of a neighbourhood lobby that became part of an urban poor movement known as *Muungano wa Wanavijiji*. The *Muungano Movement* was largely successful at reducing the number of informal settlement demolition and expulsions by

the end of the 1900s, backed up with the help of legal and other civil society organisations.

In the new century, the Government of Kenya adopted a more accommodative approach to informal settlements. The State initiative on the formulation of national policies and large-scale projects for action aimed at informal settlement upgrades has been renewed over the last 10 years. In 2003 the United Nations HABITAT-World Bank Cities Alliance and the Government of Kenya signed an MOU to approve the Kenya Slum upgrading program (KENSUP-2008). In 2011, Kenya's KISIP project was introduced to complement KENSUP in 15 municipalities across the region. A number of small upgrade projects were simultaneously launched based on cooperation between NGOs, religious groups, state and municipal authorities. Several improvements have been made to the laws and organizations promoting informal settlement intervention. These include the Housing Policy (2004), the National Land Policy (2009) and the Kenya Constitution (2010).

The Government's key program (KENSUP) has been criticized for implementing a regeneration strategy close to previous unsuccessful redevelopment projects, where informal settlement dwellers have made way for middle income by gentrification. Government is often criticized for paying lip service to the ideals of participatory informal settlement refurbishment; and is reluctant to experiment with in-situ refurbishment, which has proven to be the most effective and sustainable way of providing better housing, infrastructure and livelihoods for urban poor and can be introduced on a gradual basis. Kusienya (2004). Corruption and lack of political accountability are still serious obstacles to programmes such as KENSUP. Even at the

community level, the actions of some leaders or members of the Committee (SEC) have been challenged by residents who complain about their absence in meetings and lack of communication between the affected community and those responsible for the project implementation (Rosa and Calas, 2011).

In addition, many people's livelihoods are ruined by informal settlement upgrading projects which create more misery and poverty. In the worst case, the issue of informal settlement is simply shifted from one informal settlement to another. These policies or lack of policies have contributed to the emergence of new informal settlements, the exclusion of populations, gentrification, poor partnership and mistrust of governments and communities (HABITAT 2003:220, Kenya and GTZ 1996:1). The failure of these projects were also strongly affected by corruption in the allocation of land rights (Kibwana, 2000), as well as by tribalism (Leach 2000). The Government in its informal settlement upgrading policies has failed to address the needs of informal settlement residents and favoured the privileged.

2.3.5.1 Kenya Slum Upgrading Programme

The Kenyan Slum Upgrade Program (KENSUP) builds on the experience of a number of stakeholders in the area of informal settlement upgrading. KENSUP is run and operated by the government, as it is enforced by the Ministry of Housing and the local authorities. The complementary stakeholders include civil society, local communities and the private sector. KENSUP's key objectives were to improve the livelihoods of informal settlement dwellers and IS workers, minimize poverty and achieve the MDG target 7 Target 11 – to improve the lives of 100 million slum dwellers by 2020.

The vision of the project, in addition to the development and implementation of policies and strategies to promote the reduction and prevention of slums, is to facilitate enhanced and healthy urban living conditions in Kenya (Republic of Kenya, 2006). KENSUP's main objectives were: the creation of an informal national settlement and management framework; the establishment of good urban governance; the provision of social and physical infrastructure; tenure security and improved housing; the improvement of income generation opportunities, and job creation; attraction of private finance and investment promotion; enhanced capacity for research, planning, execution , monitoring and assessment; and response and mitigation of HIV / AIDS prevalence (Republic of Kenya, 2006).

2.3.5.2 Kenya Informal Settlement Improvement Project

The Kenya Informal Settlement Improvement Project (KISIP) is an initiative started by the Government in collaboration with the World Bank, SIDA and French Agency for Development (AFD) in June, 2011. It focused on improving living conditions, infrastructure development and tenure security in the informal settlements. In addition, it supported the government in planning for future urban growth in a manner that prevents the emergence of new informal settlements (Republic of Kenya, 2013).

The program was implemented in 15 municipalities, including Eldoret, within five years from June 2011 at a cost of USD 165 million. The project comprised four components namely:

(i) Institutional strengthening and programme management.

(ii) Enhancing tenure security - This involved planning, surveying and issuance of titles.

(iii) Infrastructure and service delivery - The Government to invest in roads, bicycle paths, pedestrian walkways, street and security lights, waste management, water drainage, sanitation, green spaces, platforms etc.

(iv) Planning for urban growth - The Government to provide technical assistance to the municipalities with an aim to take measures that will reduce or prevent informal settlements. (Muraguri in IFRA: 121)

2.3.6. Informal Settlement Policy and Institutional Arrangements in Kenya

Globally, national approaches to slums and informal settlements have generally changed from negative policies such as displacement, benevolent neglect and forced relocation to more constructive policies such as site improvements, self-help accommodation, enabling and rights-based policies. Where adequate reform policies were enforced, informal settlements become more financially cohesive and provide tenure security opportunities, local economic growth, income increases, and urban poor shelters.

The Kenyan government accepted the presence of informal settlements in compliance with its KENSUP regulations in 2005 and was committed to resolving the conditions through improved informal settlements. The country has accepted informal settlement upgrades as an essential component of house growth in the Poverty Reduction Strategy Paper and the National Housing Policy and national housing development programmes. The government of Kenya also launched in 2004 the Kenya Slum Upgrade Program and in 2011 the Kenya Informal Settlement Improvement Project that aimed at improving the living conditions of people working and living in informal residences in Kenya's urban areas. The Constitution of Kenya, 2010, Chapter 4, Section 43(1b) on

"Economic and Social Rights" in the Constitution of Kenya, 2010, emphasizes that everyone is entitled to affordable and appropriate housing and to fair sanitation standards.

2.3.6.1 The Poverty Reduction Strategy Paper, 2005

Pursuant to the Poverty Reduction Strategy Paper of 2005 by the Republic of Kenya, the implementation of informal settlement upgrades has been described as one of the poverty alleviation programs targeting poor communities living in urban informal settlements mainly in Nairobi and Mombasa, and lack of access to basic water and sanitation, road, energy and housing infrastructure.

2.3.6.2 National Slum Upgrading and Prevention Policy, 2012

The government started implementing a National Slum Upgrade and Prevention Strategy through the Ministry of Housing in 2012 (Republic of Kenya, 2013). The strategy aimed at making communities and informal settlements more sustainable. The government acknowledged and committed to working with all stakeholders to ensure the mechanism is participatory, all-inclusive and consistent with the Kenya Constitution (2010) in the successful implementation of the policy.

2.3.6.3 National Housing Policy, 2004

According to the National Housing Policy (Republic of Kenya, 2004), upgrading of informal settlement areas was to give a high priority to the environment. Upgrading was to be carried out with minimum displacement to ensure that the facilities and associated services are adequately designed and delivered. For current informal settlement areas adequate upgrade measures shall be implemented taking into account

key upgrade components like land tenure protection, infrastructure and services provision, improvement of housing structures and the community 's socioeconomic situation.

2.3.6.4 Kenya Vision 2030

According to the Republic of Kenya (2012), Vision 2030 acknowledges that Kenya's cities and towns lack adequate planning and this means that efforts should be made to ensure successful development planning. Increased access to affordable and appropriate housing and the introduction of major reforms that aim at unlocking the potential of the housing sector are also envisaged.

Planning and management of both rural and urban development is vital to the overall realization of Vision 2030 as part of strategies and priorities for housing and urbanization. Projects considered to be the key avenues for achieving housing and urbanization goals include:

- Construction of physical and social infrastructure in slums in 20 urban areas.
- Generating 200,000 housing units annually through a combination of programs to fill the void.
- Reduce the huge housing gap in the country by increasing the ability of local authorities
- Developing housing technology centers in each constituency to improve access to decent housing by promoting location-specific construction materials and low-cost housing.

Vision 2030 can be very effective if adopted by different stakeholders in the housing sector and successfully support the idea of permanent urban human settlements. Vision

2030 offers an avenue for sustainable development by means of informal settlement upgrade and redevelopment, by encouraging capacity building in Kenya's urban planning departments, the building industry and promoting access to housing finance, legislative, structural, and regulatory improvements, and supporting low-cost housing.

2.4 Integration Process in Informal Settlement Upgrading

Arguably one of the best ways of implementing the green practices in the informal settlements is provision of access to basic services. Although there is high initial cost in service connection, service providers in water, energy and waste sectors need to work with governments and development actors to further reduce the connection fee to encourage people to connect legally to services rather than obtain them through cartels that connect illegally and charge more than formal service providers. In addition, payment options that take into account income levels in informal settlements should be given to help minimize defaults and interruptions in services. A good example is the Nairobi Water and Sewerage Company which has introduced a mobile phone app that allows customers to record readings, collect and settle bills in the water and electricity industries. This enables customers to pay their bills when funds are available (Kenya Urbanization Report, 2016). Furthermore, the provision by Kenya Power and Lighting Company in an informal settlement of a prepayment meter enables every household to check exactly how much electricity they spend every month. The pay as you use Safaricom solar system is also another move that encourages green practices in communities.

Integration of green practices requires awareness-raising, for instance, based on the Aurelia (2016) Case Study on the adoption of energy-efficient lighting in the Nairobi

settlement of Kibera, it was observed that the incandescent bulb could break five times a month, while high-quality energy-saving bulbs can achieve a lifetime of six to eight years, saving product costs. In addition, a randomized controlled trial (RCT) in Kibera showed the effect of clearly educating people about this. The combination of a high-quality voucher with an outstanding information flyer increased the absorption rate for successful lighting to 84% compared to 23% when the voucher was provided. In order to promote energy efficiency uptake, policy support programs need also to be integrated. For example, fake CFL bulbs in Kenya have reduced consumers ' trust in these products as the market is heavily populated with lower-quantity, lower-durability products. The above-mentioned study highlighted the influence of these issues on demand for effective lighting. The study showed that the respondents were very happy to purchase a CFL bulb, even though they believed they had made efforts for a high quality product that was not falsified. Quality assurance is thus a key policy framework feature needed to incorporate green energy to reduce the unnecessary erosion of the market's trust in unfamiliar efficient technology and create confidence in energy efficient innovations combined with quality.

Similarly, integration of green waste in informal settlement upgrading requires tapping into greening a number of informal activities that benefits the poor, including waste management through efforts to prioritise the 3Rs of Reduce, Recycle and Reuse. Waste management integration process also involves well laid down policies from disposal at household level, transport of waste and management of landfill or dump sites.

The NEMA regulations on waste transportation (NEMA, 2014) include:

- The County Governments should provide adequate transport for the various segregated waste streams;
- The waste transportation trucks should be closed and suitable for the transportation of the various waste streams to the waste treatment facilities and landfills;
- The trucks waste trucks should be regularly serviced and maintained to avoid littering of waste;
- All waste transportation vehicles should be licenced to operate by NEMA

Figure 2.3 shows a picture of an ideal waste transportation truck that is closed and suitable for the transportation of the various waste streams to the waste treatment facilities and landfills.

Figure 2.3: A well designed waste transportation vehicle in use in Denmark

Source: NEMA (2014)

Integration of green waste practices also involves management of dumpsites. Figure 2.4 shows the Kipkenyo Dumpsite in Eldoret which portrays an unmanaged dumpsite which poses a challenge to the environment and leads to unsustainable waste management practices.

Figure 2.4: The Kipkenyo Dumpsite in Eldoret

Source: NEMA (2014)

Figure 2.5 shows a well-managed sanitary landfill in the City of Dublin which is environmentally friendly and leads to sustainable waste management practices.

Figure 2.5: A well-managed sanitary landfill in the City of Dublin

Source: NEMA, (2014)

On green water integration, “Water and Sanitation Program Report on innovation in scaling up access to water and sanitation services focused on the innovations that were developed and implemented to improve sustainable access to water and sanitation services for residents of urban low income areas. The innovations covered institutional level work under social connections policies a financing mechanism using commercial micro-finance and use of output-based subsidies from the Global Program on Output Based Aid (GPOBA) and Information Communication Technology (ICT) initiatives using a mobile phone based self –meter reading system locally known as *Jisomee Mita*. The social connection policy has now made it affordable for Kayole Soweto residents to access piped water through formal connections from the network to communal residences.” (Mwangi *et al*, 2015).

According to UNWATER (2012) domestic water consumption makes up 8% of total global water use particularly in developed countries, domestic water use is often many times larger than the WHO minimum recommended per capita consumption. Thus, household water consumption has a large potential to be reduced. Benefits of reducing domestic water consumption include lower water bills or less time spent collecting water, reduced pressure on local water resources, and increased availability of potable water available for appropriate purposes such as drinking, cooking, and hygiene.

One effective way of reducing water consumption is to reuse the wastewater produced at the household level. The reuse of wastewater presents an opportunity to not only save water and financial resources by reducing water consumption, but to simultaneously increase food production or create livelihood. In developing countries, optimising wastewater reuse can therefore be a significant window for development (UNWATER

2012). In addition, waste water recycling is one of the most sensible and winning options for promoting water sufficiency and it can range from simple home methods to sophisticated industrial wastewater filtration systems. Reuse of different types of wastewater is hence a way to optimize water use at home. It can either be reused directly or treated and reused (UN-Water, 2010). Appropriate purposes for direct reuse can include, washing cars, flushing toilets and gardening. However, a critical aspect for wastewater reuse is that the quality of wastewater must be appropriate for its reuse.

2.5 Benefits of Green Practices in Informal Settlement Upgrading

Hadi (2015) and UNEP (2011) argue that embracing environmental sustainability practices in energy, water and waste sectors is associated with many benefits and is considered the path way to achieving SDGs. According to Campbell (2012), embracing green energy practices have an impact on the individual level. These benefits are those applicable that aid individuals, households and companies that translate into health benefits and wellbeing from energy efficiency. He further argues that replacing traditional biomass cooking stoves with energy efficient ones would reduce fuel costs as well as the burden on time, health and the environment. The same was pointed out by UNEP (2014) that about 70 per cent of households in Kenya rely on wood fuel but use of improved cooking stoves can improve the lives of individuals, particularly women and children, in rural and urban areas by reducing the time to collect wood fuel, reducing indoor air pollution thus potentially introducing cost savings to households. Access to modern energy enables income generating activities, access to communication, improved education outcomes and health services. Further, greenhouse gas (GHG) emissions can be reduced by clean energy solutions such as solar lanterns, energy efficient lighting and appliances, cooking stoves, and improved

and Liquefied Propane Gas (LPG). Consequently, these clean energy solutions enhance social and economic benefits.

Efficient cooking stove technology is needed for informal settlement communities to enjoy using fuel wood and charcoal as their primary source for cooking. Thus embracing such green energy practise means money could be saved for less fuel consumption from fuel wood and charcoal which overburden their low income. Moreover, indoor air pollution problems from inefficient cooking methods could be solved at the same time.

According to a study by the International Finance Corporation, "US$10 billion a year is spent on kerosene in sub-Saharan Africa alone to illuminate homes, workplaces and community areas. Globally, the figure is estimated at US $36 billion. Kerosene is also dangerous as it is a fire hazard and the wick's smoke, the glass cracks and the light may be too weak for reading". In addition, according to the World Health Organization, the fine particles in kerosene fumes cause chronic pulmonary disease. Burning kerosene also produces climate-changing carbon-dioxide emissions (*The Economist, 2012*).

The economic sense for solar lighting is even clearer; buying a lamp that charges in the sun during the day and produces light at night can eliminate spending on the kerosene that fuels conventional lamps (UNEP, 2014). Use of solar for lighting eventually leads to reduced electricity bills and reduction in buying of paraffin. In addition, UNEP (2011) argues that the solar sector will significantly contribute to job creation from 173,000 to 764,000 for the year between 2008 and 2025. Further, jobs created by the renewable energy sector can be safer in terms of potential health risks, compared to

employment within the fossil fuel energy sector, ensuring longer term employment periods and increased human capital (IPCC, 2011).

A study by Gongera and Gicheru (2016) on analysis of green energy adoption on household development in informal settlement of Kibera found out that adoption of green technology can spur good physical wellbeing and productivity, improve welfare of households and reduce death caused by related diseases. Apart from that, the UN-Habitat Best Practice Casebook on Adopt a Light Slum Lighting Project, observed that a total of 33 high light masts were installed in informal settlements in Nairobi including Kibera, Mathare, Korogocho, Huruma, Kawangware and Kangemi. The masts served in excess of 500,000 people in 150,000 households. In 2006, an evaluation of the project conducted by Steadman Kenya Limited, a respected market research company now renamed Synovate Kenya Limited, concluded that in addition to improving neighbourhood security, the project had succeeded in providing a conducive environment for productive economic activities. Business hours had increased within the lit areas and fewer cases of mugging and harassment were recorded in the lit areas compared to unlit areas. This means that installation of streetlights and flood lights in informal settlements enhances security and leads to extension of business hours and thus increased income. Practical Action 2010 Policy argues that access to energy has the ability to create new income opportunities, expand existing activities and realize cost savings on current practices (Poor People's Energy Outlook, 2010).

Generally the benefits associated with access to modern energy (Barnes and Samad, 2018) include:

- Increased household income;

- Payment of lower prices for legal electricity compared to electricity sold by exploitative and illegal operators;
- Improved health due to the reduction in indoor air pollution;
- Reliable lighting enables people to work at night which contributes to increased income;
- Improved security for the residents due to fewer fires and better quality lighting;
- Morale boosts in social status associated with households making the transition from social exclusion to social inclusion; and
- The potential to increase educational levels and achievement as children and adult learners have adequate lighting to read and do their schoolwork in the evenings.

There are a range of advantages in access to clean water, but almost 1 billion people lack access to clean drinking water and 2.6 billion lack access to better sanitation (WHO and UNICEF 2010) and as a direct result 1.4 million children under five die each year due to the lack of access to water and sufficient sanitation facilities (UNICEF 2004). The 1% rise in the uses of unprotected sources of water for drinking purposes is directly related to an increase in infant mortality of around 0.16% for East Nigeria and North Cameroon (Ward *et al*, 2010). However, the detrimental effects of insufficient water access do not stop with waterborne disease. When there is no water, people (mainly women and children) have to take a great deal of time to gather the water or they have to pay high prices to transport it.

The cost of water purchased from a water cart in Western Jakarta, Indonesia, is 10 to 50 times that of a total water utility for a secure supply (Fournier et al, 2010). It is difficult to find a way to persuade governments and private investors to proceed in

particular, amid the common belief that poor people cannot pay for the use of water (services). The lack of convenient access to scrub water erodes the capability of the poorest to engage in alternative practices. For example, when children spend more of their days gathering water, they have less chance of going to school or learning to escape poverty. If women have to pay for water transport time, they have no chance of winning jobs elsewhere. More than one fifth of the East African's population live in conditions in which every water pick- up journey takes more than half an hour (WHO / UNICEF 2010). Once the government is insufficient, enormous income is used to resolve the consequences of disease rather than produce wealth (Tropp, 2010).

On the contrary, the findings of various scholars such as Fewtrell and Colfrod (2004); Galiani *et al* (2005); and Jalan and Ravallion (2003) state that access to clean water and sanitation is considered important to protection, livelihoods, health and quality of life, and is of particular importance to women and children. This will result in improved water supply and sanitation policies offering a wide range of benefits: longer lifespans, higher enrollment in schools, lower health costs, lower disease morbidity and mortality, and less time and effort on water and waste management. The saved time may allow women to participate in alternative productive tasks such as longer children's care, socialization and education. As noted in the Sustainable Solid Waste Management and Green Economy Key Issues Paper (2013), it is widely recognized that poorly managed waste can adversely impact human health and safety of both waste employees and therefore the wider public in some ways. It is also associated with an increase in public and private medical costs and a loss of productivity from injuries or sick days of work. However, introducing fundamental strategies for the management of green waste, including waste collection and its containment in an environment not covered by the

population, will contribute to enhanced public health, protection and the related cost burden being reduced. A further consequence of good waste management practices is that it leads to poverty reduction, job generation and better conditions of employment. Some of society's poorest people rely on waste collection for their livelihoods, which is also related to unsafe conditions such as child labour, dangerous health and safety conditions and prejudice against waste traders. The establishment of a reuse and recycling industry is a recognised pathway leading toward substantial job creation and employment opportunities.

In order not to sacrifice social conditions such as safe work conditions , social security, the cessation of child labour, 12 million people are currently working in recycling in Brazil, China and the United States economies. In reality, the sector is now responsible for recycling waste reclamation (informal sector). The sorting and processing of recycled goods per tonne is ten times higher than landfilling and incineration (UNEP, 2011), which is outlined in the following three pillars of the sustainable economy as shown in figure 2.6.

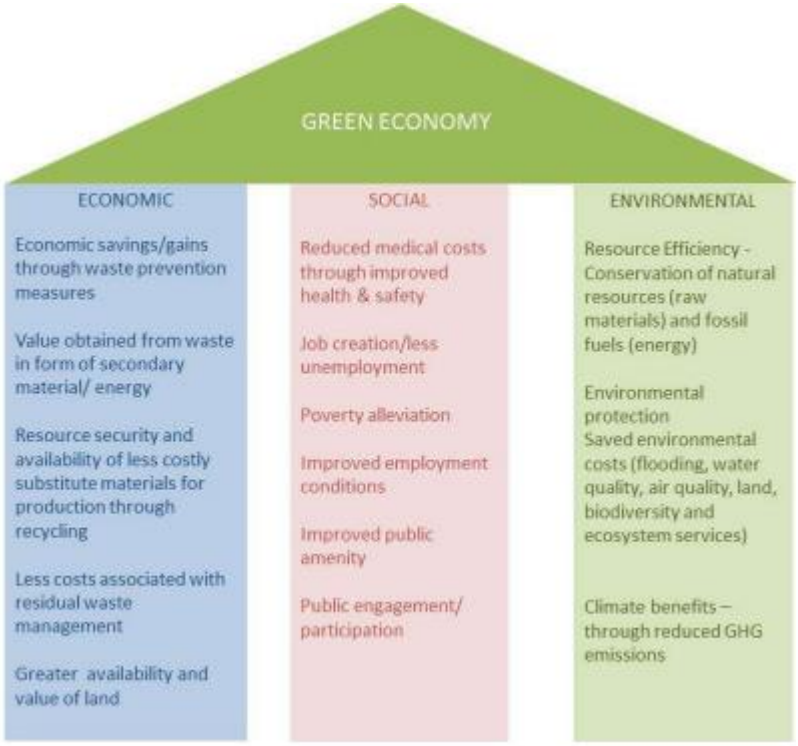

Figure 2.6 Three Pillars of Green Economy

Source: Sustainable Solid Waste Management and the Green Economy Key Issues Paper (2013)

In addition, proper storm water drainage management helps in reducing respiratory and water borne diseases, soil erosion, and the risk of flooding. It also has a positive effect on health by reducing or preventing the formation of temporary stagnant water pools, in this way reducing exposure of the population to water related diseases leading to improved sanitation and reduced littering (UN Habitat, 2011)).

2.6 The Dynamics of Implementing Green Practices in Upgrading

There are various underlying dynamics in informal settlement upgrading that may influence implementation of green practices in the upgrading process. Also it is important to note that informal reclamation is not a separate operation, but includes

many interrelated factors relating to the informal settlement livelihoods. This justifies reviewing a wide range of literature to discuss the following interrelated factors.

2.6.1 Initial Cost of Green Practices

The Kenya Urbanization Report (2016) observes that households with lowest income (by a maximum of KSh 6,000 per month) spend a considerably greater share of their income on basic utilities, that is, 12 percent of their income on water and 18 percent on electricity. That is in comparison with households who invest an average of 2 percent of their income on water and 3.2 percent on electricity earning between KSh 22,500 to 100,000 a month. This is because poor households have lower public network access rates and often use secondary sources, which are often more costly and of low quality than public services. Furthermore, the study assumes that for households with low income quintiles, , the cost of connecting to urban water and sewer networks by public networks, without subsidies, is not affordable posing a barrier to households wishing to link to the network. In addition, this report states that consumers in Kenya pay application fees, purchase their own materials or recover the water system from service providers. The average household link costs $220, which is beyond the reach of many, in particular poor households, within 50 meters from the distribution line. Similarly, Njoroge (2013) pointed out that urban poor are not often capable of complying with Kenya Power requirements of providing infrastructure costs, such as meters, cables or even their electricity bills. Waruru (2017) pointed out, on the other hand, that solar has high initial costs as opposed to conventional fuel, but has many developments in technology and financing, including pay as you go solar mobile payments that help to solve the costly problem. The study of Makashini *et al,* (2014) observed that while

informal settlement households in Zambia had reasons for taking energy-saving steps, the cost of technology was a severe obstacle to adopting energy saving technology.

In order to achieve Vision 2030, the government has reduced connection charges to KSh1, 160 for informal settlement residents to enable them access Kenya Power and Lighting Company services (Njoroge, 2013). In informal settlements, 40 thousand households were linked to the formal services through the electrification program. In informal settlements households paid just around US$ 15 to connect to a prepayment meter and the remainder was met through a Global Partnership on output-based assistance grant. The Program has encouraged residents of informal settlements to link to connect to the Kenya Power network instead of depending on cartels (Kenya Urbanization Report, 2016).

2.6.2 Long Term Planning Effects on Adoption of Green Practices

Iweka and Adebayo (2015) research on Global Slum Upgrading Practices: Recognizing Contemporary Challenges, main findings were the politicization of informal settlements upgrade projects, misunderstandings and negative attitudes, planning, architecture and structural issues, land tenure issues, the difficulty of assessment methods, reputation of non-governmental organizations, non-homogeneity of the slums and slum residents, socio-cultural , social and economic issues.

On the challenge of planning, the needs and demands of the people are at the core of urban upgrade projects. These needs and criteria are required to be clearly defined, recognized and prioritized. Iweka and Adebayo (2015) further argue that research into Kenya's slum upgrade programs found many structural and program design problems

that hindered their successful execution, despite strong government support. In addition, the aim of informal renovation is to ensure that IS residents have access to basic services such as water, sanitation, waste disposal, housing, access roads, footpaths, storm drains, lighting, schools and health services, among others. However, Ndukui (2013) points out that, in fact, most IS upgrade programs concentrate on housing improvement at the cost of other IS livelihoods. This is a challenge because the approach that seeks to enhance the overall quality of life of IS dwellers does not impact the outcomes by approaching housing on its own. He suggests that it is important to achieve a more comprehensive strategy, often when long-term planning takes place. Armitage (2012) also argued that the government and by extension the local government with regard to informal settlements in South Africa is concentrating on buildings rather than basic services like sanitation, sewerage, storm water, highways, electricity, solid waste disposal and so on.

More generally, as Fadhile (2015) clarified, the environmental strategy of a developer will rely on the long term planning of the adoption of green practices that are the environmental management activity, on the upgrading project, on the characteristics of each informal settlement and its effect on the environment.

A study by Abusalia, Osumanu and Ahmed (2015) on urbanization problems in low-income areas in Ghana was the state of urban planning and the provision of social services. They argued that the current planning framework does not adhere to the criteria that planning should address, especially in the areas of the IS. They advocated for the rethinking of the urban planning mandate in the light of the relation between poverty and urbanization in low-income countries. To them the search for new ways of

balancing vulnerability and coping strategies poses an urban dilemma for both planners and residents of IS. This urban problem in the informal sector leads them to a quest for a new alignment of planning with local features. Watson (2009) calls for a fundamental analysis of planning practices in order to play an important part in dealing with IS and urban poverty, while UN-Habitat (2005) claims that urban planning contributes to the emergence of IS.

According Kenyan, the National Slum Upgrade and Prevention Strategy (2015), planning for informal settlements suffers from inequalities between towns, cities and counties. Classical planning approach has further compounded the situation because the planner is not consulted by informal settlement residents. Thus, inefficient processes for development control, lack of ability for preparing and executing plans, lack of plans and insufficient plans all help to spread many unexpected settlements.

2.6.3 Participation and Implementation of Green Practices

According to Ziblim (2014), the involvement of informal settlement communities and the need to give them a voice at every stage of the upgrading process is crucial. Participation is an important way of empowering IS communities to change their own livelihoods. However, lack of public participation may threaten the rapid and efficient implementation of projects. On the basis of the N2 Gateway Housing Development Pilot project initiated by the Government of South Africa around 2005, the Government agreed to reduce the amount of consultation and public participation required to ensure the rapid implementation of the Center for Housing Rights and Evictions (COHRE 2009). However, as of 2012, the project had not yet been completed, partially because of pockets of public opposition and on-going legal conflicts (Jordhus-Lier and de Wet,

2013). In another vein, Jordhus-Lier and de Wet (2013) cautioned that when catchwords such as "participation" are loosely used, they appear to generate false perceptions and resulting disappointments in the minds of community members who assume that their opinions could substantially influence the decision-making process of improving their livelihoods.

A study by Waringa (2016) on Challenges of Slum Upgrading for Urban Informal settlements in Soweto East Village in Kibera observed that the implementation of upgrading programmes is influenced by various factors which include:- complexities of IS settlements with regard to tenure arrangements; lack of coordination of various stakeholders; resistance to the IS upgrading programme especially by the slumlords; lack of participation by the IS dwellers in the upgrading programme; residents not being aware of their roles as stakeholders in the upgrading programme; lack of adequate land for IS upgrading; lack of goodwill and mistrust from the IS dwellers; inadequate budgetary allocations from the government exchequer to the programme; politicization of the programme; environmental degradation; varied political, cultural and religious inclinations amongst the residents and their leaders; various stakeholders being involved in the programme leading to partnership concepts that often derail the implementation schedules of the upgrading programme; and non-genuine NGOs. One of the factors he pointed out was lack of participation by the IS dwellers in the upgrading programme which makes them feel that they are not part and parcel of the upgrading process and therefore unwilling to participate in the program.

The study by Ehigiator (2013) examined the role of slum upgrade, the political culture and the structure of power in Makoko, Lagos and their impact on participation in the

slum upgrade. The outcome indicates that the Makoko Association and the community residents were involved in the upgrade of Makoko. The level of involvement was limited because the Lagos state was not interested in the consultations leading to demolitions.

2.6.4 Accessibility to Green Technologies

Makashini *et al* (2014) revealed that property management in informal settlements poses obstacles to the use of energy efficient technology. This is because most households use electricity linked to an extended or stand-alone house in the same yard from a main house and not from the service provider. This means the households use the prepaid electricity meter in the main house in the expansion or second house. The landlord was also responsible for purchasing the power tokens for every household in the yard. Therefore some landlords included a rent to supply the electricity. The landlord therefore did not allow the tenants to use any electrical equipment including stoves and ironing boxes as they claimed they used too much electricity. This 'landlord control' prohibits households from using energy-efficient equipment.

2.6.5 Personnel with Green Practices

Centered on the case studies of Favela Bairro in Rio de Janeiro which is one of most renowned informal settlement upgrading schemes (Lucci, Paula *et al*, 2015), on what works in improving the living conditions of informal settlements opine that Favela Bairro is known as an 'integrated initiative' since it tries to solve problems from a wide range of sectors simultaneously. These include: basic facilities (water sources, sewage treatment, drainage, highways, paving, sports areas and parks, reforestation); social services (childcare centres; referral of welfare services; income and events generating

work); collective association and development and land titling (Jaitman and Brakarz, 2013). They observed that while the participation of trained technicians could provide valuable input, other perspectives could also pigeon hole the program and call for solutions which are not tailored to local circumstances. Implementation of decentralized sewerage schemes was recommended by funding agency experts as necessary in tropical countries. Native plants, however, were neglected and weakened and even dangerous for the inhabitants. That's because the state water supply corporation has been using a centralized wastewater collection scheme rather than running and servicing local waste water sources (Magalhães and di Villarosa, 2012).

In addition, studies by Gongera and Gicheru (2016) on the study of the adoption of green energy in the informal settlement of Kibera, revealed that the adoption of green technology was affected by the lack of extension and distance to green enterprise dealers. Armitage (2012) assessed sustainable urban drainage problems in South Africa, noting that teamwork was needed to provide sustainable solutions for the provision of services. He argues that any effort to upgrade informality involves the mediation of professional community workers who can promote complex discussions between the local government and residents and, among residents. He argues further that there is a shortage of sufficient number of qualified people who are able to plan and execute urban drainage in a time-saving and holistic way and the lack of funding required to pay for the work. Given historical challenges in assisting developing countries, the best way developed countries can help is in offering professional support to local governments to achieve sustainable urban drainage.

2.6.6 Policy and Legal Framework

A research by Malama *et al* (2015) on the comparative analysis of energy efficiency in Zambia's low- and high-income households shows that high technical costs are an obstacle in implementing low-income energy efficiency initiatives, but the government tried to help with tax incentive measures. However, there is no clearly established energy efficiency policy in Zambia that would make it more systematic to resolve all energy efficiency issues.

Wamalwa's (2014) study on rain water harvesting technology in Kenya and the United States considers that rain water collection technology as an old developed art in Kenya, with a wealth of knowledge which has not been fully implemented due to various challenges faced by various stakeholders, particularly in the case of informal urban settlements and their neighbourhoods. In most urban centres, it maintains that architects, beneficiary workers, engineers and policy makers do not incorporate the rainwater harvesting systems into the building but are introduced as an after-consideration because of current legislation and a lack of understanding. In certain cases there are no guidelines in the support of rainwater harvesting in government offices, CBOs, NGO Operations and even some donor agencies.

In the background paper of the National Slum Upgrade and Preventative Policy of the Republic of Kenya (2015) it was noted that no relevant legislation tackles the problem of informal settlement. Existing legislation is specifically structured to deal with planning and regulation of growth. There is no detailed legislative structure for dealing with unique informal settlement problems under the Constitution and new land laws. Issues such as land tenure regimes, institutional regulatory management practices,

coordination and defense against forced displacement are also difficult to tackle effectively.

Owusu and Samuel (2016) suggest that renewables may be the key source of energy in a low-carbon energy world in their analysis on the viability of renewable energy sources and climate change mitigation. However, disruptive alterations are required in all structures in order to leverage readily available renewable sources of energy. The study showed that a major obstacle to the use of renewable energy is contingent on the policy and political tool of a country, which in turn affects both costs and technical advances. In addition, the costs of renewable energy technologies are affected by technological developments which lead, in turn, to market failures and low patronisation of renewable energy technologies. A successful renewable energy policy takes into account the interconnection of factors that influence the delivery and sustainability of renewable energy. In addition organizing the energy transition from unsustainable to renewable energy is often described as the major challenge of the first half of the twenty-first century (Verbruggen *et al*., 2010).

2.6.7 Project Completion

In order to achieve an IS upgrade phase, the availability and distribution of adequate financial capital is a key success factor. Weak institutional and financial structures can impede the upgrading activities, as they are highly dependent on external financing. This inevitably leads to unfinished projects, and if the donor withdraws for whatever reason, the project will end meaning that this will not be a sustainable activity.

2.6.8 Misappropriation of Funds and Corruption

Oppong's (2016) Slum and Gomorrah Sustainable Development Study in Accra, Ghana have pointed out that Informal Settlement Moving updates are often characterized by obstacles which include low participation expenditure, corruption and lack of commitment of State agents and IS dwellers' reluctance to pay for improved services. Informal Settlement Modifications are an interventionist approach. In situ informal settlement upgrades in Kibera, Nairobi argues that there is often a danger of resident's voices being silenced by members of the Settlement Executive Committee (SEC) on behalf of them. In particular, the residents expressed their concern about the potential for corruption within the SEC. Furthermore, it is not easy to develop strategies and frameworks for developing a participatory process and there are many strong arguments in this particular project which support the view that local authorities and governments should take charge of upgrading projects with a view to local scale-up, decentralization and democracy. However, whether these organizations are ineffectual, dishonest or under-resourced, is not inherently an efficient policy.

2.6.9 Maintenance of Upgraded Infrastructure

Present IS upgrade practices do not seem to have included maintenance on the agenda. This continues to make it impossible for improved facilities to be sustained. The World Bank (2006), suggests improving project incentives to operate and sustain community-based slum infrastructure. The stakeholder participation in human waste management research carried out in informal settlements in Sub Saharan Africa in Kwedho *et al* (2015), have identified poorly built and difficult to sustain the facility for human waste management in informal settlements.

Generally, Perten (2011) clarified that both the group and technical teams should be involved in the management of the completed project. In a sense, the day-to-day maintenance of completed projects should be the responsibility of the community residents, while repairs requiring specialized expertise and services should be carried out by technical teams or other outside organizations. But, in order for the maintenance to be effective, an arrangement must be in place prior to the execution of the project; assigning tasks to the different actors. In a report by Baker (2006), on Integrated Urban Upgrading for the Poor: the experience of Ribeira Azul, Salvador, Brazil, the study noted that the lack of participation of the Municipality of Salvador in the operation and maintenance of neighbourhood improvements was a major challenge in the Ribeira Azul program due in part to resource constraints.

Baker (2006) also argues that knowledge from other nations illustrates the various inputs needed to effectively operate and sustain the infrastructure. The first is the engagement in project creation and implementation of stakeholders, especially public service providers and communities, which creates an ownership sense and creates incentives to take responsibility to maintain the benefits that a project produces. Secondly, fostering collaborations between utilities / public service providers and local community groups can contribute significantly to the long term existence of an organization which can provide social and technological support long after work is ended. The evidence showed that the concept for communities to operate and to retain freely was impractical, while contractual connections with local cooperatives or micro-enterprises that were specially qualified could work well.

In order to extend the initiative, first of all municipalities have to resolve the problem of operation and maintenance. They play an important role in sustainability and are therefore necessary from the beginning. Public knowledge of operations and maintenance issues through education can also play an important role and would hopefully be included as a sub-component of the Programme. A third choice is to enter into contracts with local cooperatives or microenterprises that have been developed and trained for the operations and maintenance required under the programme. This will provide local jobs and lead to infrastructure investment sustainability.

In summary, it is important to define and institutionalize the role of the beneficiaries in the operation and maintenance of the upgrading strategy once they are implemented. One of the reasons why upgrading projects fail in their evaluation over longer periods of time is because there is no clarity regarding the post-implementation processes in IS upgrading projects. Due to the lack of maintenance, upgraded settlements soon fall into the state of degradation and decay giving rise again to conditions that are typical of slums from which they were upgraded.

2.6.10 Awareness of Green Practices By the Community

Ndukui (2013) states IS initiatives upgrading to IS citizens' ignorance, lack of awareness and willingness to face obstacles hence IS initiatives do not benefit. The author recommends that successful IS upgrades provide knowledge of rights and sustainable local projects, as well as motivating beneficiaries to increase independence. The lack of knowledge, combined with the general failure to update a number of previous IS projects in favour of targeted IS dwellers has led, according to Amnesty International (2009), to a general mistrust. The challenges to introduce an IS upgrade

program were described by Mwangi (2012) as lack of knowledge of an established policy; insufficient funding and tenure security, high population growth. He argues that lack of awareness of an existing policy may have been due to lack of adequate consultations with the local community.

The value of a clean and safe environment is limited according to NEMA (2014). This leads to ineffective municipal waste management practices, which inevitably lead to pollution. This further includes poor household waste management, including insecurity, reuse, reduce and recycling. They also claim that negative approaches to waste management and lack of individual accountability have led to malpractices like littering, illegal dumping and open burning. Another important case study in this study is in Medellín, which is Colombia's second largest city. Another 'integrated' IS upgrade program that is frequently referred to as an example of good practice is Medellin's Programa Integral de Mejoramiento de Barrios Subnormales. However, Lukci *et al* (2015), stressed that the programme's ability to manage the subcontracts with highly structured processes and restricted versatility is challenged where Community organizations lacked the technical skills needed by the programme. They further argued that the project, in the form of neighborhood councils, had not offered adequate technological support to resolve these gaps and that social capital was not designed to be sustainable beyond the existence of the program.

In Makashini *et al*. (2014), findings have shown that households cannot implement and use energy reduction strategies in Zambia without awareness of energy conservation technologies. Research by das Gupta (2011) also revealed that lack of knowledge and

understanding by households and inadequate supervision and control by the competent authorities are the main obstacles to promoting the sense of quality.

2.6.11 Politicization of IS Upgrading Program

The politicization of the IS upgrade program is another aspect. Amis and Kumar (2000) connect poverty in the IS with political marginalization. This means that the local government is not involved. Appadurai (2001) also refers to the lack of political empowerment in relation to IS impoverishment. The IS poverty can also be tackled, in other words the IS dwellers can actively engage in decision making. Goetz (2000) and Goddard (1997) express similar sentiments, which describe social action and political mobilization as the key weapon in challenging IS (Elmhirst, 1999) for enhancing IS services with methods of political survival to exploit the vulnerable in IS for selfish ends. Roy (1999), who ties IS politics to the social and economic agendas of the day, is making similar ideas. Blong explains floods as an IS environmental threat, linked to lack of political will and money, from a different viewpoint. He also asserts that IS fires may be started to evict IS dwellers for political reasons.

2.7 Theoretical and Conceptual Framework

2.7.1 Theoretical Framework

Various Scholars have advanced many theories on the study of urbanization and have applied several approaches in dealing with informal settlement challenges. Urbanization theories among them migration, industrialization and dependency theories are used to give insights on the informal settlement problems (Malu, 2005).

Other theories include Smart Urbanism, Participatory Planning Theory and Triple Bottom Line (TBL) as discussed below.

2.7.1.1 Smart Urbanism Theory

Smart Urbanism Theory has its origins in the works of Louis Wirth, 1938. It was advanced by Congress for New Urbanism, founded in 1993. According to Campbell (2012), Smart Urbanism is the emergence of true urban life which leads to a flourishing society and a healthy local economy. The theory can be applicable in this study because it deals with the complex issues posed by the existence of informal settlements in developing countries. Smart urbanism is an operating programme for delivering massive small changes, and allowing the necessary complexity in the design of towns and cities. It is termed as emergent urbanism which is sustainable, collaborative or generative. Campbell (2012) further argues that smart urbanism comes from two concepts: firstly, the needs of the 'Resilient City' which involves good urban design that can address environmental, social, economic and issues. Secondly, the 'Talented City' where the need to foster innovation for example green practices, facilitate enterprise and build social accommodating change. Talented City' approach adopts a new top-down discipline that is more 'open' to bottom-up responses from a variety of actors.

Kelbaugh, (2009), suggests that Smart Urbanism combines systems of thought with sensitive environments to render towns and cities capable of sustaining life in an ever-changing world. This theory is important to the study since the modern urban design and management philosophy is focused on smart urban planning. The strength of the theory is the standard 3-phase sequence of urban transformation, which begins with

planning, then continues with the development and delivery of urbanism, and clearly involves the classification of the role of planning in managing urban growth. Doing things right from the start gives a good opportunity to realize the later consequences when it's incorrect in the first place leads to everything else going wrong. This is why urban planning advocates generally see the design framework as the key goal of efforts to ensure comprehensive and sustainable urban management through informal settlement upgrading.

2.7.1.2 Participatory Planning Theory

The planning was initially carried out by Paulo Freire and Kurt Lewin in 1971 and then adopted by the leaders in the programme, Patrick Geddes and Lewis Mumford in 1973. Participatory, often knowledgeable communication, consultative or collective planning. It arose as a reaction to the inability of planning institutions in the second half of the 20th century to cope with the rapid changes in Western cities. Its goals were to replace hierarchical and hierarchical planning structures with more inclusive and democratic decision-making. This was achieved by facilitating the participation of a whole range of stakeholders in dialog-oriented planning processes, the engagement of a whole range of stakeholders in the planning process, in conversations and joint initiatives at their heart (Innes and Booher, 2003). Participatory planning theories promote collaborative, inclusive and equitable conversations for the use of undistorted communication as the basis for any planning process. In these cases, all stakeholders can define, analyse, suggest and mediate about the issues and proposals of a planning project to consider and learn from views and desires of others who are part of the process. Consequently, decision-making is based on the agreement that is most acceptable for "all" actors concerned about claim or solution (Healy, 1996).

Critics of participatory planning theories claim that they are utopian, idealist and impossible to incorporate in real life. The critique is specifically concerned by the lack of awareness in society and planning / political culture of power systems (Flyvbjerg, 2002). They refer also to a rejection of disparities between world views and values and to the contradictory rationales generated by these in the planning process (Watson, 2003).

Despite the criticism, the need for more inclusive and democratic planning processes cannot be denied to supporters and opponents. In the upgrade of informal and disadvantageous neighbourhoods, foreign donor agencies fully endorse and recommend the participatory planning strategy (World Bank 2001; UN Millennium Project 2005).

This theory is important to the study because upgrading demands participation. The lack of participation leads to a lack of community support for upgrading and general lack of commitment and a lack of sense of ownership of the project, particularly when a top-down approach to the informal reconstruction of settlements is the key approach. Furthermore, the presence of informal settlement groups and the need to give them a voice is the underlying concept for updating the Informal Settlements policy at all stages of the modernization process. Participation is an important way to motivate IS communities to change their livelihood, but lack of public participation may also threaten the rapid and efficient implementation of the project.

2.7.1.2 Triple Bottom Line Model (TBL)

Although smart urbanism and participatory planning theories have been advanced on the study of upgrading the informal settlements and informs the study partially, this study is grounded on the Triple Bottom Line Model (TBL) advocated by business consultant John Elkington in 1990 to describe economic, environmental and social value of investment. The idea is often referred to as 3Ps (people, planet, profits). Triple bottom line thinking is motivated and applies to the concept of sustainable development on the basis that development can take place in ways that meet the needs of current generation while maintaining the same conditions and opportunities for future generations (World Commission on Environment and Development, 1987).

The TBL solution involves a much wider illustration and a broader emphasis on economic sustainability than mere financial practicability from a sustainable urban planning perspective. The Johannesburg Declaration on Sustainable Development (UN 2002) explains on the wider sustainability forum that sustainable development TBL has three mutually reinforcing pillars: economic development, social development and environment security as shown in Figure 2.7. Sustainability is now seen as the interaction of those three columns and the creation of a shared forum to achieve or exercise sustainable development to achieve common benefits.

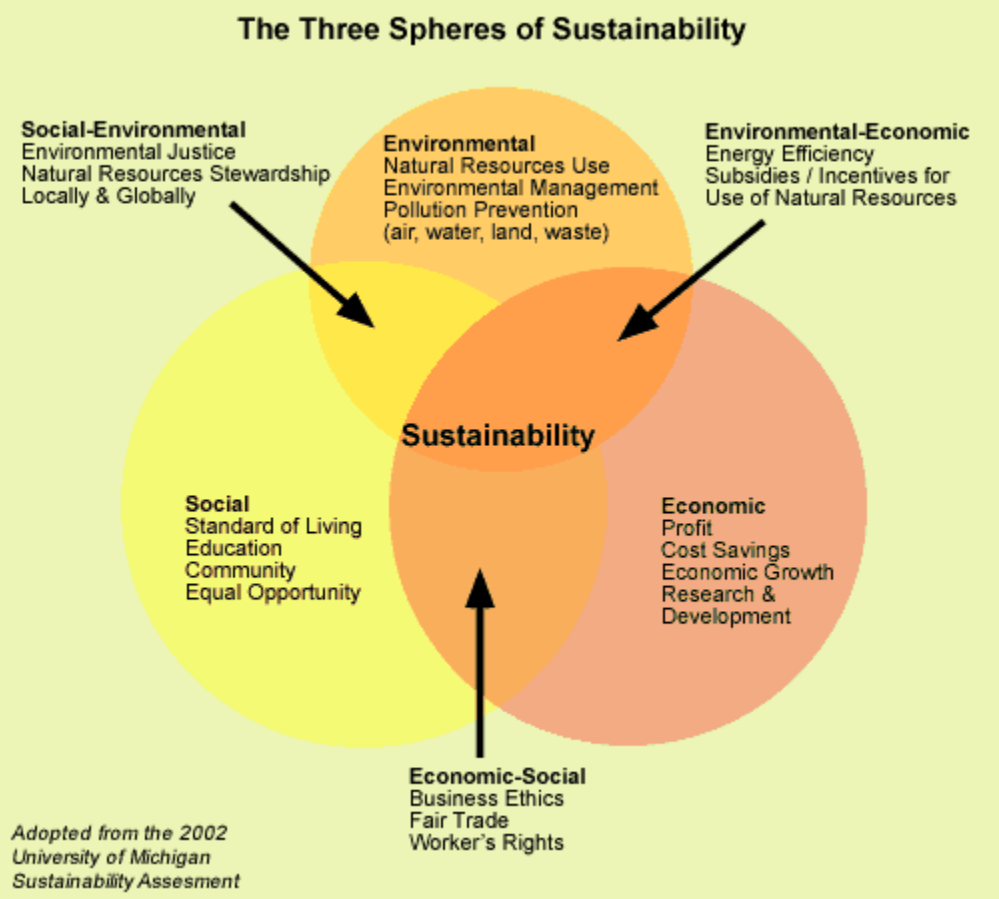

Figure 2:7 Three Pillars of Sustainability

Source: University of Michigan Sustainability Assessment (2002)

Global consciousness is on the increase of the need for sustainable development to resolve the increasing environmental challenges caused by global warming and climate change, pollution, and the loss of human capital (SDN, 2009). This model is applicable in the study since upgrading operations combined environmental, economic and social interventions are multi-field operations. They are aligned with the mission of sustainable urban growth by making stable, socially just, economically urban neighbourhoods open to better services and a proper urban environment. Upgrading also manages resource usage by relying on existing systems and efforts. The study took the TBL model as the basis of its conceptual structure, based upon the above claims,

since informal settlement modernisation involves three mutually reinforceable pillars, namely economic growth , social development and protection of the environment. This can only be done if all parties involved in this process are able to optimize capital while mitigating environmental risks.

2.7.2 Conceptual Framework

Figure 2:8 shows that upgrading of informal settlement is influenced not only by how it integrates green practices which includes Green Energy (renewable energy, solar), Green Water (Rain water harvesting, reuse), Green Waste (reuse, recycle,) but also what is entailed in the upgrading process which involves the stakeholders to be involved and how the specific process is to be done. In addition, forces in the government which comprise policy that govern the integration of green practices in upgrading also influence the process. The Constitution and the laws need to provide a comprehensive legal framework for addressing the specific Informal settlement issues and there is need for proper policies and legislation for acquiring and adoption of green practices and technologies.

The green practices relate to practices such as renewable energy, rain water harvesting, and recycling and reuse of waste. All these practices when integrated in the upgrading process of an informal settlement while involving various stakeholders will lead to upgraded informal settlement with street and security lighting**,** improved waste management**,** improved storm water drainage, clean water supply and water and sanitation systems as shown in the Figure 2.8. In the long run economic, social and environmental sustainability is achieved in informal settlement upgrading with associated benefits due to adoption of green practices as discussed below.

Economic sustainability in achieving this is based on the fact that informal settlement economies play a vital role in meeting the living requirements of informal settlement residents in developed countries, since they contribute significantly to the growth of urban economies, with their large proportion of the formal labour force, in developing countries. They contribute to the provision of urban services (waste collection) and the production of goods (such as day-to-day products) for local markets and exports (Vages and Long 2013). At the heart of poverty is joblessness. Jobs are also the only asset for the poor to better their livelihoods. The creation of productive employment opportunities, particularly in the green economy, is therefore necessary in order to reduce poverty and to achieve sustainable economic and social growth. Productive employment opportunities will contribute essentially to achieving the goals of the agreed internationally development, notably the Sustainable Development Goals.

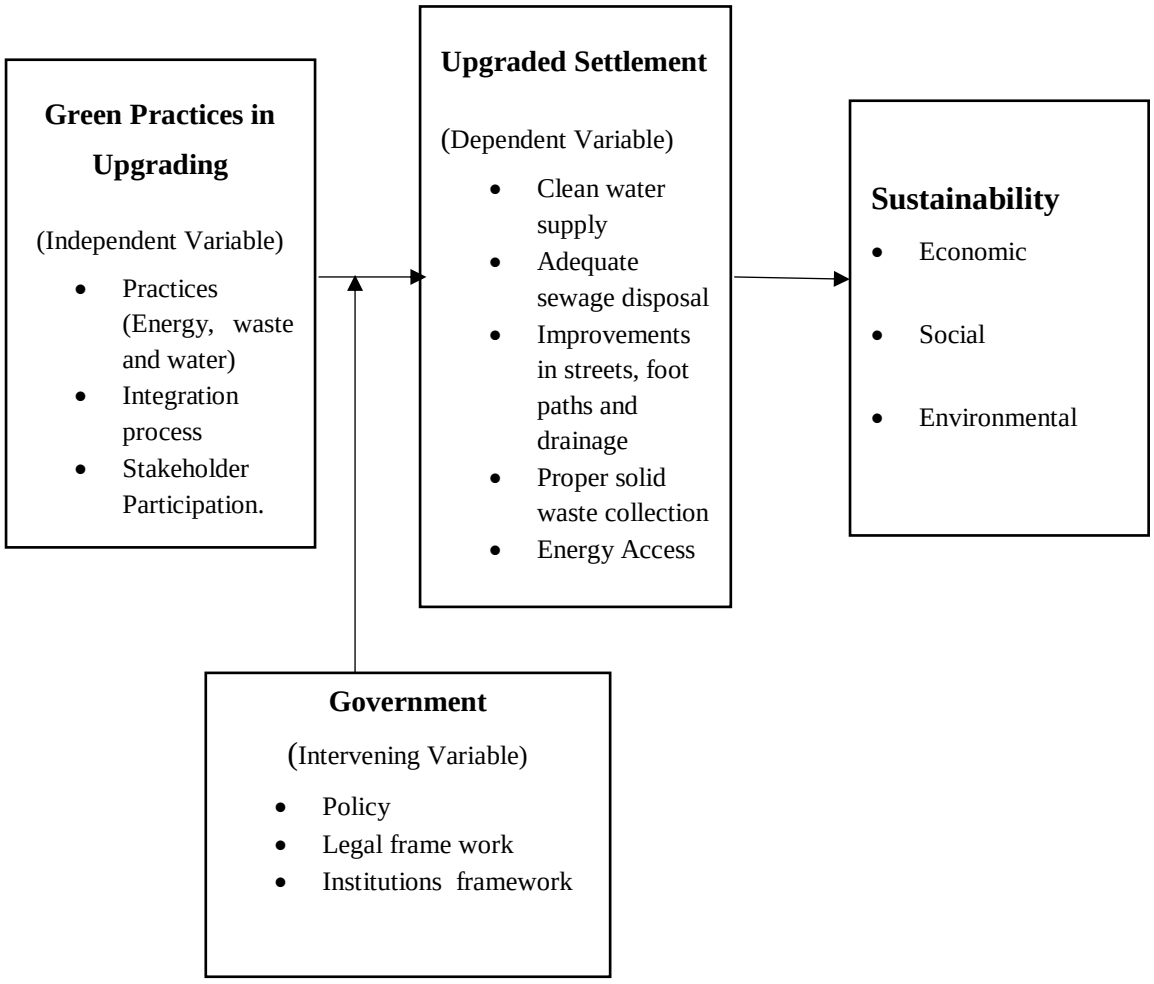

Figure 2:8 Conceptual Model of Integration of Green Practices

Source: Author, (2017)

The four clear and harmonious steps, namely social inclusion, engagement, empowerment and community mobilization, will help to achieve social sustainability. It can be argued that: social inclusion implies the involvement of communities in improvement processes involving local citizens' empowerment. And after the process of upgrading, the empowerment process leads to community mobilization where informal settlements become responsible and effective. Social sustainability could thus be accomplished through improvement processes, helping residents to feel part of society to informal settlements and making them feel their worth as people deserving fair access to livelihoods, such as food , clean water, clothes, housing , healthcare,

educational, transportation, etc. Residents participate in the upgrade process, including preparation, execution, monitoring and enhancement of facilities or programs, at all levels of progress. The engagement of residents and other local stakeholders ensures that improvements to their priority needs proceed in line with local requirements and the use of local resources (Abdelhalim, 2010).

Environmental sustainability is a multi-faceted problem that strikes a balance between various problems. These topics include the energy reserves, for example, in the house, development, transport of materials, use of renewable energies and energy efficient design and planning. In addition to the detection, reuse, recycle, the avoidance of contaminants and chemicals, the harvesting of rainwater and healthy disposal of waste (UN HABITAT, 2012 a). It's accepted that the key determinants of environmental health for informal residents are poverty, which is a result of a lack of access to clean water, insufficient sanitation and improper waste management, indoor air pollution and overcrowding. In short, the TBL model acknowledges the need to update settlements, while at the same time retaining, improving or restoring environmental and social benefits.

2.8 Literature Review Gap

Several studies have looked at energy security and adaptation in informal settlements, how waste is disposed, knowledge on disposal practices, waste reuse, problems in managing waste, role of stakeholders in solid waste management and access to water through social connections policy but little has been done to incorporate energy saving practices, sustainable waste management from collection to disposal and adoption of water innovation into the upgrading process. Despite the growing number of studies

on informal settlement upgrading, these studies are either more focused on the challenges of implementation of upgraded projects or are more geographically biased in that they are concentrated in major towns in Kenya like Nairobi. There are not enough studies on integration of environmentally sustainable practices in upgrading informal settlements in fast growing towns like Eldoret and this is the gap that this study will try to fill.

2.9 Chapter Summary

This chapter discussed literature on the concepts of green practice and upgrading initiatives and empirical literature was analysed and indicates that various studies have been conducted on green practices adoption, stakeholder's involvement, benefits and challenges of informal settlement upgrading. The studies have indicated success stories of upgrading. It was evident that green practices play and will continue to play a significant role in upgrading informal settlements and in achieving sustainable development. It has also been seen that little research has been done on the integration of green practices in upgrading of informal settlements in growing towns and every effort should be taken to address this gap in order to empower all the stakeholders in this sector while addressing the various challenges affecting the informal settlement dwellers.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Overview

This chapter presented the process involved in carrying out a study on integration of green practices in upgrading of informal settlement of medium sized towns in Kenya. Key areas discussed included: study area, research philosophy, research design, research approach, target population, sample procedure and sample size, data collection instruments, validity and reliability of research instruments, methods of data analysis and presentation and ethical consideration. This chapter sought to justify the relevance and validity of the processes that guided and supported the study.

3.2 Study Area

The study area was in Eldoret Town in Uasin Gishu County, which is one of the counties in the North Rift Region. The county shares common borders with Trans Nzoia County to the North, Elgeyo Marakwet County to the East, Baringo County to the South East, Kericho County to the South, Nandi County to the South West and Kakamega County to the North West. It covers a total area of 3,345.2 Sq. Km (Uasin Gishu CIDP, 2013). Eldoret town covers approximately 1,903 square kilometres. The town has been experiencing a rapid rate of urbanisation and population growth which could be attributed to devolution. Additionally, the infrastructure of the town and especially in the informal settlement has been stretched due to ever increasing population.

3.2.1 Population Density and Settlements

According to the 2019 Population and Housing Census, the total population of Uasin Gishu County stood at 1,163,186 with a censual population growth rate of 2.67%. The population growth rate is higher than the national growth rate at 2.9%. The population density is 352.9 persons per sq. Km.

On Urban Settlements, the total Urban population as per the 2012 population projections was 357,651 with Eldoret – 289,380, Burnt Forest – 32,649, Turbo – 22,165, Matunda - 10,031, Jua kali – 3,427. The other urban areas are Kipkaren, Timboroa, Ziwa, Moiben, and Moi's Bridge etc. Eldoret Town is densely populated; it had a population density of 1996 persons per Km^2 in 2012. The high population density in Eldoret Town is attributed to urbanization and being the headquarters of the county government, this density was projected to rise even higher and it is the town with the highest population growth rate in Kenya. The areas with high population concentration are Langas, Munyaka, Huruma, Maili Nne, and Kamukunji which are the informal settlements areas (CIDP 2013). Among the emerging issues on urban settlements in the CIDP are Urban sprawl/ Unplanned settlements. Practical solutions suggested include development of housing projects, informal settlement upgrading and Urban renewal and regeneration (CIDP 2013).

3.2.2. Climatic Conditions

Eldoret is regarded as a climate-friendly city; Uasin Gishu generally experiences stable and viable precipitation, which is distributed uniformly all year round. The average rainfall ranges from 624.9 to 1.560.4 mm with two distinct peaks from March to September to May and August. Between November and February there are dry spells.

The temperatures range from 7 to 29 degrees Celsius. These conditions are generally favorable for cattle, crop and fish farming. However, the weather trend has changed slightly over the years due to global warming (Uasin Gishu CIDP, 2013).

3.2.3. Economic Factors

The town is served by a potential agricultural climate, ecological tourism, industrial activities, such as the processing of corn and wheat, the textile sectors, such as the Rift Valley textile industry and the development of higher learning institutions. Eldoret can be used for the shipment to foreign markets of finished products and raw materials.

3.2.4 Characteristics of Informal Settlements under Study

In 2011, the government and other development actors initiated Kenya Informal Settlement Improvement Project (KISIP) in 15 municipalities to run for five years up to 2016. Eldoret municipality which is in Uasin Gishu County was one of municipalities chosen. In Eldoret municipality, the following informal settlements were selected and included in the KISIP program as shown in Figure 3:1; Huruma/Mwenderi, Kamukunji settlement and Munyaka settlement (Republic of Kenya, 2014).

Figure 3:1: Huruma/Mwenderi, Kamukunji Settlement and Munyaka settlement

Source: Adopted from Odongo (2012)

Apart from KISIP there are other initiatives initiated by other stakeholders like CSO's, local community, County Government and the private sector (Uasin Gishu CIDP, 2013). This research looked at physical improvement projects like infrastructure and service delivery which comprises investment in roads, bicycle paths, pedestrian walkways, street and security lights, waste management, water drainage, sanitation, green spaces, platforms etc. in the upgrading of informal settlements. This study

examined the green practices integrated in informal settlement upgrading initiatives at Munyaka, Kamukunji and Huruma informal settlements in Eldoret town.

3.2.4.1 Munyaka

Munyaka is located in Eldoret East District, Ainabkoi constituency, Kapsoya ward, Chepkoilel location and Sigot sub-location approximately 4.3 km northeast of the central business district. The subdivision of the original farm of 121.4ha began in the 1980's. The farm was divided into 969 small plots of about $50m^2$ each as shown in Figure 3:2.

Munyaka has a land area of more than 88 hectares (88.2 ha) and is situated on an area of slightly rolling hills and has a rural feel to it. It has an estimated population of 18,107 and 4,416 households. There are four clusters in Munyaka: (i) Bahati, (ii) Cyrus, (iii) Munyaka, and (iv) Mwitirithia (Republic of Kenya, 2013).

Figure 3:2 Land Use Map of Munyaka Settlement

Source: Adopted from Odongo (2012)

3.2.4.2 Kamukunji

Kamukunji is located in Uasin Gishu District, Soi Constituency, Kapsuswa-kwinet ward, Kiburgen location, and Kamukunji sub-location. The settlement has an area of 11.1 hectares and is approximately 2.5 km north of the central business district (Figure 3:3).

The settlement is named after a meeting place where initial residents used to converge, and is part of the wider Kamukunji Estate. The total population is 4,527 which comprise 1,104 households. The settlement is flat on its southern edges and then extends up the sides of a rocky hill on its northern boundaries. The settlement becomes quite muddy during the rainy season and is surrounded by undeveloped or agricultural land as well as other, less dense settlements to its north. The settlement is organized into six clusters: Stage 1, Stage 2, Stage 3, Stage 4, Stage 5, and Stage 6. These names referred to the name of the nearest matatu stop (Republic of Kenya, 2013).

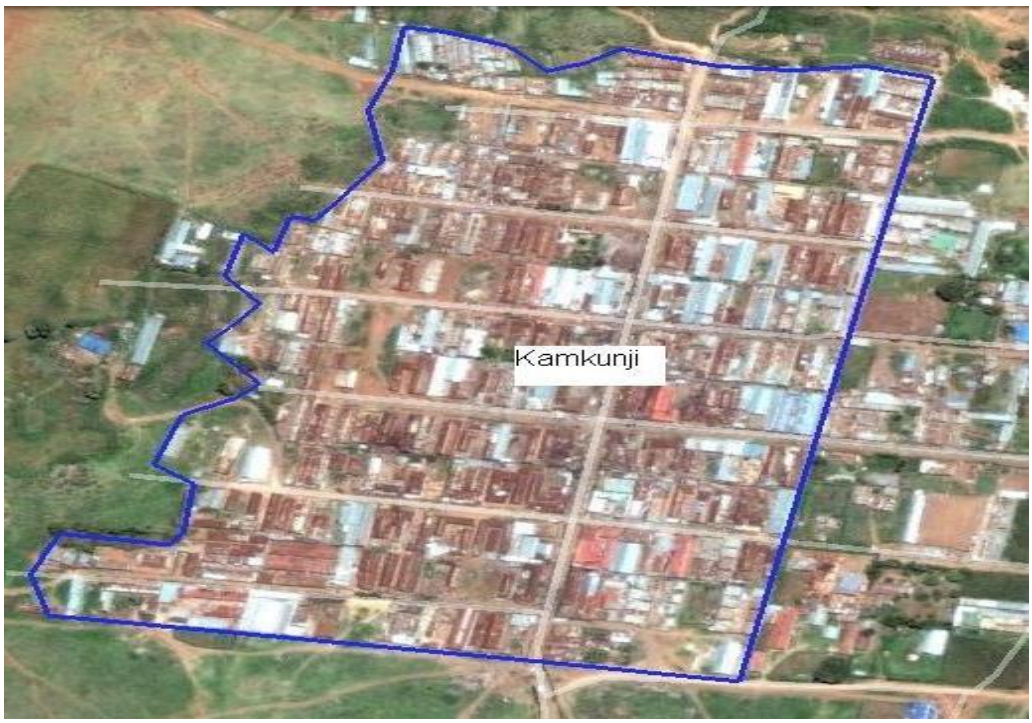

Figure 3:3 Land use Map of Kamukunji Settlement

Source: Adopted from Odongo(2012)

3.2.4.3 Huruma/Mwenderi

Huruma is located in Turbo Constituency, Huruma Ward, Turbo location and Kapyemit sub location and is approximately 3 km northeast of downtown Eldoret as Shown in Figure 3.4.

Figure 3:4 Huruma/Mwenderi with Verified Boundaries

Source: Adopted from Odongo (2012).

Between 1974 and 1976, the King'ong'o Farm put up 120 acres for sale. This land was bought as a collective, with individuals owning shares. The farm directors opted to sell to "common citizens" rather than to wealthy landowners and farmers. This is the origin of the name '*Huruma'*, which means compassion in Kiswahili.

Many of the residents of Huruma came from other informal settlements within Eldoret town and many were previously squatting in government forests in the region. These first residents opened businesses that later gave names to the clusters in which they are found (e.g. Pilot, Gatanga, Nyathiru, Big Five and Flamingo).

Together, the settlements of Huruma and Mwenderi have a combined area of 70.9ha. Huruma takes up the bulk of the area with Mwenderi comprising of only two rows of

houses on the south-eastern edge of Huruma. The settlements are on a gradient and at the bottom of the slope are the Sosiani River and ELDOWAS' wastewater treatment lagoons.

Huruma is divided into four clusters: (i) Big Five, (ii) Gatanga, (iii) Nyathiru and (iv) Pilot. All these clusters were named after a prominent shop or business located in the respective cluster, the population stands at 15,090 with an estimate of 4,438 households (Republic of Kenya, 2013).

3.3 Philosophical Worldviews

Although philosophical ideas remain largely hidden in research, Slife and Williams (1995), argue that philosophical ideas still influence the practice of research and need to be identified. Philosophical world view is referred to using different terms interchangeably. Some refer to it as the epistemological worldview, philosophical perspective or scientific paradigm. Creswell (2009) prefers the use of the term worldview and he defines it to mean, a basic set of beliefs or frameworks of thought that influence a researcher's choice of a research design. Others have called them paradigms (Guba and Lincoln, 2005; Mertens, 2009); epistemologies and ontologies (Crotty, 1998), or broadly conceived research methodologies (Neuman, 2011). Creswell further describes a paradigm as a general orientation about the world and nature of research perspective held by the researcher. This orientation may be shaped by such factors as the researcher's area of discipline, experiences of the scholar and beliefs. Guba and Lincoln (2005), hold a common view that a paradigm is an interpretive framework that is guided by a set of beliefs and feelings about the world

and how it should be understood and studied. Denzin and Lincoln (2005), list this set of beliefs as;

1. ***Ontology***- deals with the question of what is, what can be, what exists. What is real
2. ***Epistemology***- is the branch of philosophy which studies the nature of knowledge and the process by which knowledge is acquired and validated
3. ***Methodology***- deals with how do we know the world or gain knowledge from it

The types of beliefs held by individual researchers will often lead to embracing a qualitative, quantitative, or mixed methods approach in their research. Further, Creswell (2003) identifies Four different world views; positivism, constructivism/interpretivism, advocacy/participatory and pragmatism as discussed below.

3.3.1 The Post Positivist Worldview

The post positivist assumptions have depicted the standard style of analysis, and these assumptions hold true additional for quantitative analysis than qualitative analysis. This worldview is typically known as the methodology or doing science analysis. It is also called positivist / post-positivist research, empirical science, and post-positivist research. This last word is called post-positivism because it reflects post-positivism thought, contradicts the conventional notion of the absolute reality of knowledge (Phillips and Burbules, 2000) and acknowledges that we cannot be "positive" to our statements of knowledge when we research human behavior and behaviour. The post-positive tradition comes from 19th-century writers such as Auguste Comte, Bentham Mill, Emile Durkheim, Isaac Newton, and John Locke

(Smith, 1983), most recently articulated by writers such as Phillips and Burbules (2000).

3.3.2 The Social Constructivist Worldview

Social constructivism is often combined with interpretivism and it is typically seen as an approach to qualitative research. The ideas came from Mannheim and from works such as Berger and Luekmann's (1967), the Social Construction of Reality and Lincoln and Guba's (1985) Naturalistic Inquiry. More recent scholars who have summarized this position include Schwandt (2007), Neuman (2000), Lincoln and Guba (2000), and Crotty (1998), among others. Social constructivists hold assumptions that people seek understanding of the universe in which they live and work. Individuals develop subjective meanings of their experiences, meanings directed toward certain objects or things. These meanings are varied and multiple, leading the researcher to look for the complexity of views rather than narrowing meanings into a few categories or ideas. The goal of the analysis is to rely as much as possible on the participants' views of the situation being studied.

3.3.3. The Advocacy and Participatory Worldview

Another group of researchers holds to the philosophical assumptions of the advocacy/participatory approach. This position arose during the 1980s and 1990s from individuals who felt that the post positivist assumptions imposed structural laws and theories that did not fit marginalized individuals in our society or issues of social justice that needed to be addressed. This worldview is typically seen with qualitative research, but it can be a foundation for quantitative research as well. Historically, some of the advocacy/participatory (or emancipatory) writers have drawn on the works of Marx,

Adorno, Marcuse, Habermas, and Freire (Neuman, 2000). They believed that the constructivist stance did not go far enough in promoting an intervention agenda to support marginalized communities. The advocacy / participatory worldview claims that analysis needs to be intertwined with politics and the political agenda. Research also requires an action plan for transformation that can change the lives of the participants, the structures in which the person works or lives, and the life of the researcher. Relevant topics, such as empowerment, injustice, racism, domination, suppression, and alienation, need to be discussed that discuss significant social issues of the day. As a focal point of the study, the researcher always starts with one of these problems.

3.3.4 The Pragmatic Worldview

The other stance on worldviews comes from the pragmatists. Pragmatism is derived from the work of Peirce, James, Mead, and Dewey (Cherryholmes, 1992). There are many manifestations of this theory, but for many, pragmatism as a worldview derives from actions, situations, and consequences rather than from pre-existing circumstances (as in post-positive situations). Applications are worried with what works and solutions to problems (Patton, 2002). Instead of focusing on procedures, researchers stress the research problem and use all available approaches to explain the problem. As a philosophic basis for mixed-method studies, Tashakkori and Teddlie (1998), Morgan (2007) and Patton (2002) express the importance of concentrating emphasis on the research issue in social science research and then using pluralistic methods to learn about the problem.

In summary, Lincoln and Guba (2000) argued that social science research is fundamentally related to one's framework, commonly understood as a collection of

values that underpin human behavior. In line with these considerations, research undertakings are distinct from the manner in which they provide explanations about the social environment. The same authors point to issues of ethics (or axiology), epistemology and ontology in their discussions on methodology, which decide, in an important way, how researchers approach, conduct and, ultimately, report on research. Study undertakings must therefore be interpreted as specific premises and expectations held by the individual or persons undertaking the research. The philosophical paradigm adopted in the analysis was pragmatism on the basis of the above assertions.

Pragmatism was suitable because it is a philosophical underpinning for mixed methods studies, it is not fixed to any one system since it draws freely from both qualitative and quantitative assumptions. It allowed the researcher the freedom to choose the approaches, techniques and procedures that sufficiently guided the conduct of inquiry into integration of green practices in informal settlement upgrading. In addition, Pragmatic philosophy has its priorities on the practicality and application of research, to solve human problems. The pragmatic theory insists on constant empirical verification of phenomena in order to ascertain the legitimacy of facts, since it is only through such investigations that the intricacies surrounding practices and processes can be unravelled (Nyametso, 2010). Consequently, the adoption of the philosophy for the present research was partly informed by the realisation to address the problems of informal settlements in Eldoret town. It was necessary that the study results should be practically focused by using the findings to develop recommendations to tackle the informal settlement problems. Furthermore, the truth about green practices integrated in upgrading can be discovered and modified from time to time through investigations and in relation to the contexts in which the investigations are carried out. Further

justification for adopting the pragmatic philosophy and using a mixed method approach for the present research derives from the fact that even though researchers usually present sharp distinctions between inductive and deductive (or qualitative and quantitative) research, the actual research processes, from the stage of research design, data collection, presentation of research results, analysis, discussions and conclusions, do not follow exclusively either of the above approaches (Morgan, 2007). In fact, the research process involves back and forth drawing on the elements of induction and deduction. This drawing on both elements of induction and deduction is called abductive reasoning and is grounded in the philosophy of the pragmatic approach to research (Morgan, 2007). According to Creswell (2003), mixed methods approach is akin to the repetitive processes that every researcher goes through in drawing on quantitative and qualitative tools, techniques and methods to enable them to find answers to their research questions.

In addition, according to pragmatist's research philosophy, research questions are the most important determinant. It can also combine both positivist and interpretivism positions within the scope of a single research according to the nature of the research question (Collis and Hussey (2014). It can be argued that pragmatist management researchers can be compared to architects. In the same way architects use whatever materials and methods needed to build the building, pragmatists use whatever combination of methods necessary to find the answers to research questions. At the same time they use a method or combination of methods that advances a specific research in the best possible manner (Saunders *et al*, 2012).

3.4 Research Approach

The researchers' involvement in the collection of data is just as critical as its results. The very different study traditions chosen need to be interpreted as deliberative decisions, focused as much on the philosophic orientation of the researcher as on concrete research questions. Three key approaches to analysis include;

3.4.1 Quantitative Research Tradition

The tradition of quantitative research is aligned with a positivist approach with its roots in the natural sciences. Using the methods used in laboratory experiments, the use of specimens provides the basis for the use of variables to monitor and manipulate the desired results (Akooje, 2007). Quantitative research methodologies emerge from a viewpoint that considers findings to be value-neutral, and research performed within this 'positivist perspective' borrows from natural sciences dedicated to monitoring variables and outcomes. Thus, this viewpoint comes from one that is intended to lay down rules and principles; in the case of social science, those required for social action. Accordingly, this tradition and the perspective from which it comes consider it important that some attention be paid to 'verifying' in order to maintain trust in the results (Sechrest, 1992).

3.4.2 The Qualitative Research Tradition

Qualitative research is defined as "paradigms (which) stem from an anti-positive, interpretative approach and are idiographic, therefore holistic in nature, and their main purpose is to understand social life and the meaning that people attach to everyday life" (Schurink 1998). While the definition of qualitative methods may be considered problematic in terms of what it is not, it does imply a clearly defined epistemological

distinction from the dominant quantitative approach. Similarly, Holliday (2002) indicates that the root of the discrepancies between the two cultures can be found in the qualitative positions of 'opposition to positivism...a philosophical basis for quantitative study.'

3.4.3 Mixed Methods

Traditionally, there are essential features associated with qualitative and quantitative approaches. Qualitative data-gathering approaches have been related to the use of in-depth, open-ended interviews, direct observation and written documentation (Patton 2002). In order to understand the world of the subject, more ethnographic approaches have also been used by the researcher seeking to get into the world of the subject by participation. Qualitative approaches have been considered to have the advantage of defining information, meaning and nuance, although they are unable to examine the macro context in the light of the limited number of topics. Data collection techniques related to quantitative methods include experiment surveys, analysis of official statistics, systematic observation and analysis of content (Bryman, 1988). As a result of their reach, they allow and require complex statistical aggregation and analysis of time and spatial trends. Although combined with the use of structured questionnaires, they are able to provide large-scale answers to pre-determined categories. As a means of obtaining the breadth of responses to a specific phenomenon under analysis, they provide an invaluable means from which uncovered areas cannot be gleaned by the use of in-depth qualitative methods alone. In terms of reference to quantitative researchers, the distinction between qualitative and quantitative research is often defined as working with a few variables and many cases, and qualitative researchers as working with few cases and many variables (Ragin 1987).

There have been some quite influential attempts to see some degree of synergy between the two data-gathering methods. Silverman (2000) sees the dichotomies as highly dangerous and describes them thus: The fact that simple quantitative measures are a feature of some good qualitative research shows that the whole 'qualitative/quantitative' dichotomy is open to question, mostly, such dichotomies or polarities in social science (are) highly dangerous. At best, they are pedagogic devices for students to obtain first grip on a difficult field. At worst, they are excuses for not thinking, which assemble groups of researchers into armed camps unwilling to learn from one another (Silverman 2000).

In a similar vein, Patton (2002) argues for a realistic approach that sees gaps based on 'numeric' and 'interpretive' terms. He points out that, since qualitative and quantitative approaches have different strengths and limitations, they represent alternate but not mutually exclusive research techniques (and therefore) both qualitative and quantitative data can be obtained in the same study (Patton 2002). Others have joined the call to see a degree of shared recognition of qualitative and quantitative roles in the data collection (Poggenpoel *et a*l. 2001; Smeyers 2001). The pragmatism of this approach recognizes, as opposed to a 'research position', the need for a commitment to a 'research issue'. One view considers that the "... object under study is the deciding factor in selecting a system and not the other way round" (Flick 2002: 5). Although there is still a need for defensive measures to be used, the goal is to ensure that sufficient data is obtained in the most reliable and productive manner. Poggenpoel *et al*. (2001) see the usage of both. The use of multi-methods is the basis for a significant degree of tolerance between traditions. Whereas it would not be uncommon in the early 1990s for studies to be dismissed on the basis of what would have been called 'methodologically sound data collection

techniques,' these are less frequent. If qualitative researchers see value in the large-scale data collection tools used for quantitative analysis, it is also a welcome shift, whereas those dedicated to quantitative approaches see the importance of interviewing strategies to recognize salient characteristics.

Commitment to the use of multiple methods implies that there will be some fascinating permutations in the mix of data-gathering processes in today's large-scale research enterprises, resulting in large-scale surveys preferred by quantitative researchers. Based on the above argument, this study adopted a mixed methods approach which includes both quantitative and qualitative approaches. Quantitative approach is characterized by an objective positivist search for singular truths that relies on hypothesis, variables and statistics while qualitative approach rejects positivist rule and accepts multiple realities through the study of in depth cases and can be accessed as being subjective (Creswell, 2008 and Neuman, 2005). The benefit of following this strategy is that the bias of quantitative and qualitative methods can be reduced (Green, 2008). The ability to draw wide-ranging observations and profound descriptive text on contextual issues using numerical information allow mixed methods to generate results that definitely distinguish from the mono approaches (Sosulski and Lawrence, 2008). Due to the complexity of issues involved in the informal settlement upgrading, a pluralistic method, and for that matter a mixed research approach, was deemed to be the ideal research approach. It was necessary to adopt a method which enabled generalisations to be made, while at the same time facilitating rich descriptive texts. It was only through such an approach that the research can adequately interpret the meanings constructed by the research participants about their experiences. In addition, the mixed research approach was considered desirable because it allowed complicated issues to be

exhaustively investigated, interpreted and disseminated within the relatively short period allocated for the present research.

The tools for data collection in mixed methods were derived from both qualitative and quantitative sources, including questionnaires, interviews, focus group discussions, general observations, and review of the literature. While the questionnaires generated quantitative data, the interviews, FCD and observations provided qualitative data. Mixed methods can be used in one of three distinct manners: (a) sequentially where either the quantitative or qualitative approach implementation constitutes a distinct and a different study; (b) in nested fashion where one of the conventional methods becomes the main research approach while the other knowledge claim is more limited in use; and (c) fully integrated where all of the methods are completely combined and simultaneously utilised to investigate the research questions throughout the course of the study (Sosulski and Lawrence, 2008). The present study adopted a fully integrated approach. Which means the research employed all the relevant quantitative and qualitative elements to address questions of the study at all phases of the research. This is because the intricacies surrounding every stage of the inquiry required that relevant methods were complementary and concurrently utilised to attain a detailed, comprehensive and trustworthy construction of the experiences of the research participants in statistical and deep descriptive data forms as progress was made throughout the study.

Creswell and Clark (2007), while providing procedures to guide mixed methods research, emphasized the importance of timing, weighting and mixing. These are further discussed here below on how they were applied in the study.

3.4.3.1 Timing

Timing is about when the data will be collected. The researcher collected qualitative and quantitative data simultaneously and also sequentially depending on the availability of subjects under study. The questionnaires, FGDs and then interviews were done sequentially while observation and photography was done simultaneously with the above three main data collection instruments. However, separate analysis was conducted to help maintain clarity of the results obtained.

3.4.3.2 Weighting

This concerns the relative importance given to different approaches to be used in the study. This is quite often indicated using capital letters for dominant approach (QUAL or QUAN), and lower letters for less dominant methodical approach (qual or quan). However, it is possible to give equal weights to both traditions, in which case both will be capitalized (QUAL or QUAN). The decision on how to weigh the data may be related to one's epistemological view and practical issues related to data access and data types. In this study, both the quantitative and qualitative were given equal weight.

3.4.3.3 Mixing

According to Creswell (2009), data for a study can be mixed at data collection, analysis, interpretation or at all the three stages. Data can be merged by embedding one data type on another, transforming and or integrating two different data types together or they can be presented separately and then connected to answer a particular research question(s).

In Summary, the study was based on the assumption that collecting diverse types of data best provided a more complete understanding of a research problem than either

qualitative or quantitative data alone and therefore it began with a survey in order to generate results to the population and in the second phase focused on qualitative, open ended interviews and FGD's to collect detailed views from participants to help explain the initial quantitative survey.

3.5 Research Design

According to Creswell and Plano Clark (2011), in the last decade, mixed methods procedures have been developed and refined to suit a wide variety of research questions. Many authors opine that there are many mixed methods designs but the four major designs include Sequential explanatory design, Sequential exploratory design, Concurrent triangulation, and Concurrent nested. Sequential explanatory design involves the collection and analysis of quantitative data followed by the collection and analysis of qualitative data. The priority is given to the quantitative data, and the findings are integrated during the interpretation phase of the study Cresswell (2003). In Sequential exploratory design qualitative data collection and analysis is followed by quantitative data collection and analysis. The priority is given to the qualitative aspect. As a result of this design, three stages of analyses are conducted after the primary qualitative phase, after the secondary quantitative phase, and at the integration phase that connects the two strands of data and extends the initial qualitative exploratory findings (Creswell and Plano Clark 2011; Teddlie and Tashakkori 2008; Onwuegbuzie, Bustamante,and Nelson 2010). In concurrent triangulation only one data collection phase is used, during which quantitative and qualitative data collection and analysis are conducted separately yet concurrently. The findings are integrated during the interpretation phase of the study. Usually, equal priority is given to both types of research (Creswell and Plano Clark 2011). Concurrent nested is the design that only

one data collection phase is used, during which a predominant method (quantitative or qualitative) nests or embeds the other less priority method (qualitative or quantitative, respectively) (Palinkas, Aarons, Horwitz, et al., 2011,). This nesting may mean that the embedded method addresses a different question than the dominant method or seeks information from different levels. The data collected from the two methods are mixed during the analysis phase of the project.

The study adopted the concurrent triangulation. This design was found appropriate since it attempts to describe a more complete understanding of a phenomenon of what is in a social setting such as an informal settlement. Creswell and Plano Clark (2011) asserts that concurrent triangulation design allows cross-validation or corroboration findings, provides well-validated and substantiated findings compared to sequential designs and that data collection takes less time. While dealing with complex issues in an informal settlement this design enabled the researcher to corroborate findings to clearly bring out the relationship between the variables.

3.6 Target Population

The target population of this study as shown in Table 3.1 comprised mainly the residents of households which has an estimated population of 9958 households (KISIP 2013) in the 3 informal settlements in Eldoret namely; Huruma, Kamukunji settlement and Munyaka settlement which were selected and included in the KISIP program and are undergoing other partial upgrading by CSOs, local community and the private sector. In addition, the study also targeted key informants which included representatives from the Ministry of Land, Housing, and Urban Development, NEMA,

KISIP officials, County Community Development Officer, County Director of Environment, County Director of Water, and County Physical Planner.

Table 3.1: Target Population of the Households in Three Informal Settlements

Informal settlement	Households
Munyaka	4416
Kamukunji	1104
Huruma	4438
Total	9958

Source: KISIP (2013)

Further, the study also targeted 57 Settlement Executive Committee from the three informal settlements

Table 3.2 Target Population of Settlement Executive Committee

Informal settlement	Population size
Munyaka	20
Kamukunji	19
Huruma	18
Total	57

Source: Ministry of Lands, Housing and Urban Development (2012)

3.7 Sampling Procedure and Sample Size

3.7.1 Sample Size

The study population was comprised of households, key informants and settlement executive committee members operating in Huruma, Kamukunji and Munyaka

settlements in Eldoret town. The sample size of the study was determined based on Robert V. Krejcie and Daryle W. Morgan's table (1970) as shown below.

Table 3.3: Robert V. Krejcie and Daryle W. Morgan's table (1970)

N	*S*	*N*	*S*	*N*	*S*
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note.—*N* is population size. *S* is sample size.

Source: Krejcie & Morgan, 1970

According to KISIP (2013) the total number of households in the three informal settlements was 9958. Based on the Table 3.3, one uses the total population (N) to determine the corresponding sample size (n) that is already predetermined, therefore a

sample size of 370 was drawn from the population of 9958 and was proportionately divided in the three informal settlements as shown below.

Table 3.4*: Sample Size*

Informal settlement	**Households**	**Sample Size**	**Percentage**
Munyaka	4416	164	44%
Kamukunji	1104	41	11%
Huruma/Mwenderi	4438	165	45%
Total	**9958**	**370**	**100**

Source: KISIP (2013) & Researcher (2016)

The study gathered field data from 370 households' heads (out of 9958 households). In addition, 7 key informants were interviewed while the Settlement Executive Committee provided 30 respondents, 10 from each settlement representing various categories of stakeholders for the Focus Group Discussion.

3.7.2 Sampling Techniques and Procedures

The study employed simple random sampling, systematic and purposive sampling

3.7.2.1 Simple Random Sampling

Simple random sampling was applied in selecting the first household in each of the three selected Informal settlements. The household formed the unit of analysis. The study respondents within the selected units were household heads. A sample of 370 households in the three informal settlements was deemed appropriate.

3.7.2.2 Systematic Sampling

It is worth noting that even though houses are not numbered in the informal settlements of this research, linear arrangements were observable in the chaotic layout of houses in the settlements and this allowed for the systematic random sampling of houses. The first household was selected randomly in each of the three informal settlements, then every subsequent 7^{th} household was selected and a questionnaire administered until the total sample size for that particular settlement was exhausted. The study used the systematic sampling formula N/n where N represented the total number of households in the respective settlements while n represented the sample population that received the questionnaires.

3.7.2.3 Purposive Sampling

Purposive sampling technique was utilized to select key informants and stakeholder's representatives from SEC who were believed to be resourceful by virtue of possessing information crucial to the achievement of the study objectives. This method was employed in the identification of the various government actors such as a representative from the Ministry of Land, Housing and Urban Development, one from NEMA, KISIP Project Component Three Manager, County Community Development Officer, County Director of Environment, County Director of Water and County Physical Planner. In addition, various stakeholders' representatives from the SEC in every settlement was purposively selected for the FGD.

3.8 Data Collection Technique

3.8.1 Nature and Sources of Data

3.8.1.1 Type of Data

Two types of data were collected, that is, primary and secondary. The primary data was collected from the field and gave first-hand information about the extent to which green practices have been integrated in informal settlement upgrading. Secondary data in form of documented information were sourced through retrieval of documents such as project reports, literature review, city indices, fact data sheets, maps, and County Integrated Development Plan.

3.8.1.1.1 Primary Sources of Data

Primary data sources included households, key informants and the settlement executive committee. The above primary data was collected using questionnaires, interview schedules, FGD and observation guides to provide the baseline data for the research study in the field.

3.8.1.1.2 Secondary Sources of Data

Secondary data was obtained from various sources including reference books (published), information from government bodies such as relevant line ministries tasked with the responsibility of executing various government policies necessary in the planning and management of urban areas in Kenya, strategic annual and quarterly reports of Eldoret town, CIDP and its planning frameworks on slum upgrading and relevant references.

3.9.2 Methods of Data Collection

Since the research adopted the mixed methods approach, a combination of data collection techniques was employed in this study to generate both qualitative and quantitative data. Both primary and secondary data was collected. The research used various methods and instruments as discussed below.

3.9.2.1 Key Informant Interview

Seven key informants were purposively sampled for interviews by the researcher. They had specific knowledge on the integration of green in informal settlement upgrading such as a representative from Ministry of Land, Housing and Urban Development, one from NEMA, KISIP project component three managers, County Community development officer, County Director of Environment, County director of water and County physical planner The interview was conducted on different dates and time depending on prior appointment. The interview enabled the researcher to get insight of the actual challenges in the informal settlements and what the government and various stakeholders' actors have done in integration of green practices in informal settlement upgrading.

3.9.2.2 Focused Group Discussion (FGD)

The views, thoughts and experiences of the SEC were sought through discussions. This was conducted by holding three focus group discussions with each comprising eight to ten participants in the three informal settlements at different days. The focus group discussion provided an opportunity for the researcher and the Settlement Executive Committee of three informal settlements to explore and understand the diversity of perceptions and opinions about the renewal of the settlement through the integration of

green practices in the informal settlement upgrading. This also allowed the researcher to be exposed to many views held about the government and other development actors and on the importance of understanding people's feelings about the new concept of green practices.

3.9.2.3 Photography

In order to substantiate information obtained from the field study, photographs of the study area were taken to support field observation regarding living conditions of IS dwellers. Photographs were used to capture information which were then referred to during the analysis of data to provide useful visual interpretations of different phenomena encountered during the research study. It provided the researcher an opportunity to directly share reality on matters related to the study. It's also creative since it captured attention visually.

3.9.2.4 Document Review

Secondary data was mainly sourced through review of documents such as reports, projects, and books with information gathered being utilized during the study analysis. Taylor (2002) and Creswell (2009:180), identified common documentary sources for research such as public documents like government surveys, legislation, historical records, print media content and private documents such as journals, diaries, or letters.

3.9.2.5 Questionnaires

A questionnaire was designed and administered to the 370 household's heads in Munyaka, Huruma and Kamukunji informal settlements. The questionnaires were useful in gathering data from various households' heads so as to gather views on the

community's perception about the entire process of informal upgrading and integration of green practices in the study area. The questionnaire was divided into various parts that touched on green practices being employed, integration process, benefits of adopting green practices and the challenges in implementation of green practice. A five point Likert Scale was used to assess the effect of green practice on sustainable informal settlement upgrading and the dynamics of implementation of green practices. Open and closed ended questions were also used in the questionnaire.

3.9.2.6 Observation Guides

These were used to provide a guide on the elements to be observed. The purpose of the observation was primarily to add naturalistic depth to the interview, to give first-hand situational accounts existing on the ground and to provide an internal validity check from a second source of ethnographic data for corroboration. The researcher developed specific items to be observed and this gave the researcher an opportunity to observe the actual situation in the informal settlements.

3.10 Reliability and Validity of Research Instruments

3.10.1 Reliability and Validity in Quantitative Research

Reliability is the extent to which results are consistent over time and reproducible under a similar methodology (Joppe, 2000). To ensure reliability of the research instruments, the researcher conducted a pilot study which involved administering the same questionnaires to households in Langas informal settlement. The aim was to ascertain how it would work in the actual study by identifying potential problems and areas that may require adjustments. The same questionnaire was administered to the same group

of respondents after a period of two weeks. After administering the questionnaires, a correlation coefficient was calculated to indicate the relationship between the two sets of scores. Pearson product moment correlation coefficient was used to determine the correlation coefficient (Γ^1_x). The reliability of the entire instrument was obtained through $\Gamma^1_{xx} = 2\Gamma_{xx} / (1 + \Gamma_{xx})$, where Γ_{xx} is the correlation between the two tests. Below is the result for the reliability of the questionnaires.

$$\frac{2 \times 0.7021}{1.7021} = 0.8249$$

Straub *et al.*, (2004) suggest that reliability should be equal to or above 0.60 for a pilot study. The value established was above the minimum value recommended.

Joppe (2000) provides the following explanation of what validity is in quantitative research: Validity determines whether the research truly measures that which it was intended to measure or how truthful the research results are. In other words, does the research instrument allow you to hit "the bull's eye" of your research object? Researchers generally determine validity by asking a series of questions, and will often look for the answers in the research of others. Validity measures what is intended to be measured" (Field, 2005) and explains how well the collected data covers the actual area of investigation (Ghauri and Gronhaug, 2005). There are several forms of validity. These include; face validity, content validity, construct validity, criterion validity and reliability. In this study, face and content validity of the questionnaire was established using a panel of experts who explored the theoretical constructs and how the constructs were represented in an operational measure in the questionnaires (Cohen *et al*, 1998; Bhattacherjee, 2012). Face validity is established when an individual, who is an expert on the research subject, reviewing the questionnaire (instrument) concludes that it

measures the characteristic or trait of interest (Miller, 2015). It is a researcher's subjective assessment of the presentation and relevance of the measuring instrument as to whether the items in the instrument appear to be relevant, reasonable, and unambiguous and clear (Oluwatayo, 2012). A dichotomous scale for the items in the questionnaire was used with categorical options of "Yes" and "No" to indicate a favourable and Unfavourable item respectively. Favourable items meant that the items were objectively structured and were positively classified under the thematic category. Cohen's Kappa Index (CKI) was used in determining the integer-rater agreement for the questionnaires for respondents by two supervisors and three other senior research experts within the department of development studies at Moi University. The inter-rater agreement was 0.75 for households. DM. *et al*. (1975) recommended a minimally acceptable Kappa of 0.60 for inter-rate agreement.

Content validity on the other hand is "the degree to which items in an instrument reflect the content universe to which the instrument will be generalized" (Straub, Boudreau *et al*. 2004). It involves evaluation of a new survey instrument in order to ensure that it includes all the items that are essential and eliminates undesirable items to a particular construct domain (Lewis et al., 1995, Boudreau *et al*., 2001). Relevant literature reviews were done followed by an evaluation of the research instruments by five experts, two of whom were the researcher's supervisors. Their suggestions and clarifications were used to improve representation and sampling adequacy of the content that were investigated. A content validity survey was then generated where each item was assessed using a three point scale (not necessary, useful but not essential and essential). The content validity ratio (CVR) proposed by Lawshe (1975) was adopted

to calculate how many experts rated the items as “essential”. The CVR Lawshe method is given by;

$$\text{CVR}= \frac{n_e - \frac{N}{2}}{\frac{N}{2}} \ .$$

The CVR was 1 since all the five experts rated the items as “essential”. Lawshe (1975), recommended a minimum ratio of 0.99 for the number of experts nor exceeding 5.

3.10.2 Reliability and Validity in Qualitative Research

The definition of reliability and validity is interpreted differently by qualitative researchers. In other words, these terms as described in quantitative terms do not apply to the framework of qualitative study. The issue of the replicability of the results does not concern them (Glesne and Peshkin, 1992), but the accuracy (Winter, 2000), the credibility and the transferability (Hoepf, 1997) provide the lentils for assessing the findings of qualitative research. While the credibility of quantitative research depends on the construction of instruments, in qualitative research, "the researcher is the instrument" (Patton, 2001, p. 14). Therefore, it seems that when quantitative researchers speak about the quality and reliability of research, they typically refer to research that is reliable, while the credibility of qualitative research depends on the skill and effort of the researcher. Although reliability and validity are discussed separately in quantitative studies, in qualitative research these concepts are not interpreted independently. Instead, language that incorporates integrity, transferability and trustworthiness is used.

Trustworthiness in this study was achieved by applying Cuba’s five strategies “Model of Trustworthiness”, which consists of credibility, transferability, dependability,

conformability, and authenticity (Tobin and Begley, 2004). This was applied as a measure to ensure consistency, trustworthiness, data quality, and to safeguard what the participants communicated during their interviews and FGD in order to present an accurate reflection of their views.

Credibility*:* This concerns whether an interpretation is valid. Credibility can be defined in a number of ways, such as member controls, peer debriefing, extended engagement and ongoing inspection (Tobin and Begley, 2004). In addition, member verification was ensured by holding a follow-up interview with the participants and providing them with an opportunity to comment on the results. Triangulation of the data source or the use of peer or external audit account methods was used to confirm the accuracy of the study results and to verify the accuracy of the accounts (Creswell, 2009). A longer amount of time was spent on the site during field work, as the researcher felt that this eventually increased the reliability of the study.

Transferability*:* Refers to the generalization of the research investigation. In a naturalistic study, this only concerns a case-to-case transfer. Qualitative inquirers need to recognize that the similarity is considerably different in qualitative investigation, as there is no single right or true interpretation in the naturalistic paradigm (Tobin and Begley, 2004). Don Moyer (1990) argues that rejection of usual viewpoints of generalization is necessary, as naturalistic investigations of human beings have personal meanings, which are essential.

Dependability: This was achieved by assessing the consistency of the research process and documentation, and ensuring that the results are traceable and noticeable (Tobin and Begley, 2004). Creswell (2009) states that various rigorous approaches are

recommended to ensure that the findings of a study are correct by making sure that the mistakes are corrected through rechecking the transcripts after transcription.

Conformability: This was dealt with during the data analysis and was not supported by the inquirer's opinion, but clearly results from the recorded data. The imperfections were also addressed by introducing authenticity as a fifth criterion.

Authenticity*:* This was illustrated by analyzing and identifying unique themes or characteristics during the investigation in order to understand the phenomenon being studied. To determine whether the results are precise the researcher employed member reviews by presenting the final report or established themes to participants in order to verify the findings.

In addition to the above, for the researcher to ensure that the findings of this study were correct; the researcher made sure that the mistakes were corrected by rechecking the transcripts during the transcription process. These procedures thus served as evidence that the results were consistent.

3.11 Data Screening and Cleaning

Data cleaning and screening involves initially proofreading the original data against data entered into the system. Data was first screened and cleaned for missing values, normality and outliers. The missing values were replaced using series means as suggested by Tabachnick and Fidel (2013). In addition, univariate outliers were identified using standardized residuals of more than 3.0 and less than -3.0 being considered outliers by Tabachnick and Fidel (2013).

3.12 Methods of Data Analysis and Presentation

Creswell (2009) acknowledges that data analysis in mixed methods study is shaped by the type of research strategy chosen for the procedures. Data analysis for this study was based on qualitative and quantitative data generated.

3.12.1 Quantitative Data Analysis

Quantitative data gathered during the field research were analysed through descriptive and inferential statistics. Descriptive statistics adopted included use of frequencies, percentages, and mean standard deviation. The mean, indicated the average performance of a group on some measure of a variable, and the standard deviation, which indicated how spread out a set of scores was around the mean, that is, whether the scores were relatively homogeneous or heterogeneous around the mean. Inferential statistics included ANOVA, (analysis of variance), which was used to determine whether the means of the three informal settlements were statistically different from one another on benefits associated with Green Practices. In addition, chi square was used to test whether there was a significant relationship between various variables on implementation of green practices. The Logit regression model was used to predict the likelihood of households in any of the three-settlement areas in adopting green practices which included green water, green energy and green waste.

3.12.1 .1 Analysis of Variance

ANOVA (Analysis of Variance) is a statistical technique used to determine whether there are any statistically significant differences between the means of three or more independent (unrelated) groups. To test the equality of the sample means of the categories of informal settlements, an F test at 95% confidence level was used.

ANOVA, developed by Ronald Fisher in 1918, extends the *t* and the *z* test which have the problem of only allowing the nominal level variable to have two categories. This test is also called the Fisher analysis of variance. The use of ANOVA depends on the research design. Commonly, ANOVAs are used in three ways: one-way ANOVA, two-way ANOVA, and N-way ANOVA (Cardinal and Aitken, 2006).The results from the one-way ANOVA do not indicate which of the three groups differ from one another, so, in many cases, it is of interest to follow the analysis with a post hoc test or a planned comparison among particular means. If several comparisons between pairs of means are made, it is a good idea to use a test, such as the Tukey, that controls for alpha inflation (Algina, and Olejnik, 2003).

In this study, a prior test of homogeneity of variance was conducted through item by item Levene Test Statistics to check the assumption that the variance of the three informal settlements are equal i.e. not significantly different. Additionally, a post hoc Tamhane analysis for multiple comparison was conducted to determine which means for the various items differed from each other in the three settlements.

3.12.1.2 Chi Square

The Chi Square statistic is commonly used for testing relationships between categorical variables. The null hypothesis of the Chi-Square test is that no relationship exists on the categorical variables in the population; they are independent. To make a conclusion about the hypothesis with 95% confidence, the value labelled assumption significance (which is the *p*-value of the Chi-Square statistic) should be less than 0.05 (which is the alpha level associated with a 95% confidence level). If the *p*-value is less than 0.05, we can conclude that the variables are not independent of each other and that there is a

statistical relationship between the categorical variables. In this study, chi square was used to test whether there was a relationship between variables on implementation of green practices in upgrading of informal settlements.

3.12.1.2 Logit Regression

A logit model is a non-linear specification which ensures that the predicted probability is (0, 1) for all values of X_i. It seeks to estimate the probability that an event occurs for a randomly selected observation versus the probability that the event does not occur (odds ratio) and further predicts the effect of series of variables on a binary response variable (Kleinbaum, 1994). It's therefore used for situations in which one may predict the presence or absence of a characteristic or predictor variable.

A logistic regression is a type of regression used when the response variable ($Y_{i)}$ follows a binary: 0, 1) where,

Y=

The study wanted to establish the probability that a household in any of the three settlements are involved in green practices. Therefore, in this study, the green practice or otherwise will be denoted by

If P_i is the probability that a household has green practice, the logit regression will be given by

$\varepsilon(Y) = P =$

Let $Z = \beta_0 + \beta_1 X$

Then $\varepsilon(Y) = P =$ = =

$^{ln=}\beta_0+\beta_iXi$

The probability of success (Green Practice) will be given by

Ṕ=

Let $GP_{i\ denote}$ the probability that a household in any of the three settlement area are involved in green practices

$GP_i = \beta_0 + \beta_1GE + \beta_2GWt + \beta_3Ws + u_0$

$GE = \alpha_0 + \alpha_1$Electricity $+ \alpha_2$ Solar $+ \alpha_3$Energy Saving Bulbs $+ u_0$

$GWt = \gamma_0 + \gamma_1$Rain Water Harvesting $+ \gamma_2$Water Recycle$+ \gamma_3$Pipe Repair $+ u_0$

$GWst = \lambda_0 + \lambda_1$ Recycle of waste $+\lambda_2$Waste Reuse $+\lambda_3$Waste Reduce$+ u_0$

The cumulative distributive function of the model is given by;

Where

GP Green Practice

GE Green Energy

GWt Green Water

GWst Green Waste

For households that have green practices

3.12.2 Qualitative Data analysis

3.12.2.1 Content Analysis

In broad terms, content analysis emerges as the intellectual process of categorizing qualitative textual data into cluster type, to identify consistent patterns and relationships between variable and themes Julien (2008). This method is commonly used to analyse a wide range of textual data including recorded observations, narratives, responses to open-ended questionnaire items, photographs and video. The most distinctive feature of content analysis according to Julien (2008), is that it is independent of theoretical perspective or framework but has its beginnings as a quantitative technique. Thus, qualitative content analysis will be helpful in answering the "why" questions and analysing perceptions and quantitative content analysis in answering the "*what*" questions. As a technique it is applied to determine the presence of certain words, concepts, themes, phrases or sentences within texts and to quantify their presence in an objective manner. It focuses on actual content and internal features. In qualitative research, content analysis becomes interpretive, involving close reading of text while qualitative researchers using this approach recognize that the content is open to subjective interpretation, reflects multiple meanings and is context dependent. The analysis of content produces codes that translate into "themes".

Hsieh and Shannon (2005), identify three distinct approaches to content analysis; conventional, directed and summative. All these are used to interpret meaning from written content. Conventional content analysis, coding categories are directly derived from data while directed approach analysis starts with theory or relevant research findings as a guide to initial codes. Summative content analysis involves counting and

comparisons of usually key words then followed by the interpretation of the underlying context. Jwan (2010) submits that content analysis is used to determine the presence of certain words or concepts within texts or sets of texts, establishing categories and then counting the number of instances when those categories are used in a particular item or text. Through content analysis, it will be possible to deal with primary data directly, which can be treated quantitatively and qualitatively. The challenge however is that it's time consuming.

3.12.2.2 Thematic Analysis

Jwan (2010), define thematic data analysis as a technique that involves searching for themes of relevance to a research topic under which data from different sources can be organized in a four step-coding system. Although a lot of analysis is essentially thematic, most scholars claim thematic analysis is only operative when researchers talk of "themes emerging from data" because themes are the product of our cognitive constructs and interpretations.

Thematic analysis focuses on identifiable themes and patterns of living and or behaviour and how the ideas relate to one another. It is used to determine to what extent the ideas or concerns about characteristics or predispositions are compatible with each other, thus reinforcing what Salwen and Greenberg (1996) describe as "directionality" of the content. This will be followed by analysis of data from qualitative and quantitative questionnaires which will be embedded in the quantified data.

In this study, qualitative data provided by the key informants and the focus groups were analysed by creating categories and themes that gave answers to the research objectives.

In addition, data from observation and photography was presented through pictures and it provided the researcher an opportunity to directly share reality on matters related to informal settlements. Since the study adopted the mixed approach, the data collected from quantitative and qualitative methods were combined and simultaneously analysed.

3.13 Ethical Considerations

Ethical considerations in research are critical. Ethics are the norms or standards for conduct that distinguish between right and wrong. They help to determine the difference between acceptable and unacceptable behaviours. Ethical considerations are important in research because ethical standards prevent the fabrication or falsifying of data and therefore, promote the pursuit of knowledge and truth which is the primary goal of research. The study was undertaken bearing in mind all the ethical concerns and attempts to uphold them. Permission to carry out research was sought from relevant authorities. The researcher obtained a clearance letter from Moi University authorizing to proceed for fieldwork, and a research permit from NACOSTI for permission to participate in fieldwork activity.

In addition, the study upheld the rights of the study population, anonymity and absolute confidentiality. Informed consent before data collection was critical for the study as well as the voluntary participation and freedom to discontinue from the interview/discussion. The researcher was cautious enough to ascertain and explain beforehand the absence of any known risk or benefit and assurance of protection from harm. Commitment to objectivity, originality, integrity and good faith in the conduct of the inquiry was central to the study. Appropriate citations and references were reflected including a research declaration by the researcher was embedded in the questionnaires

administered for the benefit of the respondents. They also were reminded not to write their names on the questionnaire and each respondent was treated in isolation to guard against any external influence.

3.14 Chapter Summary

The chapter offers a framework for piecing together the ontological and epistemological issues, the theoretical perspectives and the methodology of the study on integration of green practices in upgrading of informal settlement in Kenya. Four different world views are discussed; positivism, constructivism/ interpretivism, advocacy/participatory and pragmatism with an adoption of the pragmatic worldview. The mixed method approach in the analysis of qualitative and quantitative data was discussed with appropriate analytical tools to test the level of significance for the various constructs under study.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.0 Overview

This chapter entails data presentation, analysis, and interpretation based on the research objectives. The general objective of the study was to examine integration of green practices in upgrading informal settlements in Eldoret, a medium sized town in Kenya. The specific research objectives that provided the field study framework were to;

i. Establish the green practices being employed in upgrading of informal settlements.
ii. Evaluate the integration process in upgrading of informal settlements.
iii. Assess the impact of green practices in sustainable informal settlements upgrading.
iv. Determine the dynamics in the implementation of green practices in informal settlements upgrading

4.1 The Response Rate in the Three Settlements

The response rate of a survey is a significant concern in a study because it ensures the questionnaires collected are valid for data analysis (Hair *et a*l., 2010). In this study, a total number of 370 questionnaires were distributed to 164 households in Munyaka, 41 Kamukunji and 165 Huruma. Three hundred and sixty four (364) questionnaires out of 370 distributed were retrieved. Therefore, this makes the response rate of 98.3 % though; out of the 364 collected questionnaires only 357 were found to be useful for further analysis. 13 questionnaires were excluded from the analysis due to incompleteness and problems of outliers as explained in Table 4.1. The remaining questionnaires accounted for 96.4% of valid response rate. According to Sekaran and

Bougie (2009), a response rate of at least 30% is acceptable for surveys. In addition, according to Oso and Onen (2005) the whole point of conducting a survey is to obtain useful, reliable and valid data in a manner that makes it possible to analyze and draw conclusions. This high response rate greatly contributed towards the overall success of the field study.

Table 4.1 ***Response Rate***

No	Response	Frequency	Percent (%)
1.	No. of distributed questionnaires	370	100
2.	Complete and returned	364	98.3
3.	Unusable questionnaires	7	1.98
	● Incomplete and ineligibility	4	1.08
	● Univariate and a multivariate	3	0.81
4.	Returned and usable questionnaires	357	96.4

Source: Field Survey, 2017

4.2. Preliminary Analyses Tests

4.2.1. Data Coding and Screening

The survey data was screened for a number of potential problems in relation to missing data according guidelines provided by Tabachnick and Fidell, (2013). The significance of data screening in any process of data analysis particularly quantitative survey cannot be over emphasized because it provides an excellent groundwork for achievement of a

significant result. The output and analysis quality are dependent upon the quality of preliminary data screening (Hair *et al*., 2010). The returned questionnaires (357) were keyed into SPSS v23 a property of IBM Corporation. Each item/question was coded and given name based on its main variable initials and under the same latent construct. Questionnaires that were left blank or had large missing data were discarded and were not included in the analysis.

4.2.2. Missing Values Analysis

Studies have shown that missing values are a common occurrence in social research (Hayes, 2012). It is statistically important to check for missing values before conducting any analytic procedures because some statistical packages will not work even with a single data missing. Furthermore, overlooking cases with missing values could lead to the loss of vital information, which subsequently minimizes the statistical power and increases standard errors (Dong and Peng, 2013). The indication of a missing data is when a respondent failed to deliver an answer concerning one or more questions thus making the data collected not appropriate for subsequent analysis (Hair *et al*., 2010). In view of the effect of missing data in analysis, steps were taken by the researcher to prevent the problem of missing data right from the field of data collection in an effort to decrease their rate. Each questionnaire was thoroughly checked upon receipt to make sure that all questions were properly answered. The variables with missing values were ignored and retained since they had missing values of 5% or fewer of the cases as suggested by Tabachnick and Fidell, (2013).

4.2.3 Assessment of Outliers

Further data screening involved the treatment and assessment of outliers. Outliers are extreme scores or values of data sets that may significantly affect the analysis and the result of the study (Hair *et al.*, 2010). The presence of outliers in a regression-based analysis data set, can seriously mislead the estimates of regression coefficients and lead to unreliable results (Verardi and Croux, 2008). Two types of outliers namely univariate and multivariate were assessed in this study. The presences of univariate outliers can be detected using either standardized variable values (Z score) or by using frequency distribution tables such as histograms, box plots, and normal probability plots. The study used standardized variable values (z-scores) threshold of more than 3.0 and less than -3.0 being considered outliers (Tabachnick and Fidel, 2013). Thus, a total of 3 cases were identified using standardized values as potential univariate outliers. The univariate outliers were deleted from the dataset because they could affect the accuracy of the data analysis technique.

4.3 Demographic Profile of Respondents

In articulating the set objectives, demographic profile of the respondents provided significant information that acted as intervening variables to the study. The section focused on the demographic profile of the study participants. In line with this, the gender, age, educational levels, length of stay in the settlement and source of incomes of the participants have been analysed. The section started with an analysis of the gender of the household heads. The intention was to assess the differential opportunities and privileges that both male and female have in the upgrading process of informal settlement. This was followed by analysis of the ages of the research participants. This was necessary to determine the age groups of people who dwell in the three informal

settlements. This information helped to know the different age groups residing in the settlements and how they are involved in the upgrading process. Analysis of the education level of the research participants was necessary with a view of establishing if they had the required skills and expertise to participate in integration of green practices in upgrading processes and in adoption of green practices. This was followed by discussions on length of stay of the participants with the view of establishing how this influenced community participation on upgrading programs and the source of income of the participants with a view of assessing how this influenced the acquisition and sustainability of individually initiated green practices.

4.3.1 Gender of the Household Heads

The study considered the gender of participants and their role in integration of green practices in the upgrading process. It has been observed that lack of modern energy sources, inappropriate waste disposal and inaccessibility of clean water is experienced very differently by men and women in developing countries (UNDP, 2012).

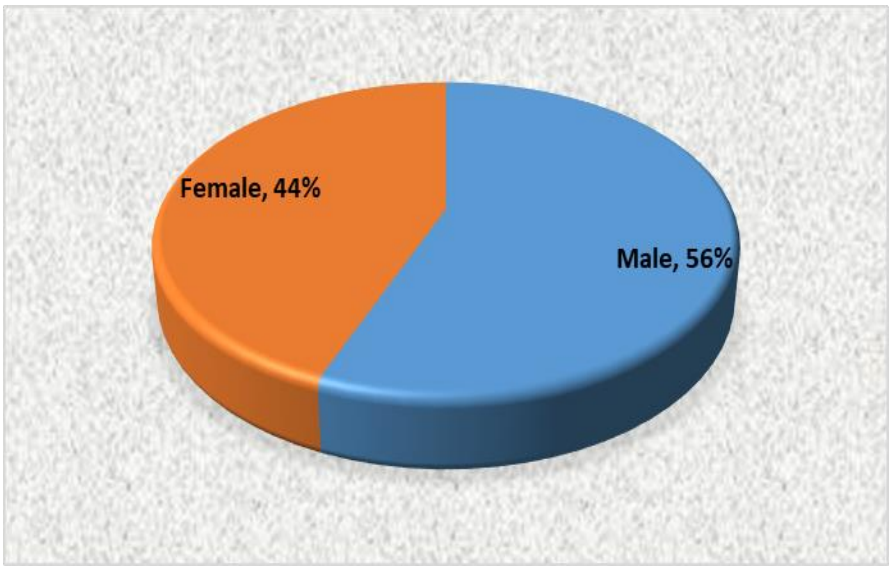

Figure 4.1 Gender of the Participants

Source: Field Survey, 2017

The survey data as indicated in Figure (4.1) shows that, majority of household's heads are men as compared to women. It was also revealed through FGD that a relatively higher percentage of women household heads could be attributed to the high percentage of widows and single mothers in informal settlements.

Generally, most of the household chores that involve the use of energy waste and water are predominantly done by women. World Bank (2015) argue that the impact of poor water and sanitation services falls disproportionately on women who bear responsibility for all household water and sanitation related tasks such as cleaning, cooking, washing, caring for children and the sick. The burden on women includes time and physical labour required to collect water from water sources and carry water home. This indicates that a high percentage of men household heads could imply that women are not the main decision-makers at the household level on key issues affecting them and this can further affect the adoption of green practices.

Issues of integration of green practices in upgrading are viewed by both genders differently though most of the household chores that involve use of energy and water are predominantly done by women and children; they are not the main decision-makers at the household level.

Further, a crosstab analysis revealed that gender was not a significant determinant of integration of green practices in the upgrading of IS for the various green practices. Table 4.2 reveals that gender was not a significant determinant of adoption of green practices such as; recycle of household waste ($\chi^2(1) = 0317$, $p = 0.573$, recycle of used water($\chi^2(3) = 4.488$, $p = 0.180$) and participation of upgrading process ($\chi^2(1) = 1.640$, p

=0.200). However, gender was a significant determinant of involvement in the process and the level of participation at planning, implementation, monitoring & implementation, Maintenance phases (χ^2 (3) =8.136, p =0.043 < 0.05).

Table 4.2 ***Gender and Integration of Green Practice***

Chi-Square Tests			
	Value	Df	Asy. Sig.(2-sided)
Recycle of household waste	0.317	1	0.573
Recycle of used water	4.888	3	0.180
Participation of upgrading process	1.640	1	0.200
Participation at Planning, Implementation, Monitoring & implementation, Maintenance phases	8.136	3	.043

Source: Field Survey, 2017

The findings imply that recycling waste or water and participation in upgrading in the informal settlement is not determinant by gender. However, participation in the entire project cycle was influenced by gender. World Bank (2015) opine that men are the main decision makers and influencers in the household, in settlement community leadership, and in local government.

4.3.2 Age of the Respondents

The age of the respondents plays a significant role in determining the adoption of new concepts and ideas and technologies. Young and energetic people have been seen to quickly adapt to innovative ideas and concepts (Wiernik, 2013).

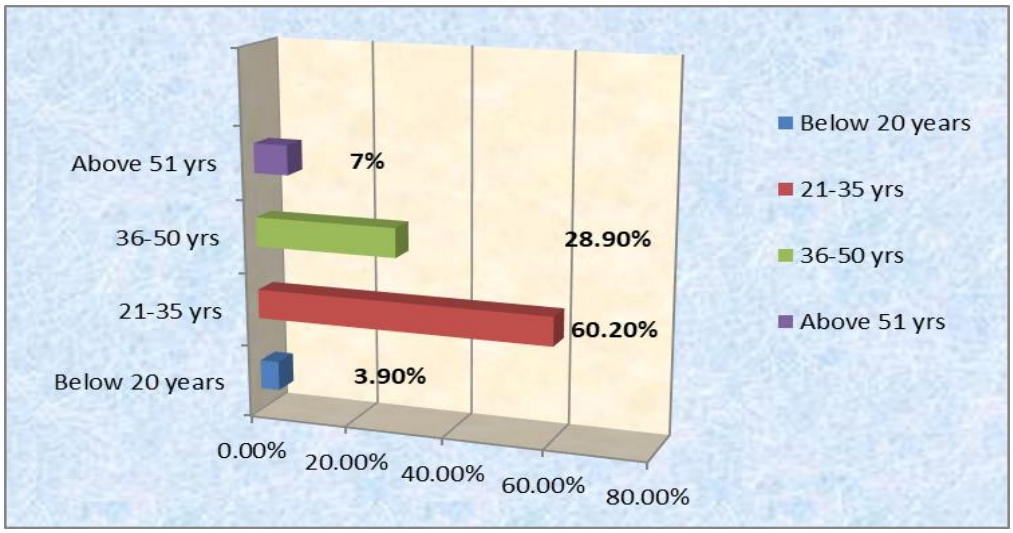

Figure 4.2 Age of the Participants

Source: Field Survey, 2017

The findings as indicated in figure 4.2 show that a majority of the respondents were between 21-35 years and the least respondents were under the age of 20 years. This finding agrees with Wahiu (2013) who argues that majority of youths may have completed or dropped out of school hence they migrated to urban areas in search of greener pastures. He adds that, the high rate of unemployment among the youth leaves them with limited choices. A majority move into informal settlements in anticipation of getting cheap housing. On the other hand, Chepsiror (2016) observes that the presence of educational institutions in the urban areas is a major attraction for youthful age who often settles in the informal settlements. Since majority of the participants are young, energetic, and active it's much likely that they can participate in upgrading process and can easily adapt to appropriate green practices. It is sufficed to argue that

the implementation of upgrading process requires young and energetic individuals who are dynamic and conversant with green practices and its impact on the environment. Uddin (2018) argues that the household heads in the informal settlements considering both sexes across are comparatively young and have the ability to work. Therefore, inclusion of these age groups in slum development policy and upgrading process needs to be ensured as they are often excluded.

4.3.3 Education Level of the Participants

The education level is a key determinant of acquisition and application of skills and knowledge. Education level provides insight into the respondent's knowledge in the participation of the upgrading process and how such individuals embraced green practices. More educated participants are considered to make informed choices on environmental sustainability choices (Hegarty, 2008).

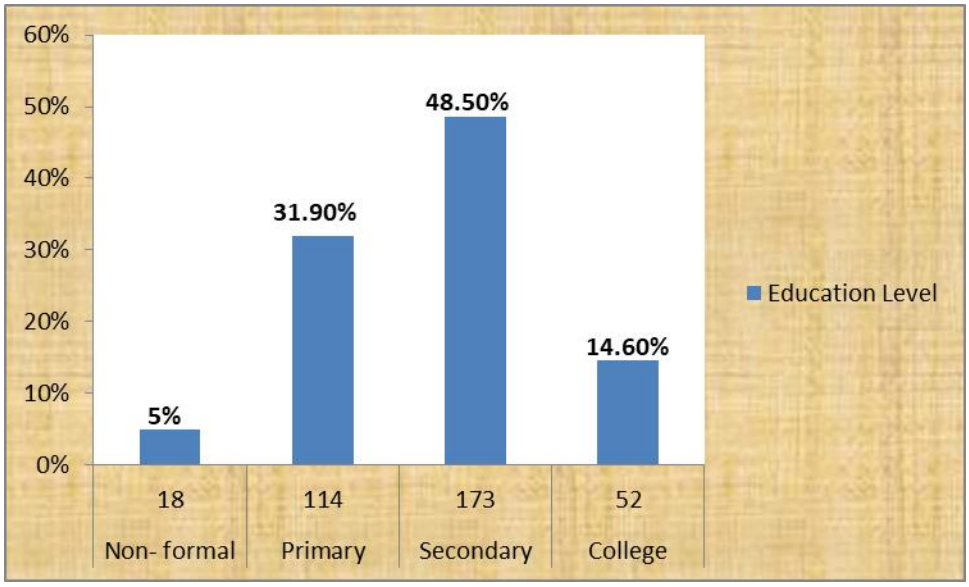

Figure 4.3 Education Level

Source: Field Survey, 2017

As shown in figure 4.3, the findings indicate the study population is literate, implying that they had the ability to learn and adopt new ideas and technology. The majority of the household members have secondary education which is a critical component in adoption of green practices. It was also revealed through FGDs that the high percentage in primary and secondary level can 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.

The Focus Group Discussion (FGD) revealed that the majority of the youth do not proceed to college due to several reasons such as; poverty and low income, unemployment, low grades, early pregnancies and lastly peer pressure which contributes to education apathy.

One of the participants put it this way*:*

> …….One girl in this settlement had scored a grade of B- in her KCSE and had not gone to any college because of lack of money and her three young siblings opted to drop out of school because they felt that hard work does not pay. After we took a step to take her to Rift Valley Technical Institute, her two sisters went back to school but one was already married……. (FGD, Munyaka 9th March 2017)

An educated population is more likely to embrace environmentally friendly practices and participate in upgrading projects since they are equipped with the capabilities to problem solve, reflect, think systematically and critically, be able to make timely and insightful decisions and they may be aware of negative impact of lack of adopting environmentally practices in a society (Hegarty 2008). By increasing awareness and concern, education can encourage people to reduce their impact on the environment through more efficient use of energy and water supplies, especially in areas of resource scarcity (GEM Report, 2015).

4.3.4 Length of Stay in the Settlement

Social capital of participants in a community is influenced by the length of stay. It is generally observed that individuals who live in a particular area for a long period have closer friendship, links and networks. This association with groups develops individual senses and enhances self-awareness and membership with groups and regulates the behaviour of the individuals (Baber, 2017) and this forms a solid foundation for individuals to corporately adapt to programs such as upgrading processes (Babaei *et al*, 2012).

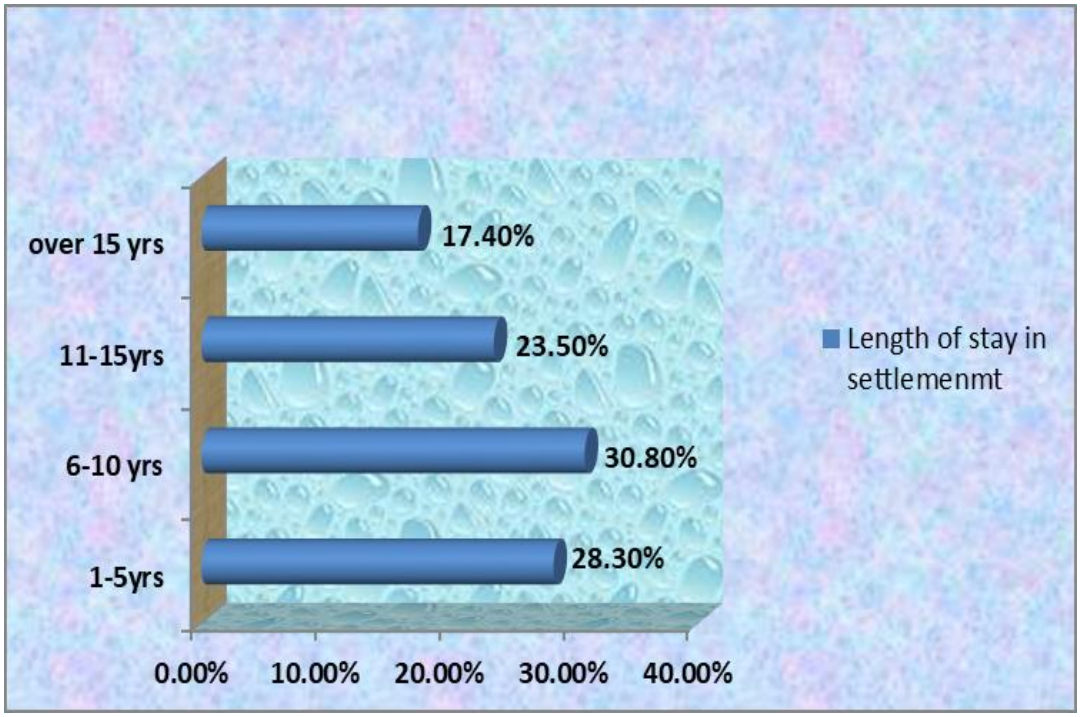

Figure 4.4: Length of Stay in the Settlement

Source: Field Survey, 2017

The rate at which people have stayed in the settlement varied from 1 to 15 years with the majority having been there for between 10 to 16 years as shown in figure 4.4. The relatively longer period of stay by majority of the participants gives an indication that they were aware of upgrading projects carried out in the area and therefore provided

reliable information on how green practices were integrated individually and collectively in the upgrading process.

4.3.5 Source of Income of Respondents

Household income in the informal settlements is derived from many sources and includes earning from formal employment, casual jobs, and business among others. From figure 4.5, it is evident that most of the household participants were in business.

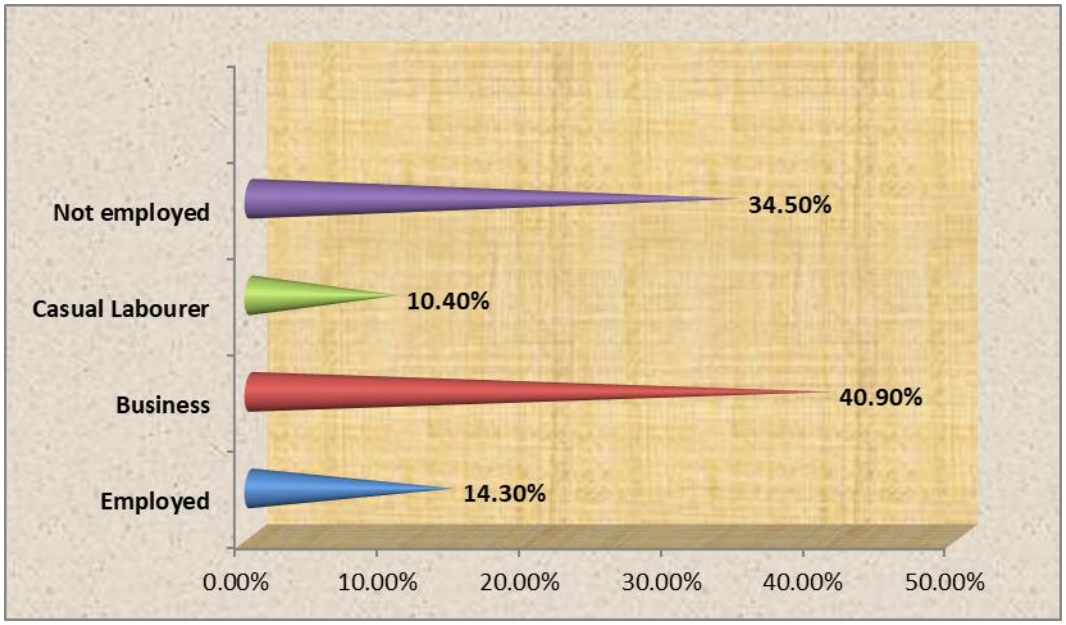

Figure 4.5: Source of Income

Source: Field Survey, 2017

Some of the small-scale business activities that they engaged in were green groceries, selling *mitumba*, food stuffs, kiosks, charcoal and other *jua kali* businesses. The pictures below show some of the small businesses.

Figure 4.6: Some of the Small Businesses within Munyaka Settlement

Source: Field Survey, 9th March 2017

These pictures (figure 4.6) give an illustration that business activities take place in IS. Nyametso (2010) argues that majority of informal settlement dwellers are engaged in activities which enable them to eke out a living because the prospect of acquiring employment in the formal sector in developing countries is becoming increasingly remote especially for those with low levels of education. He further argues that informal sectors provide migrants with jobs and enhance their fast assimilation and absorption into the urban economy thereby making the city continue to have a strong attraction for rural migrants. In addition, business activities in the central business district and market centres require cheap labour which is now available and readily provided by the informal settlements dwellers at relatively low rates.

Further, the findings indicated that most of respondents were not employed. From the earlier findings, low level of education, high number of students living in these informal settlements as well as women who are housewives may attribute to this relatively high percentage of unemployment therefore, they had to find some means to survive and earn some income. Nyametso (2010) argues that persons with higher levels of education

have higher chances to get well paid jobs in the formal sector and that educationally skilful people are also more likely to become entrepreneurs and employers than those without education. The current study further revealed that some of the participants were casual labourers who had engaged in activities that would enable them to eke out a living to meet their daily needs. Casual labourers largely lack regular incomes owing to the fact that their jobs are erratic and casual in nature. In most cases, their earnings are inadequate to meet their basic needs. In spite of this, it is the informal sector which incorporates most of the migrants into the urban system. The sector provides ready jobs for the less educated, unskilled, and desperate migrants who are willing to do hazardous, inferior, and low-waged jobs (Beauchemin and Bocquier 2003). The World Bank Report (2016) shows that the Kenyan economy is creating more jobs, mainly in the informal services sector. This low productivity in jobs creation is key to economic development, making it possible for poor migrants to eke out the basic means of living. This is identical to the situation in the three informal settlements in Uasin Gishu County. The informal sector generally serves as the main employer of active labour in Kenya.

Generally, there is a close link between working in the informal sector and poverty due to the fact that the urban informal sector absorbs most of the urban labour force in one hand. On the other hand, the informal economy workers earn far less than in the formal economy (Mathur, 2013). Slum dwellers may find themselves trapped in a low-skilled, low-income equilibrium as the continuous influx of rural migrants maintains wages at near-subsistence levels, hindering the investments in human capital that would be required to offset the adverse effects of slum living (Marx, Stoker & Suri, 2013). The low income earned by most of the informal settlement dwellers may act as a hindrance in adopting green practices.

4.4 Green Practices Employed in Informal Settlement Upgrading

The first objective of the study was to establish the green practices being employed in upgrading of informal settlements. Green practices are expected to enable the informal settlement (IS) dwellers utilise resources in an optimal manner while minimizing its impact on the environment and eventually contributing to the attainment of Sustainable Development Goals (SDGs).

4.4.1 Green Energy Practices

Adopting green energy practices aims to end "energy poverty" for the estimated 1.4 billion people who currently lack access to energy and the 2.7 billion individuals who are currently using biomass and would like healthier and cleaner energy sources (IEA 2010a). The Green energy sector includes energy conservation and the provision of renewable energy services which will reduce greenhouse gas (GHG) emissions and other pollutants and improve energy security internationally, domestically and locally (UNEP, 2011). Moreover, increased access to modern sources of energy contributes in many cases to better health and consequently the achievement of the SDGs.

4.4.1.1 Source of Energy for Lighting

Kenya's energy needs for cooking and lighting are generated from various sources, such as wood, fuel, gas, and electricity, according to the Kenya Economic Outlook Report (2016). The study showed that the informal inhabitants of the settlement are using different energy sources for lighting, as shown in the table below.

Table 4.3 ***Source of Energy for Lighting***

Source of Energy	**Frequency**	**Percentage (%)**
Solar	9	2.5%
Electricity	326	91.1%
Kerosene	16	4.5%
Candles	4	1.1%
Others	2	0.6%
Total	**357**	**100 %**

Source: Field Survey, 2017

Arising from table 4.3, it was noted that some IS dwellers have multiple sources of energy for lighting. This implies that electricity is a source of energy that was the most often used source of energy for the majority of the informal settlements. This may be due to the government of Kenya and the World Bank's slum electrification program as expressed by Njoroge (2015). He further argues that the well-built electricity network has also reduced meter-vandalism and exploitation as residents are aware of the electricity system infrastructure for the common good and contribute therefore to large networks. Although the Kenya Power and Lighting Cooperation (KPLC) is expanding the supply of electricity, there remained popular illegal electricity from private meters (Mwangi *et.al,* 2015). Electricity utilization and use was considered a green approach because it is safe, does not have any by-products, does not cause any kind of waste and is much cheaper than most other sources of energy.

Figure 4.7: Electricity connection in some parts of Huruma

Source: Field Survey, 10th November 2016

While solar use is considered a green practice, its use and adoption remain low. The initial costs of acquiring the solar infrastructure is relatively high and further coupled with limited skilled manpower in this area. Recent studies have shown that only 1% of the population has considered this adoption and further that the situation would improve, because of policies like the abolition of the solar panel value-added tax (VAT) and increased privately owned acceptance (KIPPRA, 2010). The M-KOPA initiative, led by Safaricom, Kenya's leading mobile provider, has connected more than 150,000 homes in Kenya, Tanzania and Uganda to solar power since its commercial launch in October 2012, and is projected to add more than 500 new homes per day (M-KOPA Solar & Inter Media 2015).

The Low-percentage of kerosene usage (4.5%) gives an impression that the source of energy for lighting has shifted away to use of electricity possibly due to related health issues and fire accidents in the IS (Cooper *et al.*, 2012). One of the participants in the FCD perfectly articulated this:

> ……Thanks to the county government for bringing electricity to the IS because my family's health is no longer at risk from using paraffin, we no longer spend a lot of money on Kerosene and children can comfortably do their homework. They used to find it hard to complete their homework or revise when we were using kerosene lamps because of poor lighting but now they can read better without straining and it seems it's enjoyable to them……..(FGD Huruma, 10th March 2017)

Candle use (1.1%) had a very low response rate signifying its low use among IS dwellers and this may be attributed to the associated long run costs and as well as a source of potential threat to IS fires.

4.4.1.2: Source of Power for Electrical Appliances and Types of Bulbs

Government subsidy on electricity connection led to an increase in access to electricity (79.6%) as shown in figure 4.8. There was however a low percentage of sources of power for solar (10.2%), battery (7.1%) and others (3.1%) such as candles. The net effect of subsidised electricity connection led to more acquisition of domestic electrical appliances such as radio and television. The multiplier effect was an increase in access to information.

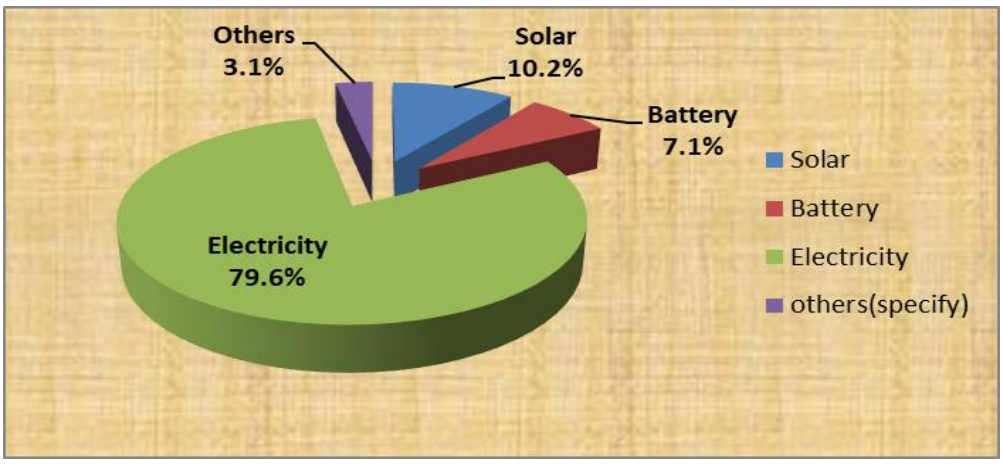

Figure 4.8: Source of Power

Source: Field Survey, 2017

Moreover, the study found out that most households (79.6%) who use electricity as an energy source use energy saving bulbs that had a greater ability to save on electricity bills and a small percentage use the ordinary bulb. This was attributed to the Kenya Power and Lighting Company project's free distribution in the country of 1.25 million energy saving bulbs to save about 60MW of the national power grid (KPLC 2016).

4.4.1.3 Type of Fuel Used for Cooking

Energy demand of the urban poor households largely revolve around household energy end-uses such as cooking (Mukwaya, 2016). Table 4.4 shows the type of fuel used for cooking.

Table 4.4: ***Type of Fuel Used for Cooking***

Type of Fuel	Frequency	Percentage (%)
Gas	123	34.5%
Electricity	46	12.9%
Firewood	152	42.6%
Charcoal	239	66.9%
Kerosene	**11**	**3.1%**

Source: Field Survey, 2017

The results indicate that the IS dwellers had multiple types of fuel used for cooking. Generally, most IS residents use charcoal (66.9%) and firewood (42.6%) as shown in table 4.3. The informal settlers prefer charcoal because of its availability, ease of use, low costs and because it lasts longer, especially when used for improved technologies like Kenya Ceramic *Jikos.* Traditional stoves and fire-fighting systems are inefficient to turn energy to warmth for cooking and there can be local environmental problems where demand for local biomass exceeds the natural resource replenishment (Ramanathan and Carmichael 2008; Venkataraman *et al.* 2010). If properly applied, the Kenya Ceramic Jiko will have the ability, thus reducing demand for wood as a fuel resource, 20–50 percent in fuel consumption. (G. *et al.,* 2006). The Ceramic Jiko also improves the protection of children by preventing the ceramic liner from becoming very hot. Furthermore, Smith and Heigler (2008) also point to the fact that several governments and development organisations, by distributing cleaner cookware, have sought to tackle pollution indoor air, but the acceptance and implementation of non-

traditional cookware has been disappointingly poor in the developing world, with few exceptions.

The findings further showed that the use of gas (34.5%) as a source of energy for cooking was relatively high. The urban poor have not used gas in the recent past because of the higher initial cost and because their appliances are not accessible to the most urban poor, given their wages and gas replenishment costs. However, among the informal inhabitants of the settlements there is a rise in the use of gas which could be due to marketing campaigns by multinational oil companies that encourage gas access by opening up outlets nearer and inside the settlement (PIEA 2016). Residents are often made aware of the use and safety measures of gas use. These efforts have made gas among residents of the three IS more appropriate. Its use is on the rise. In contrast to other types of fuel, the use of electricity for cooking is considered costly. The fact that kerosene continues to pose a major health risk by releasing impurities during combustion and thus reducing the indoor air quality can be attributed to its low usage (Dubbale *et al,* 2010). The findings correspond to previous studies by Gongera and Gicheru (2016) who found that charcoal is the generic type of fuel used in the informal set-up. This result however contradicts Andreasson (2014) who argued that coal, followed by fire wood, was the second common type of fuel used in the informal settlement. Field study observation, as seen in the following images, shows that IS residents used charcoal, firewood and gasses as a source of energy for cooking.

Figure 4.9 Types of fuel used for cooking available in the settlements

Source: Field Survey, 9th March 2017

Although the results of the current study indicate that the use of charcoal and firewood is high, they are not considered green practices. There is a need to switch to alternative energy sources to reduce the harmful effects of overusing firewood and charcoal. Further, women should be empowered socially and economically to free them from the burden of looking for firewood so that they can dedicate that time to leisure, pursuing education and gainful economic activities.

4.4.1.4 Availability of Street Light and Security Light Coverage

The provision of street and flood light in public places, such as public transit terminals, markets, schools, social centres and police stations, play areas and walking routes is regarded as a safeguard measure.

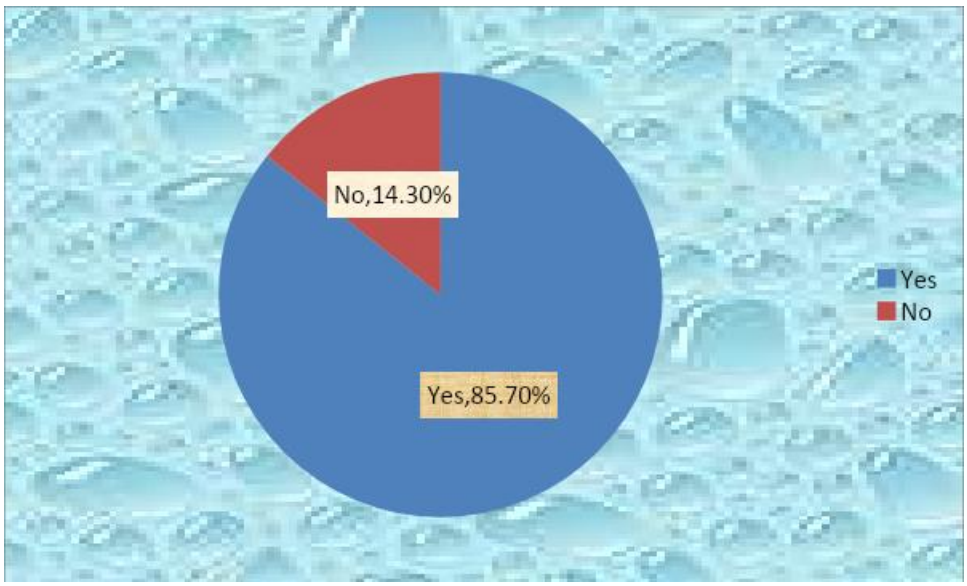

Figure 4.10: Availability of Street Lights

Source: Field Survey, 2017

Informal settlement dwellers received light from street lights and flood lights (85.7%) as indicated in figure 4.10. The FGD confirmed, however, that street lights are using electricity and not solar energy, which if adopted will ensure that the county government pays low electricity bills in the long run. The study information from FGD suggested that construction of street lighting and floodlights resulted in business hours being extended and thus increased revenues for informal dwellings. According to information from the settlement executive committee, the majority of residents are engaged in small businesses such as the sale of vegetables, which suggests that they have increased their hours of service and therefore increased their profits. Practical Action (2010) argues that access to energy will generate new opportunities for sales, extend existing operations and save money on current practices. Furthermore, most IS residents pointed out that streetlights had improved security in the informal settlement.

It was observed that in Huruma three flood lights were installed, one in Kamukunji and four in Munyaka

Figure 4.11: Flood light in Huruma Settlement

Source: Field Survey, 10th November 2016

It was further established, through an interview with the KISIP Project Component Manager, that floodlights and street lights had automatic timers and some, especially those on the highway, used solar, while those inside the IS used electricity. The use of automatic timers and solar are green practices and so it is important to adopt the use of solar energy to help minimize the electricity bill for the county government and to make the project sustainable.

4.4.2 Green Water Practices

Globally, access to clean water and adequate sanitation services is a human right and is therefore essential to the future of each and every household (UN 2010). The Constitution of Kenya (CoK, 2010), declares access to water supply and sanitation services as a basic human right. The declaration gave priority to finding sustainable

solutions that support improved access to water and sanitation services especially for low income urban dwellers through adopting green practices. A shift to green water practices that ensures proper utilisation of available water resources while at the same time taking care of the environment, is one of the strategies that can enable the world to use water more efficiently and make it available to all at a reasonable cost.

4.4.2.1 Source of Household Water

There are various sources of household water in the informal settlement as shown in Table

Table 4.5: *Source of Household Water*

Source of Water	Frequency	Percentage (%)
Shallow well	206	57.5%
Stream	29	8.1%
Municipal piped water	204	57%
Water Kiosk	82	22.9%
Harvested rain water	34	9.5%
Private Supply	13	3.6%

Source: Field Survey, 2017

The above findings show that the main source of water in the informal settlements is shallow well (57.5%) and municipal piped water (57%). Further, the use of shallow well as a source of water is 6 times more than use of harvested rainwater and seven

times more than the use of stream water. These results further reveal that IS residents had multiple sources of water.

From the FGD, most of the dwellers opted to use water from the shallow well due to the unreliable of the municipal piped water. Kenya's Vision 2030 guarantees access to water and sanitation as one of the key targets. It is hoped with anticipation that the majority of the population in Kenya's low-income areas, including those living in informal settlements, who lack access to safe and affordable water and sanitation services will have their dreams realized someday. The above findings coincide with those made by WHO and UNICEF (2010), which claim that some 13% of the world's population (884 million people) live in households with unprotected water collected and 54% (3.6 billion) are given tubing at home. They claim that in developed and middle-income countries many piped water systems operate for only a few hours a day and/or are unsafe, whereas many other households rely on public pipes. In addition to this, Asian countries have much improved access to clean drinking water but most developing countries including Kenya, Uganda and Tanzania do not have that access.

Few individuals get water from kiosks where they buy water even though it may be expensive in the long run and difficult to sustain considering the level of income of IS dwellers who do not have access to shallow wells in their vicinity. The low percentage of dwellers who harvest rainwater is associated with the fact that the rains are seasonal and that most residents have no storage tanks and also poor roofing. In addition, it was revealed through the FGD among residents of Huruma that they could not harvest water because the roofs have been affected by a smoke from a nearby factory. On the other hand, 8.1 % said that they get water from a stream which is outside the settlement and

its water is contaminated. Those who said “other” at 3.6 % include those who get water from individuals who supply at their door post at a cost.

4.4.2.2 Most Reliable Source of Water

The study further sought to establish the most reliable source of water in the IS. Access to water alone is not adequate and there is a need to obtain a reliable source to water supply in the IS.

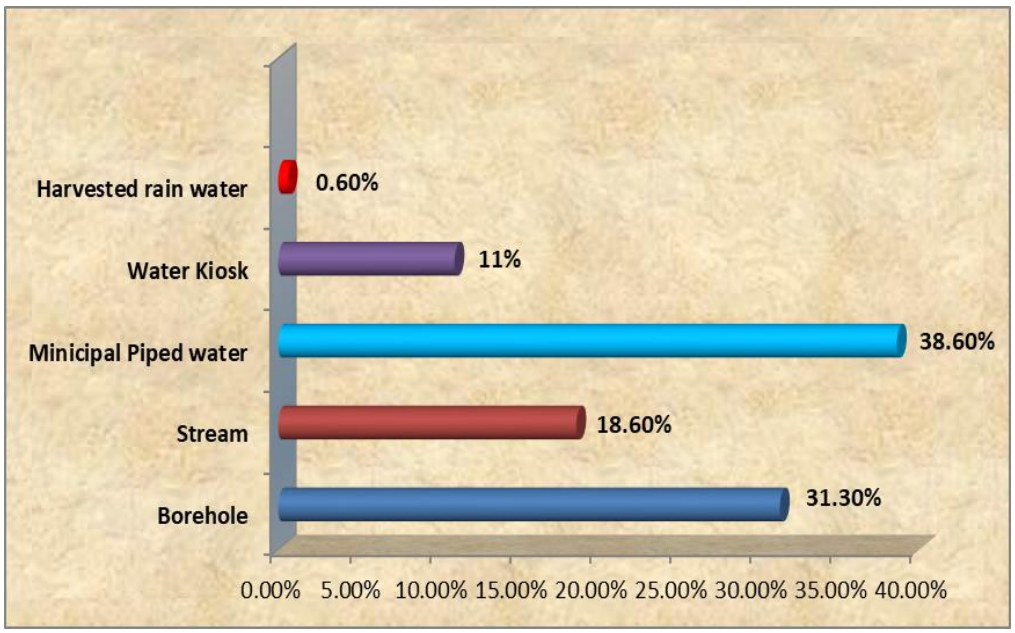

Figure 4.12 Source of Household Water

Source: Field Survey, 2017

The participants cited the most reliable source of their household water was the Municipal piped water (38.6%) as shown in figure 4.12. The implications of the above finding is that the IS dwellers feel that piped water is more reliable because they will save time especially if the water is inside the house or there is a standpipe outside. Although municipal water is paid for and it does not flow every day, the above findings imply that the low earners are willing to pay for this precious commodity. Shallow wells were ranked second due to the fact that it's a cheap and reliable source especially if it is in the compound and it is well protected but the study revealed through the FGD that most of the wells dry up especially in the dry season. Even though a stream is outside the settlements, it was ranked third and this implies that it was preferred because it is not associated with any financial cost but at the same time it is time consuming and its water is contaminated. Water Kiosk was ranked second last because it is expensive and time consuming especially when they are long queues. Rain water which is a green

practice was ranked the last which is attributed to the fact that rains are seasonal and the storage facility is a problem to the IS dwellers.

4.4.2.3 Proximity to Water Source

The respondents were asked to give information on the proximity of the water source to their residence.

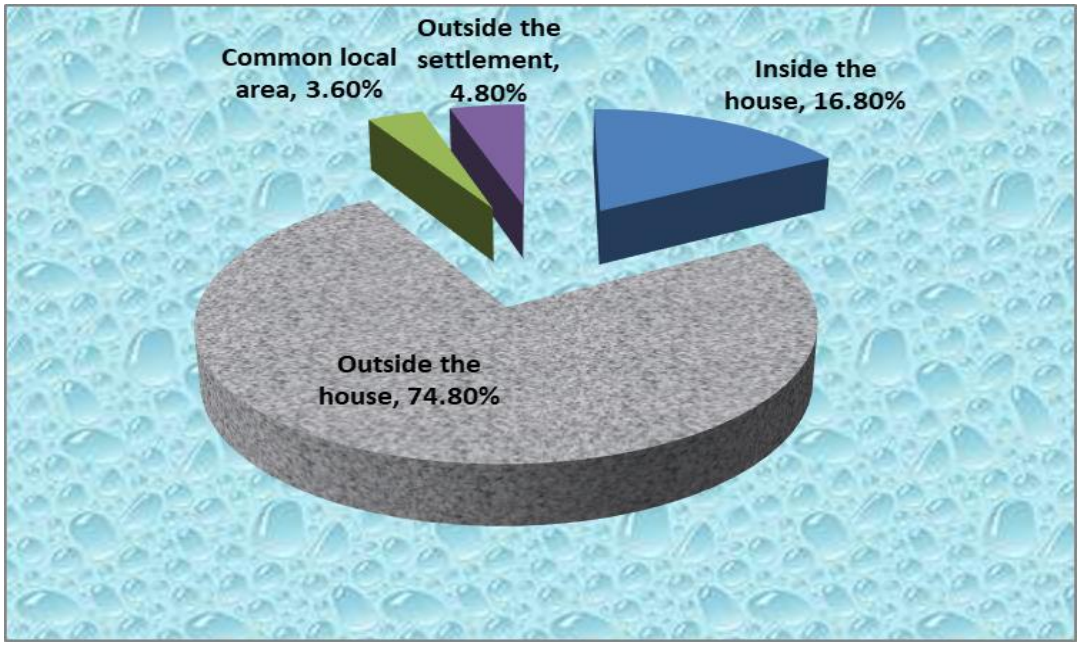

Figure 4.13: Proximity to the Water Source

Source: Field Survey, 2017

The response on proximity to water sources is shown in figure 4.13. It was evident from the study that majority had water just outside the house which shows they were saving time and some had water inside the house which concurs to some extent with the findings in the slums of Nairobi that 19 % of the population have household water connections (Gulyani *et al*., 2005; Gulyani and Talukdar, 2008). The time saved could allow women to engage in other productive tasks and it could provide more time for childcare, socialization, and educational activities.

4.4.2.4 Maintenance of Piped Water System

Maintenance is considered a green practice because it reduces water wastage and contamination.

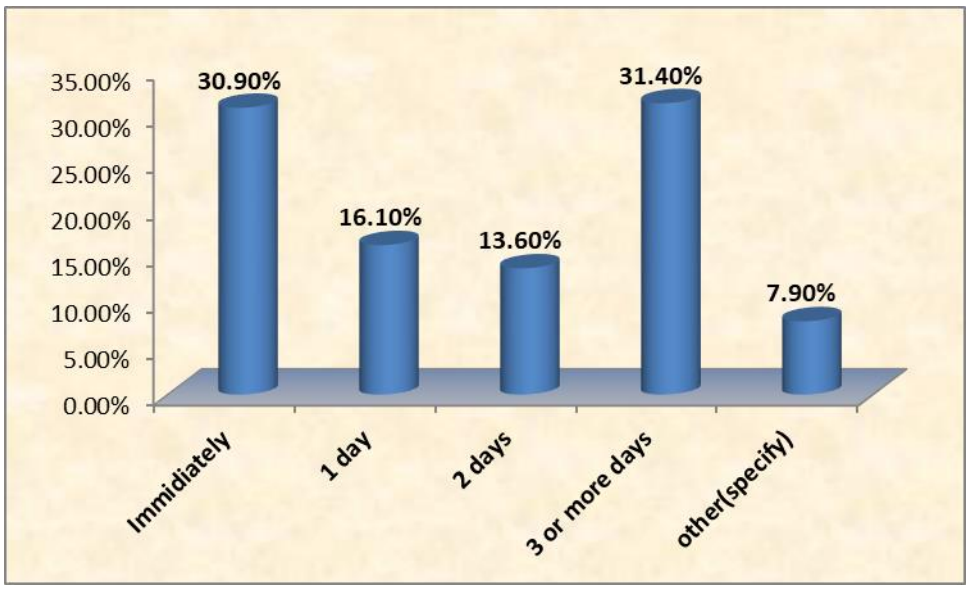

Figure 4.14: Length of Time Taken before Repair or Maintenance

Source: Field Survey, 2017

The findings show that the majority of the respondents said that the repair for leakage was either done immediately (30.9%) or took 3 or more days (31.4%) as shown in figure 4.14. It is imperative that leakages should be detected and repaired immediately to avoid loss of water and exposure to contamination. The findings add to the assertion by UNEP (2011) that cities require significant transfers of water from rural to urban areas with water leakage being a major concern. The study suggests that repairs and improvements to and replace pipes have led to the net savings of 20% of mobile water in many developed cities, with Tokyo's current water infrastructure reducing by 50% in the last 10 years alone and that in addition to immediate repairs water pollution would be avoided.

4.4.2.5 Harvesting Rainwater and Storage

The collection and filtering of rainwater for reuse is a rainwater harvesting process. The method is done by the families who can profit from the technology themselves. Rainwater is known as green practice, but it should be cleaned before it is used for drinking. It can also be to flush the toilet and for irrigation purposes. The figure 4.15 shows the percentages of IS dwellers who harvested rain water.

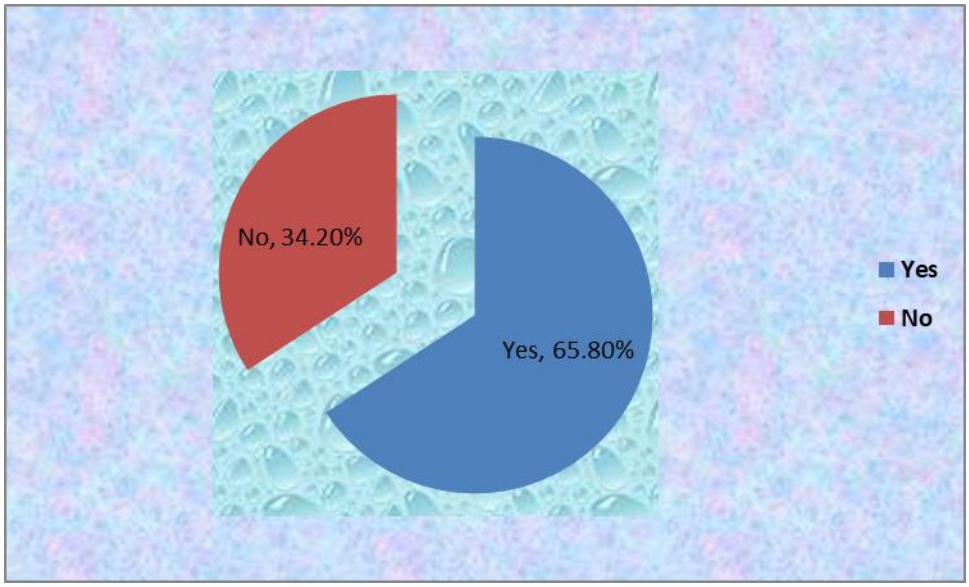

Figure 4.15 Harvesting Rain Water

Source: Researcher, 2017

Majority of the participants harvest rainwater and this contradict results on sources of water where rain water was ranked last as discussed earlier and this can be explained by the fact that when and if it rains, majority tend to harvest the rainwater. This could be attributed to erratic rains. For those who harvested rain water, they were asked to state their storage capacity that they had in their homes for the harvested water and they gave the following responses. 143 (60.9%) respondents had storage of 70-100 litres, 67 (28.5%) had a storage capacity of 100 – 150 litres and the rest 25 (10.6%) had storage capacity of between 150-200 litres. No participants had storage capacity over 200 litres.

It can be argued that in the IS individual households store water in containers, usually 20 litres jerry cans and due to the size of the houses, usually one-roomed, most households have limits to the number of containers they can keep and the cost associated with acquiring storage containers and also because few landlords have installed water tanks mainly due to the prohibitive high costs of purchasing such tanks.. This finding supports ASLA, 2010; Bell *et al.* , 2013; SDN, 2009 whereby impediments to rainwater collection are especially effective in safe storage of the water and in most seasons due to lack of rain. It has been observed that some landlords have fixed gutters on the roofs of iron sheets to allow water to be harvested during rainy seasons, but this water is mainly used for cleaning purposes.

Moreover, the Municipal Corporation has made rainwater harvesting a prerequisite for all buildings with a roof space above 100 square meters and a land area greater than 1,000 square metres, to deal with extreme water shortages in Delhi. The expected annual availability of 76,500 million litres of water for groundwater recharge is predicted to take place (ICLEI, UNEP, and UN-HABITAT 2009). This study further revealed through the interview with the County Director of water, that the county government of Uasin Gishu has come up with a water policy which will require the integration of roof water catchment in all new buildings. At the time of the field work, the policy was still waiting for the bill to be passed to make it operational. He further revealed that the law will be enforced on all new buildings by liaising with the county physical planner in charge of approving plans for construction while sensitizations to be done on all old buildings.

4.4.2.6 Recycling Used Water

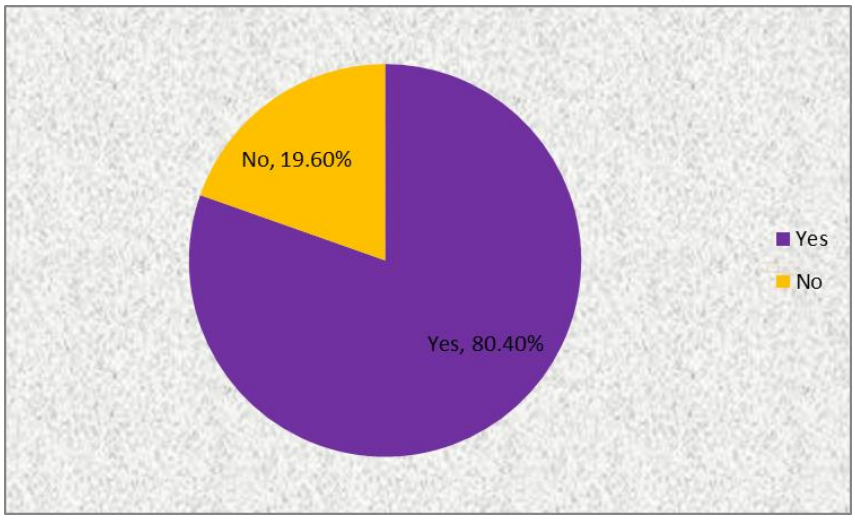

Figure 4.16 Recycling Used Water

Source: Field Survey, 2017

The study sought to find out if the residents recycled their used water. The results were represented in the figure 4.16. The findings revealed that the majority of IS dwellers recycled water (80.4%). This enabled them to maximise the use of the little water available and also to save time used to fetch the water. The study further showed that of those who recycled water, majority of them 222 (77%) recycled their water by washing their toilet, 185 (64.5%) did so by cleaning the house, 35 (12.2%) used their water in their kitchen garden while 28 (9.8%) used the water for other purposes which is a clear indication that they have embraced green water practice. The results implies that people living in informal settlements use grey water extensively. Water collected could be used multiple times first to bath, maybe for more than one person, and then perhaps to do laundry, wash a toilet and wash the floor, before being discarded outside which is a clear indication that they have embraced green water practice. According to The Water Wheel September/October 2018 article in South Africa household potable water use could be reduced by up to 50% should be used for toilet flushing and garden

irrigation. According to UN-Water, (2010) waste water recycling is one of the most sensible and winning options for promoting water sufficiency and it can range from simple home methods to sophisticated industrial wastewater filtration systems. Reuse of different types of wastewater is hence a way to optimize water use at home. It can either be reused directly or treated and reused.

4.4.3 Green Waste Practices

Urban waste management is a problem worldwide which has been compounded by the rapid urbanization and increasing urban poverty especially in the informal settlements. Solid waste management remains a major challenge in all the 47 counties in Kenya because most local authorities did not prioritize the establishment of proper waste management systems over the years and hence the County Governments have inherited this state of affairs**.** Greening the waste sector is the shift from less-preferred waste treatment and disposal strategies like burning to adopting totally different types of land filling that incorporate the 3 Rs: Reduce, Reuse and Recycle, as advocated by Lavee, 2007; Lehmann, 2011; UNEP, 2011). The strategy is to manoeuvre upstream within the waste management hierarchy, supported by the internationally recognized approach of Integrated Solid Waste Management

4.4.3.1 Disposal of Household Waste

Households in the informal settlements dispose of their household waste in numerous ways as indicated in figure 4.17.

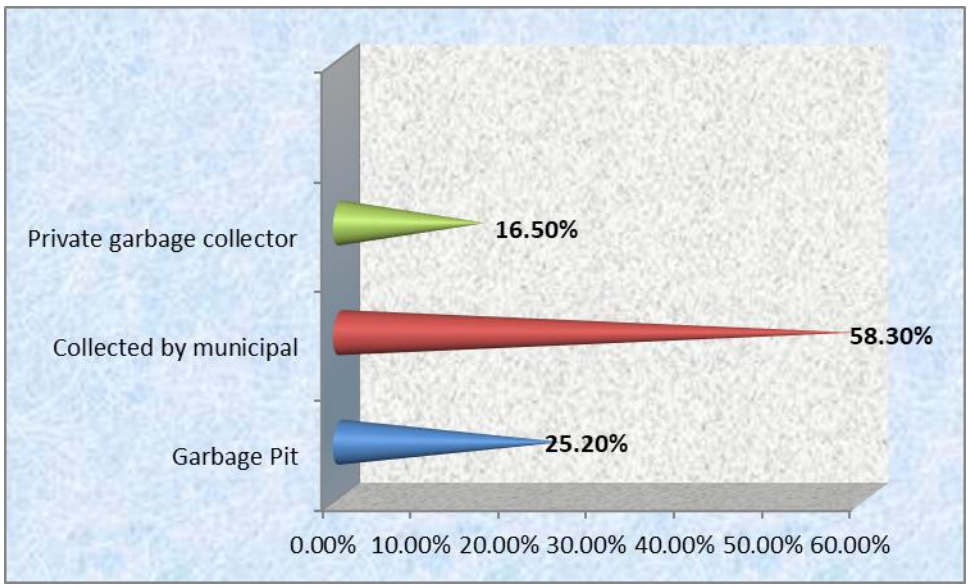

Figure 4.17 Disposal of Household Waste

Source: Field Survey, 2017

Majority of respondents indicated that the waste was collected by the county government (58.3%), while the rest used either a garbage pit (25.2%) or engaged the services of private garbage collectors (16.5%) as shown in figure 4.17. The above findings were confirmed through the FGD which gave the clarification that waste collection in informal settlements is mainly done by organized women and youth groups who made an agreement with the county government. The groups collect waste from house to house at a fee and the county government provides trucks for free to collect the waste on specific days in the various settlements. It was further observed, as shown in the picture below, that garbage is collected in gunny bags which have reduced litter in the settlements.

Figure 4.18 Garbage ready for Collection at Kamukunji Settlement

Source: Field Survey, 9th March 2017

The collection of garbage which is collected in gunny bags is an aspect of green practice since it leads to reduced litter in the settlements. However, using open trucks to transport the waste to Kipkenyo dumpsite is not aligned to green practice. The FGD revealed that some land lords had dung garbage pits within their compounds which explains why there was a high proportion 25% of those who dispose through garbage pit. The Results concurs with those of (Waweru and Kanda, 2012) who found out that solid waste disposal by burning and throwing them in garbage open pits is common practice in Kibera informal settlement due to lack of access to waste disposal facilities. They pointed out that plastics and metal tins if not properly disposed can retain water and act as breeding grounds for insects such as mosquitoes.

The interview with the Country Director of Environment revealed that there was no written policy on green waste management in the county which supports Reuse, Reduce and Recycling of waste but they only give directions. He further commended that waste collection had improved drastically because of an increase in the number of garbage collection trucks to 8 in the county.

4.4.3.2 Recycling Household Waste

Household waste recycling is a common phenomenon among IS dwellers. 57.4 %(205) of respondents said that they recycle household wastes while 152 (42.6%) said they did not. In this study, recycling involves either recycling, reusing or reducing wastage. Therefore, this is why the results of the study contradict with the findings by Nthamia (2013) who found out that 12 % of residents in the IS participate in some form of recycling. She further states that households were not willing to participate in waste recycling due to lack of recycling industries, a dumpsite and adequate information to the communities on safe handling of household waste.

The interview with the County Director of Environment further revealed that most informal settlement dwellers do not sort the solid waste at household level, however a few of them recover plastics and metal that they sell to scrap dealers. This finding agrees with Beamlak (2012) who found out that household waste collection truck crews and informal waste collectors are the major actors playing an important role in the recovery of plastics and metals to generate additional income.

Those who responded in the affirmative were then asked to specify ways in which they recycled their household waste. As shown in the Table 4.6, the residents reused plastic

bottles, plastic containers and also recycled other waste materials which included vegetable remains, wood and scrap materials.

Table 4.6: ***Recycling Techniques***

Technique	Frequency	Percentage (%)
Used Plastic bottles	125	24.9%
Used Plastic containers	79	22.1%
Other	157	43.9%

Source: Field Survey, 2017

The FGD revealed that the informal settlements reused plastics for carrying and covering food, plastic bottles to store water, milk or paraffin, vegetable remains as organic waste and they sell the metal scraps to dealers. It was also indicated through the FGD that the reused plastics were finally disposed of in the open pits. According to Waweru and Kanda, (2012) waste reuse at the household level is carried out through the use of plastics, glass bottles, paper and cardboards and cans for domestic purposes in the informal settlements. They argue that these materials are disposed of only when they are no longer of any use to the owners while scrap metal are sold to small scale recyclers who collect the items and small scale farmers collect the organic waste, sometimes paying a small fee, for use as organic fertilizers.

Trasias *et al* (2016) however pointed out that although informal settlements dwellers frequently reused plastics, the majority finally disposed of them in open dumping sites or burnt them in open pits. Plastics are non-biodegradable and, when inappropriately

dumped, result in clogging of drainage channels, creating water pools convenient for mosquito breeding and generating nuisance of smell. It further indicates that reusing plastics in informal settlement is not sustainable practice.

It was observed during the field survey that the trucks used to transport waste from the informal settlement were not closed. These poor transportation modes have led to littering, making waste an eye-sore, particularly plastics in the environment as shown in figure 4.19

Figure 4.19: Open Garbage Collecting Truck

Source: Field Survey, 2017

In addition, the interview with the County Director of Environment revealed that heaps of waste at Kipkenyo dumpsite is not segregated and all forms of waste matter including medical waste, garbage, waste from hotels, and salons among others, are evident. This clearly indicates that the dumpsite is not well managed and there is no control of waste being received. According to CIDP (2018), waste disposal in towns and urban centres

remains a challenge despite efforts made by the County and thus a recipe for environmental degradation and pollution. The lack of a proper sewer system in towns and urban centres and management of solid waste also poses major sanitation challenges. There is need to improve waste disposal by provision of sewerage systems, solid waste disposal sites, waste storage systems, establishing of a recycling plant at Kipkenyo dumpsite, among other interventions. This clearly indicates that there is lack of recycling plant in the county which is considered key in waste management

According to the Uasin Gishu county report (2018), in the department of environment, the County Government in partnership with the Norrkoping Municipality Östergötland Sweden, is finalizing plans of building a solid waste treatment plant in Kipkenyo Ward. The plant will not only manage huge solid waste collected daily from Eldoret town and its environs, but also generate power to be injected to the national grid. It is expected that the Kipkenyo dumpsite will be fenced to enable control of waste being received at the site besides purchasing of other machineries including a dumper and a front loader for the project to begin.

This study concludes that integration of green waste practices was observed which involves the sorting of waste at household level and reuse. However proper disposal, collection and transportation, management of dumpsite and availability of recycling plants pose a challenge in waste management practices.

4.4.4 Types of Upgrading Projects in the Settlement

Informal settlement upgrading may suggest many things, but at its simplest it has come to mean a package of basic services, i.e. clean water supply and adequate sewage disposal to improve the wellbeing of the community. This in turn customarily provides

a package of improvements in streets, footpaths and drainage, proper solid waste collection, street lights for security and electricity to homes often initiated through various upgraded projects (Kessler, 2000).

4.4.4.1 Upgrading Projects in the Settlements

The findings indicated various types of upgrading projects in the settlements and as shown in Table 4.7.

Table 4.7: *Upgrading Projects*

Upgrading Project	***Frequency***	**Percentage**
Street Security lighting	317	88.6%
Solid Waste Management	131	36.6%
Storm water drainage	218	60.9%
Water and Sanitation Systems	113	31.6%
Drinking water	121	33.8%
Solar installation	27	7.5%
Public parks and green space	45	12.6%
Footpath and bike path	223	62.3%
Vending Platforms	63	17.6%

Source: Field Survey, 2017

Based on analysis of the different types of upgraded projects(table 4.6), it is shown that the most popular upgraded projects in the settlement were street and security lighting(88.6%), footpath and bike path(62.3%) and storm water drainage(60.9%) while the least popular was solar installation(7.5%).

Further, an interview with the KISIP Component Three manager revealed that environmental and social management was integrated into the development and operation of projects financed under KISIP to ensure effective mitigation of potentially adverse impacts while enhancing accruing benefits. In addition, the Environmental and Social Impact Assessment (ESIA) report for the informal settlements in Eldoret Town identified adverse environmental and social impacts which could have been caused by the projects selected for implementation in these settlements and it developed, where required, suitable mitigation measures.

From the above it was clear that the main environmental mitigation measure that needed to be taken during operation was adequate maintenance of these systems and the importance of defining exactly who in each case is responsible for maintenance and the roles that citizens and government play as well. This signifies that the development actors advocate for green practices before, during and after the initiation of any upgrading projects.

4.5 Integration Process in Upgrading of Informal Settlements

The second objective was to determine the integration process in upgrading of informal settlements. Upgrading process involves various activities which have multiple effects on the water, storm water drainage, sewerage system, waste management and general well-being of the low-income residents of Eldoret. The ascertainment of individuals and processes involved in the upgrading as well as the benefits accrued thereof was deemed necessary on this objective.

The section starts with discussions on identification of various stakeholders involved in upgrading process in the settlements and participation of IS dwellers in upgrading process and their involvement in various stages in the upgrading process. Activities involved in the drinking water project and the elements for storm water drainage were discussed. Such issues included the rating of storm water drainages during rainy seasons, how often it was maintained and the problems associated with poor storm water drainage. The issues discussed under the sewerage system include the types of the sewerage system in the settlement and what was upgraded on the sewerage system. The section ends with a discussion on sustainability of the initiated projects.

4.5.1 Stakeholders Involved in Upgrading

Informal settlement upgrading process involves various improvements undertaken cooperatively and locally by various stakeholders such as citizens, community groups, business people, FBOs, NGOs, local authorities, and international communities. Figure 4.20 shows stakeholders involved in the upgrading program.

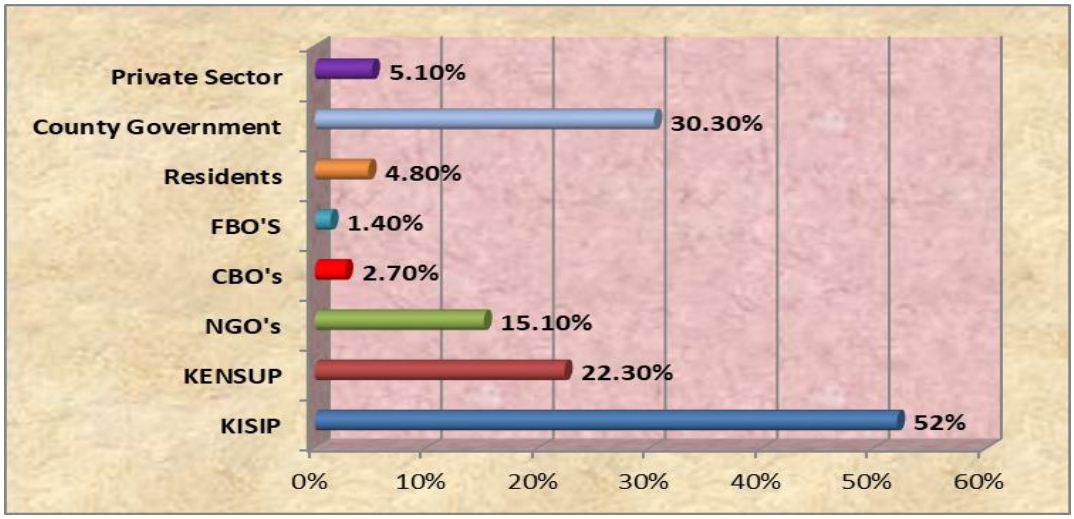

Figure 4.20: Main Stakeholders Involved in Upgrading Process

Source: Researcher, 2017

Findings in the current study show that various stakeholders are involved in the upgrading process in the three informal settlements. It was clearly evident that the respondents rated KISIP involvement (52%) and the county government of Uasin Gishu (30.3%) being identified as the main stakeholders having undertaken various initiatives in the IS upgrading. It was also noted that the KISIP project was initiated in the year 2011 and was focused on investing in infrastructure and service delivery. The project invested in roads, bicycle paths, pedestrian walkways, street and security lights, waste management, water drainage, sanitation, green spaces, and platforms in the informal settlements.

An interview with a County Director Environment revealed that the role of Uasin Gishu County government in upgrading was to implement the various projects, undertake urban planning functions, formulate supporting policies and provide and maintain physical and social infrastructure after upgrading. Chege (2013) opines that local governments are involved in provision of basic public goods and services, shelter, social and physical infrastructure in the areas of their jurisdiction. In addition, Acioly (2007) argues that experience shows that informal settlement upgrading requires political will and firm commitment of local governments that can sustain long-term programs and implementation.

According to UNHABITAT (2007), the national Government in Kenya is responsible for the execution and management of upgrading projects like KENSUP and KISIP and therefore takes care of land and tenure issues, coordination, resource supply, and monitoring and evaluation. Additionally, it is responsible for the legal, institutional, and policy frameworks, and for creating conditions favourable to slum upgrading and

poverty alleviation while the County government have a role in providing services and developing the regulatory framework in informal settlement.

It was revealed through FGD that the key milestone of KENSUP in Eldoret Informal settlements was construction of classrooms in Huruma Informal settlement .KENSUP's aim is to improve the livelihoods of people living and working in slums and informal settlements in the urban areas of Kenya through the provision of security of tenure and physical and social infrastructure, as well as opportunities for housing improvement and income generation.

KENSUP's involvement in the upgrading process has been country-wide and has a long-term strategy (2005-2025), focusing on housing and other issues in the informal settlements. Indeed, Mgele (2013) confirms that the Government of Kenya has addressed shelter issues through various initiatives and sectoral interventions that include: provision of minimum services, extension of tenure security and physical upgrading, recognition of the legitimate role of low income settlers and other stakeholders in urban development, and the formulation of a comprehensive national slum upgrading programme under the Kenya Slum Upgrading Programme (KENSUP) in the informal settlements**.**

Non-governmental organizations also play a valuable role in enhancing the quality of life in informal settlements across the globe. Poor policies, wasteful costs and corruption discouraged governments in many parts of the world from providing sufficient support to informal settlements. Often NGOs try to fill the gap, promote growth and provide help for the slums. Wilburn (2008) notes that local NGOs are often

equipped with the skills and experience required for governance. Development stakeholders who are lacking local expertise also are eager to enter into collaborations in informal settlement assistance with local NGOs. Thus NGOs can serve as a link between residents and development partners in informal settlements. These results contradict, however, those of UNHABITAT (2003), which suggests that civil society and non-governmental organizations are an important force in addressing a variety of humanitarian and informal settlement problems. However, they cannot make as much difference and advance as they can because they have to contend with state and market political disputes (Un-Habitat 2003).

The private sector role in informal settlement, as revealed through an interview with a county development officer, was achieved through Private Public Partnership with the County government. The private sector has an important role to play in the management and financing of utilities in urban areas. Additionally, by taking part in KENSUP, the sector can demonstrate its corporate social responsibility towards its workers who live in slums.

Governments and development invest significantly in improving the lives of IS citizens across a variety of upgrade initiatives, typically including infrastructure investments (water & sanitation, waste management, electricity , roads) and in some situations interventions to enhance tenure stability, social infrastructure, quality of housing, access and access to credit.

However, the immense and increasing size of IS alone outweighs its effect. If we look at the increase in these attempts to tackle the growing issue, it might be questionable

that the public sector will do this on its own and hence, the need for alternative approaches. The mobilization of additional private sector funds and resources is one such strategy with considerable potential. Moreover, UN Habitat (2003) claims that poverty levels in an IS are important for private sector strategies. In addition, a crucial condition is also the private sector itself. The formal private sector in many countries is relatively small, restricted in capability and much more resource-intensive and is therefore highly risky to oppose and promote the focus of investment opportunities for the affluent.

Information from FDGs revealed that the informal settlement dwellers were highly considered in the KENSUP and KISIP programmes geared towards improving the livelihoods of people living and working in in the informal settlements this indicates that working with them and including their inputs is therefore vital, as they know what they need, and they can guarantee programme ownership and sustainability. It was also observed that KISIP and KENSUP community organization and mobilization was achieved through formation and operationalization of settlement Executive committees (SEC) representatives from each settlement. Therefore, it's worth noting that, in most, there is emphasis on producing local leaders who will operate through democratic decisions making structures. According to the KISIP project appraisal document (PAD), KISIP was to strengthen mechanism of community participation by investing only in communities that prepared upgrading plans through fully participatory process (World Bank, 2011).

Informal settlements act as a 'poverty trap' since stigmatization, discrimination and geographic separation limit IS dwellers' access to formal job markets and credit. With

residents involvement, the limiting effects of IS can be overcome, thereby halting the growth of IS by providing opportunities for IS dwellers to improve their living standards (Otiso, 2003). In addition, the FGD with the Settlement Executive Committee in Munyaka revealed that many landlords in the IS lack the title deeds and this discourages them from undertaking any meaningful upgrading.

The interview with County Development Officer revealed that CBOs and FBOs generally have not been involved in upgrading physical projects but rather in intangible projects such as capacity building, advocacy and awareness creation which are of foremost importance. UNHABITAT (2007) observed that Civil Society Organisations have a lot of expertise on different issues relevant to KENSUP, whether technical or community-based. They are also well placed to mobilise communities and represent their interests. Their involvement enhances participation, helps mobilise local communities around common goals, and promotes consensus building for slum upgrading

CBOs and FBOs generally have not been involved in upgrading physical projects but rather in intangible projects such as capacity building, advocacy and awareness creation which are of foremost importance.

4.5.2 Participation in Upgrading Process

It is important for the Informal Settlement dwellers to be involved in defining their own problems, setting priorities, and coming up with solutions that may help solve their problems. Respondents were asked if they had taken part in the upgrading process of their settlement. The table below shows the responses.

Table 4.8 ***Participation of Residents in Upgrading Process***

Response	Frequency	Percentage (%)
Yes	115	32.2%
No	242	67.8%
Total	**357**	**100%**

Source: Field Survey, 2017

These findings revealed that the majority did not take part in the upgrading process. Those who took part were then asked to state the level of participation they were involved in. The figure 4.21 shows the responses.

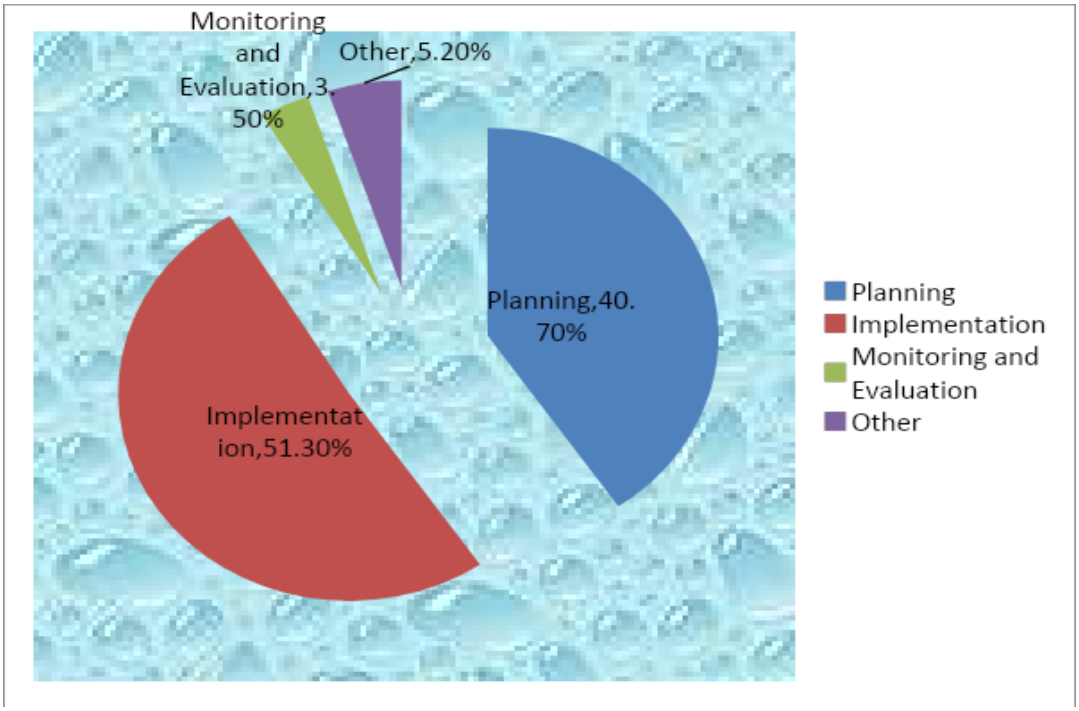

Figure 4.21 Level of Participation

Source: Field Survey, 2017

The figure 4.21 gives an indication that the community is not well organized, empowered and sensitized from the initiation stage of the projects. Perten (2011) states that there are dissimilar stages of participation. These include; initiation, planning, design, implementation, and maintenance stages of participation. On the other hand, Restrepo (2010) argues that community participation is an indispensable element in any informal settlement upgrading program and it is necessary to involve the community in the preparation of the regularization and upgrading plans and that without active cooperation, plans cannot be successfully implemented. He further argues that community participation facilitates ownership and sustainability. If the community is not fully engaged in key decision-making processes which occur in the conception and planning stage, the success of the program is challenged (Restrepo, 2010). On the contrary, interviews with KISIP *Component Three manager* and a community development officer confirmed that community members were invited to attend sensitization meetings on the proposed project but the attendance was not commendable. The interview further revealed that some were not involved because projects take long to be implemented after the baseline survey. They gave an example of KISIP projects whose process started in 2011 but was implemented in 2013. This two-year period lapse gives an impression that perhaps other IS residents could have moved to other estates and new entrants coming in altogether.

4.5.3 Upgraded Projects Activities

IS upgrading involves various projects which requires various activities to be integrated as discussed below.

4.5.3.1 Drinking Water Projects in the Settlement

An adequate supply of safe drinking water is universally recognized as a basic human need yet millions of people in the developing world do not have ready access to an adequate and safe water supply (Charumitra *et.al*, 2014)

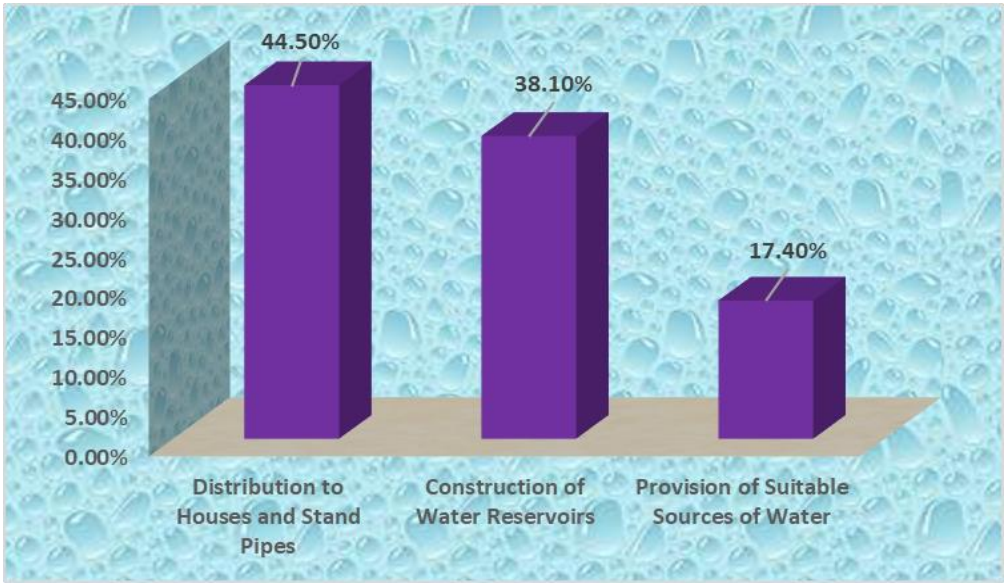

Figure 4.22: Drinking Water Projects

Source: Field Survey, 2017

As shown in figure 4.22, there were several drinking water projects of which majority of the respondents singled out that the most important was the improvement of the distribution system to houses and standpipe (44.5%). Charumitra *et al* (2014) argue in their findings that the companies need to pursue network strengthening activities, such as the expansion of pipe water supplies and sewerage channels through the expansion of the primary and secondary distribution pipes, to improve access to secure, economic and sustainable water supply and sanitation services in low income areas. The program should be balanced and include the growth and preparation of the community. In order to ensure ownership, communities should be consulted before project execution. Many members of the society engage in the building of water and sewage networks, including

young people. This provides the workforce with work and leverages money from the community for projects. One participant explained this by saying

> *"The county government through ELDOWAS brought piped water on specific mainline and water Kiosk in the IS which allowed us to easily get meter water at low cost*." (FGD, Munyaka 11th March 2017)

Well maintained water projects, enables residents access clean water and as a result, residents especially women can save time and be able to engage in other meaningful economic activities. There is no doubt that availability of clean water supply has led to less incidences of waterborne diseases and in turn lead to improved health.

The implication of these findings show that green practices were integrated in drinking water projects in the sense that improved distribution increased affordability, access, and availability of water. This ultimately contributed to better time management. Additionally, construction of water reservoirs was aimed at arresting water wastage, and water shortage.

4.5.3.2 Storm Water Drainage Upgrading

Insufficient drainage, often causing floods is considered as a major problem in the informal settlements.

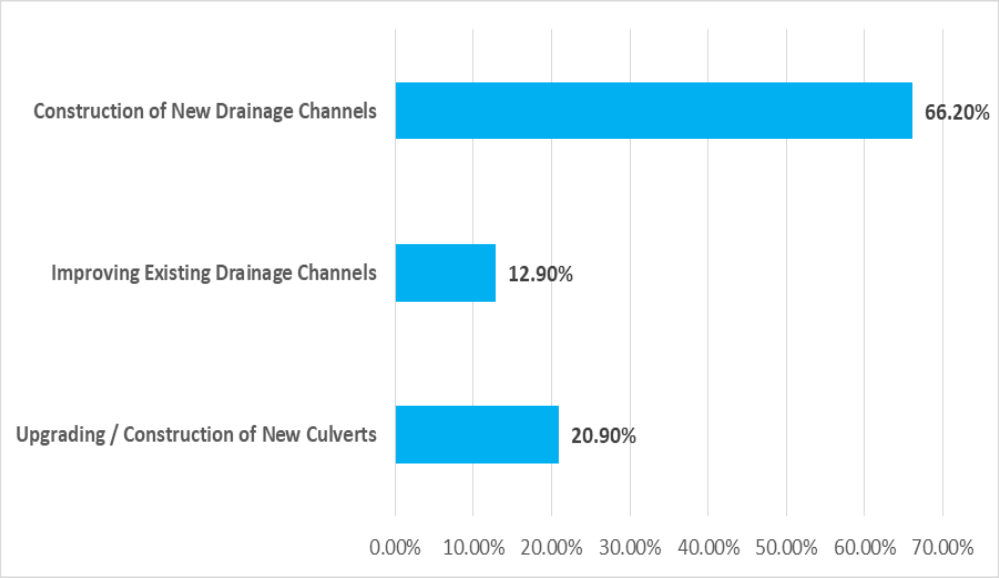

Figure 4.23: Elements for Storm Water Drainage in Upgrading

Source: Field Survey, 2017

The implications of the findings as illustrated by figure 4.23 is that, prior to the upgrading project of storm water drainage, the IS had inadequate drainage system and that is why construction of the new drainage system was rated highly (66.2%). The study further established that existing drainages were improved and enlarged to curb the normal problem of blockage normally experienced in the informal settlement. In addition, upgrading and construction of culverts was also done in these settlements. These projects/practices lead to proper flow of storm water and aids in the reduction of flooding which in turn leads to saving property and lives.

4.5.3.2.1 Rating the Storm Water Drainage System

The respondents were also asked to rate the storm water drainage system in their settlements and the results were represented in the figure 4.24.

Figure 4.24: Storm Water Drainage Effectiveness

Source: Field Survey, 2017

The results of the study showed that storm water drainage was effective as illustrated by the large number of respondents who rated it as good (40.3%). Sadly, as it was observed during the field survey, residents have not taken any personal initiative to clean the drainage long after its improvement. Further through, FGD's it was established that construction of culverts was not properly done at Kamukunji. This might contribute to blocking and eventually flood especially during the long rainy seasons. The pictures below show a poorly constructed drainage system.

Figure 4.25 Storm Water Drainage in Kamukunji

Source: Field Survey, 9th March 2017

4.5.3.2.2 Maintenance of Storm Water Drainage

The respondents were asked how often the storm water drainage systems were maintained. The results are shown in table 4.8.

Table 4.9: ***Maintenance of Storm Water Drainage***

Rate	Frequency	Percentage (%)
Often	98	27.5%
Once a month	73	20.4%
Once in three months	44	12.4%
Rarely	130	36.4%
Other	12	3.4%
Total	**357**	**100%**

Source: Field Survey, 2017

When asked about maintenance of storm water drainage majority of the respondents said that maintenance was rarely done and this can be clearly seen in the picture below that was taken during the field survey.

Figure 4.26: Poorly maintained drainage in Munyaka

Source: Field Survey, 9th March 2017

4.5.3.2.3 Problems of Poor Storm Drainage

When they were asked to state the problems associated with poor storm water drainage, 21.5% respondents could not clearly identify the problem, 50.8% said waterborne diseases and flooding and another 26.8% respondents said it led to destruction of housing and property. Half of the participants rated waterborne diseases and flooding as key problems in the IS followed by destruction of housing and property. This was illustrated below in Figure 4.27.

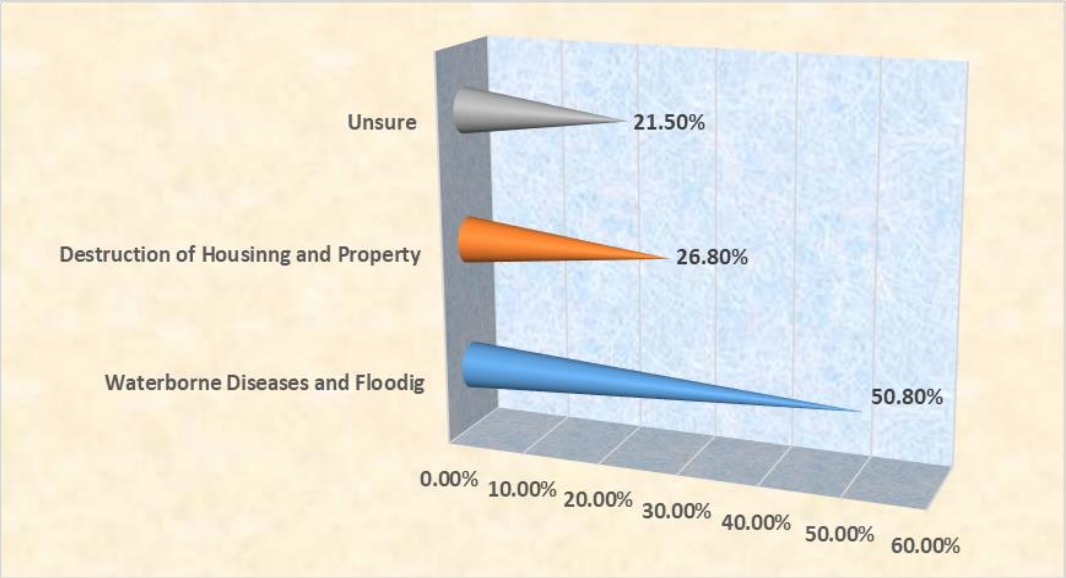

Figure 4.27: Problems of Poor Storm Water Drainage

Source: Field Survey, 2017

4.5.3.3 Sewage System Upgrading

The sewerage system is important because it carries sewage from people's homes and businesses to enable it to be reused or safely disposed of in the environment. Upgrading the system leads to improvement in the quality of life, preserving the natural environment, saving water, saving money and contributes to enjoying a better quality of life (Sewerage Board of Limassol – Amathus, 2014)

4.4.3.3.1 Presence of Sewerage System

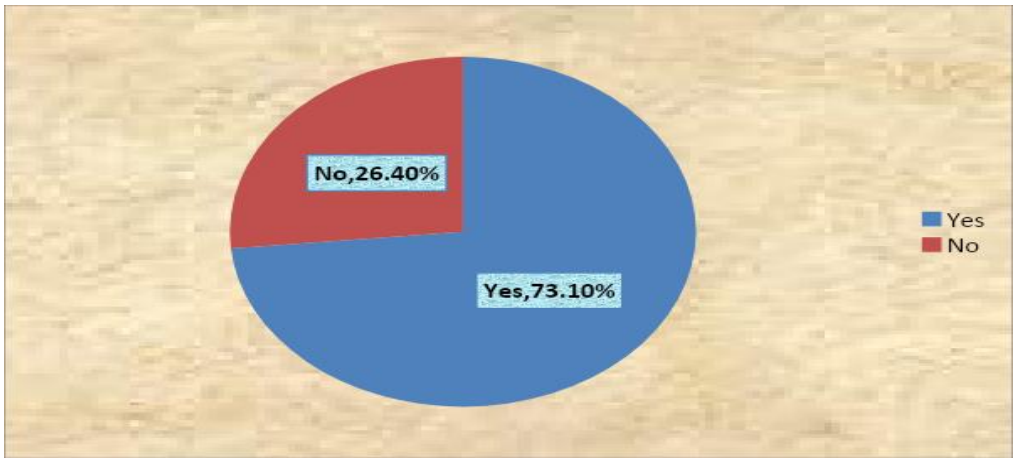

Figure 4.28: Presence of Sewerage System

Source: Field Survey, 2017

The researcher sought to find out whether the specific IS had an existing sewerage system and the results were illustrated by Figure 4.28. It was evident that most of them had some form of Sewerage system in place (73.1%) but it was further revealed through the FGD that there was no sewerage system in some parts of Munyaka informal settlement.

4.5.3.3.2 Type of Sewerage System

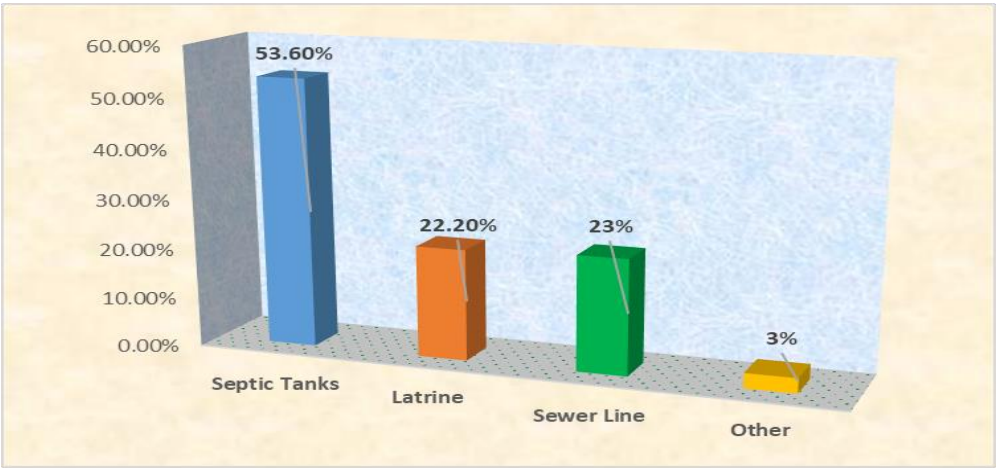

Figure 4.29: Type of Sewerage System

Source: Field Survey, 2017

The researcher sought to find out what type of sewerage system was present in the settlements. The respondents' answers are presented as shown above. Most settlements had septic tanks and sewer lines which are effective sewage disposal methods.

4.5.3.3.3 Element of Upgrading in Sewerage System

The respondents were asked to identify the elements of upgrading in the sewerage systems. According to the findings, sewage channels or ducts was identified by 199 (55.7%) respondents, trunk sewage channel or duct leading to a water treatment plant by 47 (13.3%) respondents and the remaining respondents cited that there was provision of alternative sanitation infrastructure such as communal ablution blocks as shown in Figure 4.31. This implies that there was integration of green practice (Water recycling/treatment) in these settlements.

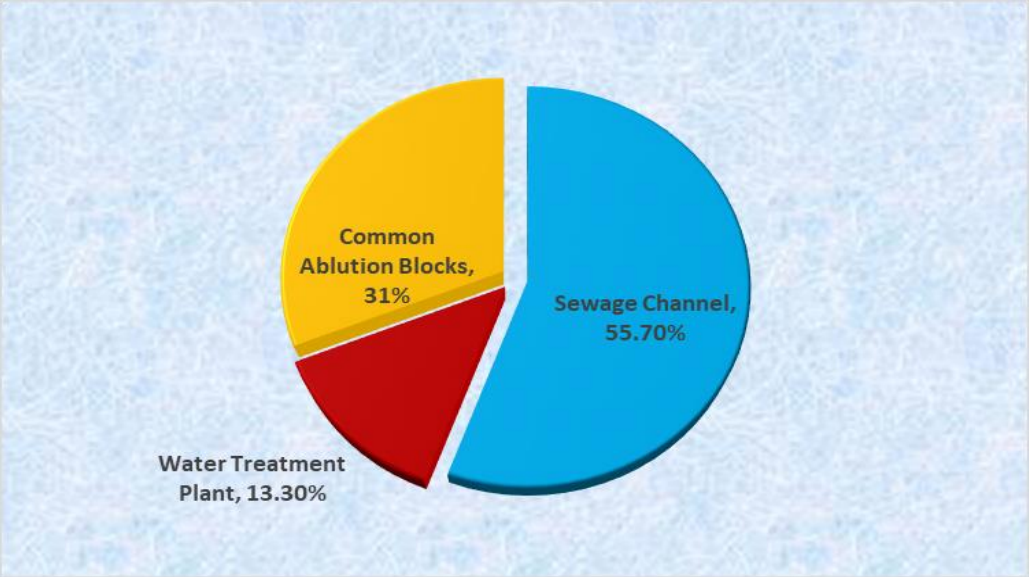

Figure 4.30: System upgraded in the Sewerage System

Source: Field Survey, 2017

Figure 4.31 Ablution Block at Huruma

Source: Field Survey, 10th November 2016

4.5.4 Sustainability of Projects

According to Imparato and Ruster (2003), sustainability takes two key dimensions: continuation of the construction process after completion of the project and preservation of the benefits of the project after completion. Projects can only develop their full benefits if they remain completely operational in the long term. Therefore, the maintenance of projects is necessary in order to keep them viable. Maintenance needs, in particular, two things: (i) the availability of personnel capable of conducting all the surveillance and work necessary to ensure the full operation of the systems; and (ii) the availability of adequate funds to carry out any maintenance or repair work that may be required. Based on this interpretation, respondents were asked if the projects were viable and gave their responses as shown in figure 4.32.

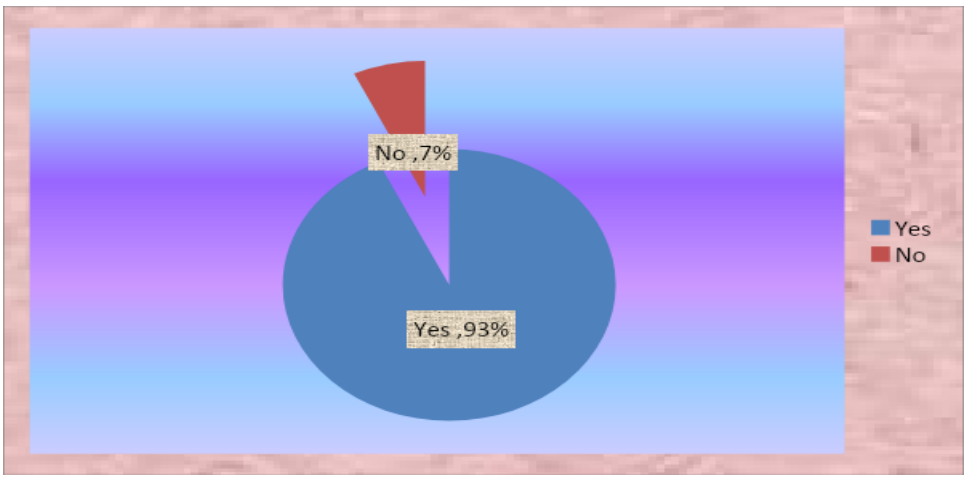

Figure 4.32 Sustainability of Green Practices

Source: Field Survey, 2017

A very small percentage of residents felt that the projects were not sustainable and cited reasons such as lack of maintenance of facilities and lack of project ownership as some of the hindrances to sustainability. Most respondents accepted that the green practices introduced were sustainable and therefore sustainable is the most adequate indicator of a project's final performance. A sustainable project continuously raises the wealth and security of a society (Imparato and Ruster, 2003). If the IS residents consider improved projects as their own, this meant that they would do all they could to sustain those projects.

4.6 Effects of Green Practices in Sustainable Informal Settlement Upgrading

The third objective was to assess the impact of green practices in sustainable informal settlements upgrading. Hadi (2015) and UNEP (2011) argue that environmental sustainability practices in energy, water and waste is associated with many benefits and it is considered the pathway to achieving SDGs. This section sought to establish the benefits arising from the green practices. The results of the study show that there are indeed various benefits associated with integrating GP in IS upgrading as shown in the Table 4.10

Table 4.10: ***Effects of Green Practices in Sustainable Informal Settlement Upgrading***

Impact	**Disagree**		**Undecided**		**Agree**	
	Freq.	**%**	**Freq.**	**%**	**Freq.**	**%**
Use of solar has led to reduced electricity bills	131	36.6%	12	3.4%	214	60%
Use of solar has led to reduction in buying paraffin	96	26.9%	2	0.6%	259	72.5%
Energy saving bulbs has led to reduced electricity bills and reduced replacement of bulbs	88	30.2%	32	9.0%	218	60.9%
Installation of street lights and floodlight has led to extension of business hours hence increased income	47	13.1%	4	1.1%	307	85.9%
Installation of street lights and flood lights has enhanced security in the informal settlement	87	24.3%	4	1.1%	266	74.8%
Footpaths and bike paths improves aesthetic beauty	92	25.7%	10	2.8%	256	71.7%
Footpath reduces traffic accidents	74	20.7%	9	2.5%	274	76.8%
Proper Storm water drainage management reduces soil erosion	73	20.6%	4	1.1%	281	57.1%
Proper Storm water drainage management reduces respiratory and waterborne diseases	37	10.4%	6	1.7%	314	87.6%

Availability of clean water supply implies less incidences of waterborne diseases and improved health	38	10.6%	11	3.1%	308	69.7%
Access to clean water helps residents save time and engage in other meaningful activities	75	21.5%	6	1.7%	274	76.8%
Proper household waste management reduces littering	61	17%	9	2.5%	287	80.5%
Proper household waste management improves sanitation	48	13.4%	8	2.2%	301	84.4%

Source: Field Survey, 2017

4.6.1 Benefits of Green Energy Practices

Solar is one of the forms of renewable energy. It's considered clean, affordable and a sustainable way of energy generation. Many people switch to solar for its substantial financial benefits such as lower utility bills and significant environmental benefits though, the initial cost is high (UNEP, 2011). As shown by the findings in Table 4.9, 72.5% of respondents agreed that using solar leads to reduction in cost of buying paraffin while 60% of respondents said that it leads to reduced electricity bills. Other respondents who rely solely on electricity, said that they use energy saving bulbs. This implies that there are both financial and health benefits since they pay less for electricity and avoid as much as possible the use of paraffin. The shift towards accessing clean, reliable, and affordable energy is considered fundamental to achievement of SDGs and is associated with environmental sustainability with positive consequences on health. Further, benefits of solar usage as an alternative source of energy have been advocated by UNEP (2011) who argue that the solar sector will significantly contribute to job

creation from 173,000 to 764,000 for the year between 2008 and 2025. The organization adds that jobs created by the renewable energy sector can be safer in terms of lower potential health risks as compared to employment within fossil fuel energy. The renewable energy sector will ensure long term employment periods and increased capital, IPCC (2011). The study found out that individual households use solar as an alternative source of energy in all the three IS. This was attributed to the fact that there was frequent power rationing. There is therefore a need for the county government and other development partners to invest in solar installation projects since it has modest maintenance cost.

The study further revealed that installation of street lights and floodlights had led to extension of business hours and thus increased income in the informal settlement. Based on earlier findings that the majority engage in small business like selling vegetables, it may imply that they had increased their operating hours till late hours even up to 10 pm and thus increased their income. This is in line with the Practical Action (2010) which proposed that access to energy will create new opportunities for earning money, expand existing activities and save on existing practices. In addition, several have agreed to increase the security of the informal settlement through street lighting installations. Many informal settlements are often used as a crime fence for insecurity. The presence of light bulbs and floodlights has possibly uncovered hidden locations where criminals might be hiding for crimes. The study also found out that construction of footpaths and bike paths help in reducing accidents and improved aesthetic beauty in the IS.

4.6.2 Benefits of Green Waste Practices

Proper storm water drainage management helps in reducing respiratory and water borne diseases and in reducing soil erosion according to 87.6% (314) respondents and 57.1% (281) respondents respectively. According to KISIP (2011), storm water drainage project outcomes include: reduction of the risk of flooding, positive effect on health by reducing or preventing the formation of temporary stagnant water pools, thereby reducing exposure of the population to water related diseases. In addition, proper household waste management led to improved sanitation as rated by 84.4% (301) of the respondents while 80.5% (287) said it led to reduced littering. In addition, the overall green economy of waste indicators may include employment value of products generated by greening, e. g. recycled goods, recovered energy and waste collection services, segregation and treatment services, according to UNEP (2011). Economic and social benefits should also include health, property, and tourism and direct and indirect jobs generation.

4.6.3 Benefits of Green Water Practice

Most respondents, 76.8% (274), agreed that access to clean water helped residents to save time and be able to engage in other meaningful activities. Availability of clean water supply implied that there were less incidences of waterborne diseases and in turn led to improved health. Fewtrell and Colfrod, (2004); Galiani *et al.* (2010); and Jalan and Ravallion, (2003) argued that access to clean water and sanitation is considered important to health, protection and living conditions, and is of particular importance for women and children. Further they indicated that many other benefits which include : longer lifetime, decrease in morbidity and deaths from different illnesses, improved attendance at school, reduced medical costs and less time and effort to handle water and

waste. This saved time will allow women to take part in other productive tasks and create more time to care for children, socialize and educate them.

4.6.4. Analysis of Variance Test (ANOVA)

As shown from the ANOVA table below, the F ratio for a majority of the items showed a statistically significant difference in the rating by the three settlements. From the table, it can be seen for example that there was a statistically significant difference in the mean ratings for 'use of solar has led to reduced electricity bills' ($F(2,354) = 9.150$, $p = 0.000 < 0.05$ at the 0.05 alpha level. Similarly, there was a statistically significant difference in the mean ratings for the three settlements areas for 'use of energy saving bulbs leading to reduced electricity bills and reduced replacement of bulbs'; the results were ($F(2,354) = 22.182$, $p = 0.000 < 0.05$ at the 0.05 alpha level. There was also dissimilarity in the mean ratings for ;'foot paths and bike paths improve aesthetic beauty and reduces traffic accident' at ($F, (2,354) = 16.041$, $p = 0.000 < 0.05$ at the 0.05 alpha level; 'installation of street lights and flood lights has led to Enhanced security' at ($F, (2,354) = 12.621$, $p = 0.000$ at the 0.05 alpha level and 'access to clean water helps residents save time and engage in other meaningful activities' ($F, (2,354) = 13.158$, $p = 0.000 < 0.05$.

Table 4.11: ***ANOVA***

ANOVA						
		Sum of Squares	Df	Mean Square	F	Sig.
Use of electricity has led to Reduced cost of buying paraffin	Between Groups	4.465	2	2.232	1.342	.263
	Within Groups	588.768	354	1.663		
Use of solar has led to Reduced electricity bills	Between Groups	122.617	2	61.308	9.150	.000
	Within Groups	2371.809	354	6.700		
Energy saving bulbs has led to reduced electricity bills and Reduced replacement of bulbs	Between Groups	82.584	2	41.292	22.182	.000
	Within Groups	658.962	354	1.861		
Installation of street lights and flood lights has led to Extension of business hours and thus increased income	Between Groups	3.540	2	1.770	1.341	.263
	Within Groups	467.323	354	1.320		
Installation of street lights and flood lights has led to Enhanced security	Between Groups	52.962	2	26.481	12.621	.000
	Within Groups	742.741	354	2.098		
Foot paths and bike paths Improve aesthetic beauty and reduces traffic accident	Between Groups	46.227	2	23.114	16.041	.000
	Within Groups	510.081	354	1.441		
Availability of water supply implies less incidences of waterborne diseases and improved health	Between Groups	14.280	2	7.140	1.309	.271
	Within Groups	1930.297	354	5.453		

Access to clean water helps residents save time and engage in other meaningful activities	Between Groups	33.303	2	16.652	13.158	.000
	Within Groups	447.980	354	1.265		
Proper household waste management Improves sanitation	Between Groups	1.361	2	.680	.535	.586
	Within Groups	450.628	354	1.273		

Source: Field Survey, 2017

Given the statistically significant differences for some of the items, as shown above, the Tamhane post hoc analysis for multiple comparison was conducted to determine which means differ from each other in the three settlement areas. The Tamhane test assumes equal variance was violated (Equal Variance Not Assumed

Table 4.12: ***Tamhane Post Hoc Analysis for Multiple Comparisons***

Dependent Variable	(I) Please tick your settlement	(J) Please tick your settlement	Mean Difference (I-J)	Std. Error	Sig.
Use of solar has led to Reduced electricity bills	Munyaka	Kamukunji	-1.32316*	.19416	.000
		Huruma	-1.14123*	.30077	.001
	Kamukunji	Munyaka	1.32316*	.19416	.000
		Huruma	.18194	.31778	.919
	Huruma	Munyaka	1.14123*	.30077	.001
		Kamukunji	-.18194	.31778	.919
Energy saving bulbs has led to reduced electricity bills and Reduced replacement of bulbs	Munyaka	Kamukunji	-1.12957*	.17513	.000
		Huruma	-.92164*	.15806	.000
	Kamukunji	Munyaka	1.12957*	.17513	.000
		Huruma	.20793	.17828	.572
	Huruma	Munyaka	.92164*	.15806	.000
		Kamukunji	-.20793	.17828	.572
Installation of street lights and flood lights has led to Enhanced security	Munyaka	Kamukunji	-.56571	.25284	.084
		Huruma	-.80872*	.16405	.000
	Kamukunji	Munyaka	.56571	.25284	.084
		Huruma	-.24301	.24105	.683
	Huruma	Munyaka	.80872*	.16405	.000
		Kamukunji	.24301	.24105	.683
Foot paths and bike paths Improve aesthetic beauty and reduces traffic accident	Munyaka	Kamukunji	-.12253	.24376	.944
		Huruma	-.74306*	.13232	.000
	Kamukunji	Munyaka	.12253	.24376	.944
		Huruma	-.62053*	.23834	.036

	Huruma	Munyaka	.74306*	.13232	.000
		Kamukunji	.62053*	.23834	.036
Access to clean water helps residents save time and engage in other meaningful activities	Munyaka	Kamukunji	-.44804*	.18127	.046
		Huruma	-.64135*	.12923	.000
	Kamukunji	Munyaka	.44804*	.18127	.046
		Huruma	-.19331	.16432	.568
	Huruma	Munyaka	.64135*	.12923	.000
		Kamukunji	.19331	.16432	.568

Source: Field Survey, 2017

The pair wise comparison revealed the following for the three settlements; there was a statistically significant difference in mean rating between Munyaka and Kamukunji on one hand and between Munyaka and Huruma on the other with standard error of 0.19416 at $p = 0.000 < 0.05$ and .30077 at $p = 0.001 < 0.05$ respectively for 'Use of solar has led to Reduced electricity bills'. However, there is no statistically significant difference in ratings between Kamukunji and Huruma with standard error of 0.31778 at $p = 0.919 > 0.05$. This difference between the rating of Munyaka and Kamukunji on one hand and between Munyaka and Huruma show that Munyaka settlement had a different opinion this could be attributed to some factors that were revealed during the FGD in the three settlements that, majority of the land lords reside in Munyaka than in Kamukunji and Huruma which implies that they had taken advantage of electricity connection project by the government and World Bank. It was further revealed during the FGD in Munyaka that majority of the landlord's installed the prepaid token systems for their tenants which goes to show that Munyaka settlement dwellers control their use of electricity and have not fully embraced the use of solar.

On Energy saving bulbs leading to reduced electricity bills and reduced replacement of bulbs, there was a statistically significant difference in the mean rating between Munyaka and Kamukunji and Munyaka and Huruma with standard error of 0.17513 at $p = 0.000 < 0.05$ and .15806 at $p = 0.001 < 0.05$ respectively. However, there was no statistical difference in the ratings between Kamukunji and Huruma with standard error of 0.17828 at $p = 0.572 > 0.05$. The implication of the finding is that the majority of Munyaka dwellers could be using energy saving bulbs to save on electricity since they are using a pre-paid meter system.

The results on installation of street lights and flood lights leading to enhanced security shows that there was a statistical significant difference in the mean rating between Munyaka and Huruma with standard error of 0.16405 at $p = 0.000 < 0.05$. However, there was no statistically significant difference in ratings between Munyaka and Kamukunji and Kamukunji and Huruma, with standard error of 0.25284 at $p = 0.084 > 0.05$ and 0.24105 at $p = 0.683 > 0.05$ respectively. Based on earlier findings, all IS had floodlights and street lights which had enhanced security in the settlements. From the field survey, it was revealed that Huruma had three flood lights installed, Kamukunji one and Munyaka four but it was further established through the FGD in Kamukunji that the existing streetlights were not functioning and in Huruma, the lighting was inadequate since the bulbs used were not very bright and also they did not cover the area sufficiently.

Foot paths and bike paths that improve aesthetic beauty and reduces traffic accident results indicates that there was a statistically significant difference in the mean rating between Munyaka and Huruma and Kamukunji and Huruma with standard error of

0.13232 at p = 0.000< 0.05 and .23834 at p = 0.036< 0.05 respectively. However, there was no statistical significant difference in ratings between Munyaka and Kamukunji with standard error of 0.25284 at p= 0.084 > 0.05. The unique rating associated with Huruma could be due to the fact that there were few foot paths on the main streets which were upgraded as observed during the field study and confirmed during the FGD in the settlement.

Further, on access to clean water helping residents save time and engage in other meaningful activities, there was a statistically significant difference in the mean rating between Munyaka and Kamukunji and Munyaka and Huruma with standard error of 0.18127 at p = 0.046< 0.05 and .12923 at p = 0.000< 0.05 respectively. However, there was no statistically significant difference in ratings between Kamukunji and Huruma with standard error of 0.16432 at p= 0.568 > 0.05. This finding could be attributed to the fact that Munyaka had different sources of water points like piped water, Shallow well and Munyaka Oasis which the Participants in the FGD felt that this water catchment was viable for development. Huruma and Kamukunji on the other hand relied on piped water whose supply was inconsistent and on shallow wells which could dry during the dry seasons and its water may be contaminated.

4.7 Dynamics of Implementation of Green Practices in Upgrading

The fourth objective was to determine dynamics of implementation of green practices in informal settlements upgrading. There are various underlying factors that may influence the integration of green practices in upgrading of IS. The interrelated dynamics are tabulated in Table 4.13.

Table 4.13 ***Chi Square Test on Dynamics in the Implementation of Green Practices***

Dynamics of implementation of Integration of Green Practices	Chi-Square	Df	Asymp. Sig.
Initial cost of adopting green practices depends on the level of income of informal settlement dwellers	553.706[a]	5	0.000
Time Period of planning affects adopting green practices	350.008[a]	5	0.000
Stakeholders' participation influences implementation of upgrading of informal settlement	157.496[b]	4	0.000
Accessibility of green technologies lead to adoption of GP	172.314[b]	4	0.000
Availability of personnel with green skills affects implementation of GP	190.717[b]	4	0.000
Appropriate policy and legal framework on green practices affects integration of GP	209.457[b]	4	0.000
Project completion level determines integration of GP.	140.633[b]	4	0.000
Misappropriation of funds and corruption affects completion rate of projects	221.908[a]	5	0.000
Level of Maintenance of facilities influences integration of GP	317.048[b]	4	0.000
The community's level of awareness influences adoption of green practices	186.849[a]	5	0.000

Source: Field Survey, 2017

There are dynamics involved in the creation of the GP to upgrade the three informal settlements. Table 4.13 shows the chi-square values of the various measured products. The findings indicated a statistical significance for all items evaluated at p = 0,000 < 0.05. The use and implementation of the Green Practices in improving informal settlements are central to all the variables evaluated. In the following section, a further analysis of the findings for each of the variables is discussed.

4.7.1 Initial Cost of Adopting Green Practices Depends on the Level of Income

There was a significant difference in the chi-square values on the adoption levels of green practice in relation to the level of income of informal settlement dwellers. The initial cost of adopting green practice and acquiring green technologies was statistically significant at χ^2 (5,357) =553.706, p =0.000 <0.05. This can be explained by the low household income and the fact that the county government has little power to invest on its own in major projects such as the solar system. The findings were consistent with the results of Waruru (2017), which showed that solar costs are high compared to conventional fuel in terms of startup costs. Moreover, Makashini *et al* (2014) argue that while informal homes in Zambia have reasons to introduce measures to save electricity, technology costs continue to be a dire impediment.

4.7.2 Time Period of Planning Affects Adopting Green Practices

Time Period of planning significantly affects adopting green practices at χ^2 (5,357) =350.008, p = 0.000 <0.05 and this generally implies that it takes a long period of time for informal settlement dwellers to adopt to the GP. The implications of the finding is that some of the residents will resist projects geared to positive impact because of fear of the unknown, ignorance and at times lack of knowledge. In the same light, Iweka and Adebayo (2015) maintain that the needs and demands of people lie at the very

center of urban upgrading projects. The preparation should clearly define these needs and demands, understand and prioritize. They also think that Kenya's slum upgrading programmes, despite strong government support, identified many structural and program planning problems that have inhibited their successful execution.

In comparison, Ndukui (2013) points out that, at the cost of other IS livelier livelihoods, most IS upgrading programs focus on housing enhancements. This is a problem, as the solution, which is aimed at enhancing the general quality of life of IS people, would be influenced by the management of housing alone. He suggests that it is desirable to provide a more detailed approach even when long-term planning is in progress. The same was stated by Fadhili (2015) that the long-term planning of environmental management practice defines the environmental policy of the development actors, depending on the upgrading initiative, the characteristics of each informal settlement and their environmental implications.

Further, Abusalia, Osumanu and Ahmed (2015) pointed out that one legitimate concern was the state of urban planning and provision of social services. They argued that there is a mismatch between the current planning system and the needs that planning should address, especially in the IS areas. They argued that rethinking of the mandate of urban planning as a response to sustainable development in the light of linking poverty and urbanization in low-income countries seems appropriate but the search for new ways of balancing vulnerability and coping strategies present an urban dilemma for both planners and IS dwellers. Whereas UN-Habitat (2005) argues that urban planning is part of the problem of the emergence of IS, Watson (2009) calls for a fundamental review of planning practices if it is to play any meaningful role in addressing issues of IS and urban poverty.

Informal settlement planning is suffering from inequality between municipalities, towns and provinces according to the National Slum Upgrading and Prevention Strategy (2015). Classical planning approach has further exacerbated the situation, as planners are hardly consultable with informal settlement residents. Incapable of planning and executing plans, lack of efficient development management systems, lack of plans and insufficient plans have all led to the spread of many unplanned settlements.

4.7.3 Stakeholders' Participation Influences Implementation

Stakeholders' participation significantly influences implementation of upgrading of informal settlement with a chi- square value χ^2 (4,357) =157.496, p =0.000 <0.05 which implies that there is a lack of participation in the upgrading process. This can be attributed to such factors like the IS dwellers ignorance and lack of information on the programme amongst other reasons (Chege, 2014). According to UNCHS (2001b), effective IS upgrading requires active involvement of the target beneficiaries.

Another factor is that, when the community feels that it is not involved in the upgrading process, they will not fully support the projects. The findings of the present study are in consonance with such assertions by Pugh (2000) cited in Endalamaw (2014). That hasty planning which allowed for little or no input from beneficiary communities, results in lack of ownership and reluctance to pay for improved services. In addition, Lack of participation further leads to lack of support from the community in the upgrading process. This could be attributed to factors such as level of education, gender, level of income and awareness of green practices.

Lack of participation also leads to a general lack of commitment and a lack of sense of project ownership especially when a top-down approach to informal settlement upgrading is the main approach and where the projects begin with government through centralized institutions and government agencies, act independently without any consultation with local people in identifying problems, determining the response, formulating, and implementing strategies, action programs and projects (Majale, 2008). According to Abdel Halim (2010) the bottom-top approach to IS upgrading begins with external actors/NGOs/CBOs initiating the projects with the local community, then the sustainability of such projects is more ensured when local residents feel the ownership of their locality.

In summary, according to Ziblim (2014), the involvement of informal settlement communities, and the need to give them a voice, at every stage of the upgrading process, forms a basic tenet of the upgrading of Informal Settlements Programme. He argues that this is one of effective ways to empower IS communities to transform their own livelihood but lack of public involvement can also pose a challenge to speedy and successful project implementation.

4.7.4 Accessibility of Green Technologies Lead to Adoption of GP

There was a significant difference in mean ratings on accessibility of green technologies on adoption of GP with a chi-square value of χ^2 (4, 357**)** = 172.314, p =0.000 <0.05.This implies that little has been done to ensure that there is a sound regulatory framework and master plan that help draw in local investors and entrepreneurs that allow expansion in green energy, waste, and water technologies. This can be attributed to the fact that IS dwellers are not ready to spend on acquisition of these technologies due to the initial

high cost. Makashini, *et al.*, (2014) revealed that landlord control in the informal settlements was a highly significant barrier to using energy efficient technologies. This is because some households use electricity that has been connected from a main house to an extension or stand-alone house within the same yard and not from the service provider. This meant that the household in the extension or second house used the electricity prepaid meter in the primary house. Therefore the landlord was responsible for buying the credit for all the households within the yard. Some landlords therefore included an amount in the rent to cater for the electricity. Thus the landlord would not allow the tenants to use certain electric appliances like stoves and pressing irons as they believed that these appliances consumed too much electricity. They also switch off the electricity to the tenants for a better part of the day and switch it on in the evenings. This allows the tenants to maximise on electricity when it is switched on with no regard to energy efficient practices. This 'landlord control' had the effect of preventing the households from adopting energy efficient technologies. Gongera and Gicheru (2016) argue that, short distance to the nearest energy specialist extension officers (2km) as opposed to the nearest commercial traders (20km) implies reduction in the cost of accessing green energy technologies which in turn can spur green energy technology adoption and improvement in household welfare (household income).

4.7.5 Availability of Personnel with Green Skills Affects Implementation of GP

The results show that availability of personnel with green skills goes hand in hand with the implementation of green practices, since the chi-square value of $\chi^2(4,357) = 190.717$, $p = 0.000 < 0.05$ shows that there is a statistical significant difference on lack of personnel with green skills and the implementation of green practices. From the FGD, one of the respondents in Kamukunji IS complained that she had acquired a home

based solar gadget but it developed a problem and when she took it back to the dealers, she was not assisted and this shows that there is lack of technical expertise in this sector. The results in the present study contradicts Gongera and Gicheru (2016) argument that renewable, clean lighting, off grid lighting units provide an example of commercial sound, affordable and effective way of providing clean energy lighting technology to all because of the availability of personnel with green skills.

4.7.6 Appropriate Policy and Legal Framework

From the findings, we can identify that appropriate policy and legal framework on green practices will affect the integration of GP with a $\chi^2(4,357) = 209.457$, $p = 0.000 < 0.05$ which shows a clear significant difference implying that a lack of policy and legal framework on green practices will highly affect the integration of GP. The findings are consistent with the findings of Gongera & Gicheru (2016) that informal settlement dwellers or poor urban residents have a problem in accessing household green energy technology in developing countries due to poor policies, high cost of technology and lack of accurate and sufficient information. They further argue that the government of Kenya has not come up with policies that would encourage the private sector to provide affordable, renewable, clean lighting, off grid lighting units to poor urban people living in the informal settlements. It was also noted through the interview with the County development officer that energy policies and strategies developed at national level did not encourage adoption of household green energy at regional level.

4.7.7 Project Completion Level Determines Integration of GP.

There exists a significant difference in project completion and integration of GP. The chi-square value χ^2 (4,357) =140.633, $p = 0.000 < 0.05$ and this can be attributed to the

fact that many projects were left hanging and not completed. A major concern that was cited as hindering the implementation of green practices was misappropriation of funds and corruption. One aspect that was revealed in the FGD is the fact that work of construction of ablution blocks was not done to the required standard because of corruption. Participants cited use of substandard materials yet contractors were well paid. There was a complaint that walls of the ablution blocks were already cracking and yet it has not been used. The interview with the County Community Development Officer revealed that another factor that contributed to incompletion of projects was due to underestimation of project requirements and budgets.

4.7.8 Misappropriation of Funds and Corruption

From the above discussion, most projects are now monuments and from the findings, we can deduce that misappropriation of funds and corruption greatly impacts the completion rates of projects in the settlement. There is a clear significant statistical difference between the two variables with a χ^2 (5,357) =221.908, p = 0.000 <0.05 and this implies that if funds were timely and used correctly, then the completion rate of projects would be high. It was also observed during the fieldwork that the ablution block projects in the three informal settlements were incomplete which was caused by delayed funding. Community's unawareness on green practices over projects that have been upgraded was another reason for incomplete projects. During the interview, the County Development Officer cited corruption as one of the key reasons why some projects are incomplete. The picture below shows an example of an ablution block that was not completed by the assigned contractors.

Figure 4.33: Incomplete Ablution at Munyaka

Source: Field Survey, 9th March 2017

4.7.9 Level of Maintenance of Facilities Influences Integration of GP

Although upgrading programs in informal settlement have produced some impressive results, they are however faced with challenges that impede this process. This study established that there was a significant difference between level of maintenance of facilities and the integration of green practices and a χ^2 (4,357) =317.048, p = 0.000 <0.05 which can mean that the facilities lacked maintenance. This could be attributed to lack of maintenance culture from both the government and beneficiaries. The findings are supported by earlier authors such as Werlin (1999) cited in Mureithi (2012) who argue that it is necessary for the government to be involved on issues such as security of tenure, land acquisition as well as maintenance of projects which are crucial to informal settlement upgrading for sustainability purposes. In addition, Endalamaw (2014) argues that lack of the adoption of a project-oriented approach to ensure the necessary follow-up maintenance of upgraded infrastructure leads to unsustainability.

It may be important to note that drainage projects and streetlight projects were not well maintained in all the three-informal settlements. IS dwellers never took any initiative to clean (as shown in Figure 4.34) because they felt that it was the role of the county government to hire people to do the work. Noted also was the fact that some streetlights were not functioning at the time of data collection yet the county government was paying a high electricity bill. It's also worth noting that electricity has lower installation costs but high maintenance costs compared to solar installation that has high installation costs but low cost of maintenance. There is therefore need to embrace the use of solar to cut on long term costs.

Figure 4.34: Some Unmaintained Drainage Systems in the Settlements

Source: Field Survey, 9th and 10th November 2016

4.7.10 The Community's Level of Awareness

The findings showed that there existed a significant difference in community's level of awareness and the adoption of green practices by the fact that the chi-square value χ^2 (5, 3357) =186.849, p= 0.000 <0.05 thus, the community is largely unaware of Green Practices and this implies that in majority of the informal settlements, dwellers were unaware of the green energy that they can access or use. The same was pointed out by NEMA (2014) that there is limited awareness and knowledge on the importance of a clean and healthy environment. This has led to poor practices by the public towards waste management and ultimately to environmental pollution. As such there is poor management of waste at the household level including lack of segregation, reuse, reduce and recycling. The interview with the County Director of Environment further revealed that the residents were ignorant of the implications of proper waste management and they had a negative attitude that requires behavioural change that can be done through increasing the awareness of green practices concerning disposal.

The residents had the following suggestions on how to adopt workable solutions to the dynamics of implementation.

- County government and all stakeholders to be involved in sustainability and maintenance of community projects.
- Public awareness within the settlements on the importance of cleanliness and keeping the drainage clean.
- Involving the community fully in the upgrading process.
- Completion of community projects by enhancing transparency and accountability.

- Adopting green practices like the use of solar as a source of lights for the street lights to reduce electricity costs.

4.8 Logit Regression Model

A logit model is a nonlinear specification which ensures that the predicted probability is (0, 1) for all values of $X_{i.}$ It seeks to estimate the probability that an event occurs for a randomly selected observation versus the probability that the event does not occur (odds ratio) and further predicts the effect of series of variables on a binary response variable (Kleinbaum, 1994). It's therefore used for situations in which one may predict the presence or absence of a characteristic or predictor variable.

A logistic regression is a type of regression used when the response variable ($Y_{i)}$ follows a binary: 0, 1) where,

Y=

Therefore, in this study, the green practice or otherwise will be denoted by

If P_i is the probability that a household has green practice, the logit regression will be given by

$\varepsilon(Y) = P =$

Let $Z = \beta_0 + \beta_1 X$

Then $\varepsilon(Y) = P =$

$\ln = \beta_0 + \beta_i Xi$

The probability of success (Green Practice) will be given by

Ṕ=

Let GP_i denote the probability that a household in any of the three settlement area are involved in green practices

$GP_i = \beta_0 + \beta_1 GE + \beta_2 GWt + \beta_3 Ws + u_0$

$GE = \alpha_0 + \alpha_1 Electricity + \alpha_2\ Solar + \alpha_3 Energy\ Saving\ Bulbs + u_0$

$GWt = \gamma_0 + \gamma_1 Rain\ Water\ Harvesting + \gamma_2 Water\ Recycle + \gamma_3 Pipe\ Repair + u_0$

$GWst = \lambda_0 + \lambda_1\ Recycle\ of\ waste + \lambda_2 Waste\ Reuse + \lambda_3 Waste\ Reduce + u_0$

The cumulative distributive function of the model is given by;

Where

GP Green Practice

GE Green Energy

GWt Green Water

GWst Green Waste

For households that have green practices

$GP_i =$ = =

^{ln} $= \beta_0 + \beta_1 GE + \beta_2 GWt + \beta_3\ GWst$

Let GP_i denote the probability that a household in any of the three settlement area are involved in green practices

The model was run into SPSS Version 21 and the results tabulated below

Table 4.14: ***Variables in the Equation***

	B	S.E.	Wald	Df	Sig.	Exp(B)
GE	1.378	.534	6.660	1	.010	3.968
GWt	1.944	.306	40.242	1	.000	6.988
GWst	.991	.696	2.029	1	.154	2.693
Constant	-2.270	.876	6.719	1	.010	.103

Source: Field Survey, 2017

From the table above, the Wald test and corresponding significance level are shown for the three predictor variables. The findings reveal that both Green energy and Green water parameters were useful to the model while the Green waste parameters did not prove useful to the model. For example, a Wald test of value 6.660 had a value of p= 0.010< 0.05 signifying that the parameters in Green Energy were useful to the equation. For the green waste parameters, the Wald test had a value of 2.029 with p-value = 0.154>0.05. This shows that this parameter was not useful in the model. From the findings, green waste does not prove useful to the model due to the p value which is greater than 0.05 and this can be attributed to the fact that this study concentrated on the effects of green practices in the upgrading of informal settlements at the household level yet green waste initiatives are normally implemented at the other stakeholders levels like the government or NGO's.

The Exp (B) represents the ratio-change in the odds of the event of employing green practices for a one unit change in the predictor variable. For example, Exp(B) for Green Energy is equal to 3.968, implying that the odds of default for a household that employs

green energy practice is about 4 times the odds of default for a household that does not employ green energy practices, all other things being equal. Similarly, the odds of default for a household that employs Green water practices is about 7 times the odds of default for a household that does not employ green water practices, all other things being equal. Finally, the odds of default for a household that employs green waste practices is about 3 times the odds of default for a household that does not employ green water practices, all other things being equal.

Goodness of Fit Test

The Hosmer and Lemeshow Test (Hosmer, and S. Lemeshow. 2000), was carried out to find out if the parameters used in the equation were fit for the model. From the results, it showed a value of 0.833 which was quite high and good for the test.

Step	Chi-square	Df	Sig.
1	**.249**	**2**	**.883**

Model Summary

Dependent Variable: GPI

Method: ML - Binary Logit (Quadratic hill climbing)

Covariance matrix computed using second derivatives				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-2.270100	0.875772	-2.592113	0.0095
GE	1.378276	0.534083	2.580639	0.0099
GWst	0.990588	0.695503	1.424276	0.1544
GWt	1.944125	0.306466	6.343690	0.0000
McFadden R-squared	0.141181	Mean dependent var		0.796089
S.D. dependent var	0.403467	S.E. of regression		0.370960
Akaike info criterion	0.891087	Sum squared resid		48.71444
Schwarz criterion	0.934445	Log likelihood		-155.5045
Hannan-Quinn criter.	0.908330	Deviance		311.0091
Restr. deviance	362.1357	Restr. log likelihood		-181.0679
LR statistic	51.12665	Avg. log likelihood		-0.434370
Prob(LR statistic)	0.000000			
Obs with Dep=0	73	Total obs		358
Obs with Dep=1	285			

Source: Researcher, (2017)

The LR statistic tests the joint null hypothesis that all slope coefficients except the constant are zero and is used to test the overall significance of the model. The Probability (LR stat) is the *p*-value of the LR test statistic. Under the null hypothesis,

the LR test statistic is asymptotically distributed as a variable, with degrees of freedom equal to the number of restrictions under test. The LR statistic and the Probability (LR stat) had values of 51.12665 and 0.0000 respectively. Since the p-value is 0.000< 0.05, the study concludes that the slope coefficients of the equation were statistically different from zero.

Model Estimation

Form the foregoing discussion, the Logistic estimation model can therefore be expressed as; $GPi = -2.270 + 1.378GE + 1.944GWt + 0.991GWs + u_0$

4.9 Chapter Summary

This chapter entailed data presentation, analysis, and interpretations as based on the research objectives. The research findings were represented using tables, figures and diagrams. The study showed that the informal settlements are adopting green practices which include use of electricity and solar for lighting and use of energy saving bulbs; in addition, the findings showed that the integration process involved various activities in upgrading which was carried out by different stakeholders. Further, it was revealed that integration of green practices in upgrading is associated with benefits like reduced electricity bills, reduced flooding and disease outbreaks. Finally, the findings established that there are various dynamics of implementation of green practices during upgrading, which includes lack of maintenance of facilities, lack of policy frameworks, community participation, high initial cost of green practices and lack of proper planning.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Overview

The chapter gives the summary, makes conclusions and recommendations based on the findings of the study.

5.1 Summary of Findings

From the findings in chapter four, several issues raised will be discussed one by one according to the objectives of the study.

a) Demographic Profile of Respondents

The survey data shows that the majority of household's heads are men while the majority of the respondents were between 21-35 years. On education, the findings showed that, majority had secondary education. Further, the findings revealed that a high number of the respondents had stayed in informal settlements for more than 6 years. This meant that they were conversant with upgrading projects carried out in the area and therefore provided reliable information that the study sought to address. It was evident from the findings that most of the household participants were engaged in small businesses and many others were not employed.

b) Green Energy Practices

Majority of the informal settlement dwellers use electricity as a source of energy for lighting, followed by kerosene and solar. Residents in these IS have largely adopted green energy practices for lighting. Adoption of solar energy is still low partly due to its high initial cost of acquiring it and partly due to lack of awareness and mobilization.

On the source of power for electrical appliances, the majority relied on electricity, as opposed to solar power, and used batteries. Further, most of the households that use electricity have switched to energy saving bulbs which have a greater electricity saving potential and is a green practice.

Majority of residents use charcoal, followed by firewood and gas for cooking. In addition, all the three settlements had street lights and floodlights around the place of residence of the participants. The streetlight and flood light provided enough security and was largely adequate. However, it was discovered that the electricity bill for the flood light and street light was being paid for by the county government and this would not be sustainable in the long run due to the high bills and there is need therefore to switch to solar powered lights.

c) Green Water Practices

The main sources of household water was shallow well and municipal piped water. The use of water kiosk, harvested rain water, stream and supply by private vendor's sources of household water was also common, though at a lower scale. Lack of water storage capacity, poor roofing and seasonal rainfall could be the major reasons why rainwater harvesting practice is still low.

Informal settlement dwellers felt that piped water is more reliable since it saves time especially if the water is inside the house or there is a standpipe outside. Many of the low earners were willing to pay for this precious commodity although its flow was not regular. Further, the majority of the residents had water just outside their houses or inside their houses. Few people in these settlements get their water outside the settlement or from a common local area.

Generally, the maintenance and repair of water pipes has serious delays that go beyond three days. This is considered unsustainable because it ends up with huge water waste. Rainwater harvesting among the IS dwellers is a widespread practice. Most residents are faced with low storage capacity with the majority having the ability to store between 70-100 litres. Recycled water is used for washing toilets, cleaning houses and for the kitchen garden. Clearly, green water practice has been embraced.

d) Green Waste Practices

Waste collection in Informal Settlement is mainly done by organized groups, women and youth groups. Through written agreements, county governments provide trucks for free to these groups to collect waste on specific days in the various settlements. Few residents engage the services of private garbage collectors. Waste reused was witnessed in the form of reused plastic bottles, reused plastic containers. Wood and scrap materials are often recycled which is an indication of embracing green waste practice.

e) Types of Upgrading Projects in the Settlement

The most popular upgraded projects in the settlement were; street and security lighting, footpath and bike path and storm water drainage. Solid waste management and drinking water projects are also common though at a low scale. For instance, in Munyaka, there is no sewer line and the other two settlements expressed their concern that the sewer lines in their settlements should be increased in their settlements. Very few projects entailed public parks, green space and solar installation. Environmental and Social Impact Assessment (ESIA) was done to identify adverse environmental and social impacts which could have been caused by the projects selected for implementation in these settlements and it developed, where required, suitable mitigation measures.

f) Stakeholders Involved in Upgrading

Various stakeholders are involved in the upgrading process in the three informal settlements. It was clearly evident that the main stakeholder which has undertaken the various initiatives in settlement upgrading was KISIP with over than half of the participants identifying it as the main stakeholder. It was followed by the county government, KENSUP, NGOs, the private sector, the residents and lastly CBOs and FBOs. KISIP project was focused on investing in infrastructure and service delivery and that the role of Uasin Gishu County Government in upgrading was to implement the various projects, undertake urban planning functions, formulate supporting policies and provide and maintain physical and social infrastructure after upgrading while KENSUP was involved in construction of classrooms in Huruma Informal settlement. NGOs served as a link between residents and development partners and the private sector played an important role in management and financing of utilities. KISIP and KENSUP community organization and mobilization was achieved through formation and operationalization of Settlement Executive Committees (SEC) representatives from each settlement. CBOs and FBOs were involved in intangible projects such as capacity building, advocacy and awareness creation which are of foremost importance.

g) Participation in Upgrading Process

Majority of the residents were not involved in the upgrading process. For those who took part, they were involved during the implementation stage, the planning process and lastly monitoring and evaluation stage. Community members were invited to attend sensitization meetings on the proposed projects though the attendance was not commendable. The length of time it takes to implement a project after a baseline survey technically knocks out community involvement. Settlements Executive Committee has been playing a role in engaging the local community.

h) Elements for Storm Water Drainage in Upgrading

Elements of storm water drainage include construction of new drainages along the roads, upgrading or construction of culverts and improving or enlarging existing drainage channels. Existing drainages were improved and enlarged to avoid blockages normally experienced in the rainy season. Most residents never take any initiative to clean the storm water drainage. Some culverts in the IS were poorly done. Poorly constructed water drainage ends up being blocked and becomes a source of flooding in the IS.

i) Maintenance and Problems of Storm Water Drainage

Storm water drainage was poorly maintained. This resulted in waterborne diseases, flooding and destruction of housing and property.

j) Sewerage System types and Element of Upgrading

Sewerage systems present in the settlement were; septic tanks, latrines, and sewer lines. Upgrading programs included sewage channels or ducts, provision of alternative sanitation infrastructure such as communal ablution blocks and trunk sewage channels or ducts leading to a water treatment plant.

k) Benefits of Green Practices in Sustainable Informal Settlement Upgrading

There are numerous benefits associated with integrating GP in IS upgrading. Adoption of solar power has led to the reduction in the purchase of paraffin. The use of energy saver bulbs has led to reduced electrical bills. The installation of street lights and floodlights has led to extension of business hours and thus increased income. There was a remarkable improvement in security as a result of the floodlight and streetlight in the three IS. The construction of footpaths and bike paths help in reducing accidents and in improving aesthetic beauty in the settlement. Proper storm water drainage management

helped in reducing respiratory and water borne diseases and in reducing soil erosion. Majority agreed that access to clean water helped the residents to save time and can engage in other meaningful activities while the availability of clean water supply implied that there were less incidences of waterborne diseases and in turn led to improved health. In addition, proper household waste management led to improved sanitation and reduced littering. Results from the ANOVA F ratio for 5 out of 9 items tested showed a statistically significant difference in the rating by the three settlements. The pair wise comparison further revealed a statistically significant difference in mean rating between the three settlements in the 5 variables.

l) The Dynamics in the Implementation of Green Practices

There are several dynamics that influence the implementation of green practices in informal settlement upgrading which include; lack of maintenance of facilities, lack of local community involvement in upgrading process, high initial cost of acquiring green practice resources, resistance to change and inadequate long-term planning in adopting the practices. Other factors include; a general lack of commitment and a sense of project ownership and inadequate personnel with green skills, inaccessibility of green technologies, misappropriation of funds and corruption and lack of policy and legal framework on green practices by the government and development actors. Lastly incomplete projects or delayed funding and the lack of awareness on green practises influence integration of GP.

5.2 Conclusion

The study sought to examine integration of green practices in upgrading of informal settlements in the medium sized town of Eldoret in Uasin Gishu County, Kenya by establishing the green practices being employed in upgrading of informal settlements,

determining the integration process, assessing the impact of green practices in sustainable informal settlements upgrading and determining the dynamics influencing implementation of green practices in informal settlements upgrading.

Based on the findings of the study, it can be concluded that in regard to the first objective IS residents practice various green practices in energy, waste and water which include use of solar, electricity gas, energy saving bulbs, recycling of waste and water. However, the use of solar and rainwater harvesting is still low which is attributed to the fact that rains are seasonal and the storage facility is a problem to the IS dwellers. In addition, use of charcoal and firewood is high, yet they not considered green practices. The collection of garbage which is collected in gunny bags is an aspect of green practice since it leads to reduced litter in the settlements. However, using open trucks to transport the waste to Kipkenyo dumpsite is not aligned to green practice. This study also concludes that integration of green waste practices was observed which involves the sorting of waste at household level and reuse. However proper disposal, collection and transportation, management of dumpsite and unavailability of recycling plants pose a challenge in waste management practices.

On objective two, the study concludes that IS upgrading is carried out by various stakeholders who undertook different activities. KISIP project focused on investing in infrastructure and service delivery .Uasin Gishu County Government role was to implement the various projects and to formulate supporting policies while KENSUP was involved in construction of classrooms in Huruma Informal settlement. NGOs served as a link between residents and development partners and the private sector played an important role in management and financing of utilities in informal settlements in urban areas. CBOs and FBOs were involved in intangible projects such

as capacity building, advocacy and awareness creation which are of foremost importance.

On various activities upgraded the study concludes that that green practices were integrated in drinking water projects in the sense that improved distribution increased affordability, access, and availability of water. Additionally, construction of water reservoirs was aimed at arresting water wastage, and water shortage. Further, improving and enlarging existing drainages reduced the normal problem of blockage normally experienced in the informal settlement which is clear indication of green practice adoption. Upgrading and construction of culverts was also done which lead to proper flow of storm water and aids in the reduction of flooding which in turn leads to saving property and lives. On upgrading in the sewerage systems, which included sewage channels or ducts, water recycling/treatment projects leading to a water treatment plant and provision of alternative sanitation infrastructure such as communal ablution implies that there was integration of green practice) in these settlements. Generally, integration of process involves provision of access to basic services through subsided connection fee like for the case of electricity and water. It also involves awareness creation on adoption of green practices that was mainly done by CBOs and FBOs and in waste management it involves well laid down policies from disposal at household level, transport of waste and management of landfill or dump sites.

On objective three several benefits are associated with integrating green practices in upgrading. Adoption of green energy practices like use of solar have both financial and health benefits since they pay less for electricity and avoid as much as possible the use of paraffin. Installation of street lights and floodlights had led to extension of business hours and thus increased income and increased the security of the informal settlements.

Economic and social benefits should also include health, property, and tourism and direct and indirect jobs generation.

Sustainable waste management can also reduce environmental and health risks. Having an efficient system to collect, sort and manage waste can prevent risks leading to a cleaner environment and improved health for informal settlement dwellers. In addition, proper household waste management led to improved sanitation and led to reduced littering.

Proper storm water drainage management helps in reducing respiratory and water borne diseases and in reducing soil erosion, reduction of the risk of flooding, positive effect on health by reducing or preventing the formation of temporary stagnant water pools, thereby reducing exposure of the population to water related diseases. Access to clean water helped residents to save time and be able to engage in other meaningful activities, less incidences of waterborne diseases and in turn led to improved health.

On objective four the study concludes that low household income associated with informal settlements affects adoption of green energy like solar due to high initial cost. Lack of long term planning on green practice adoption indicates a mismatch between the current planning system and the needs that planning should address, especially in the IS areas. Lack of participation also leads to a general lack of commitment and a lack of sense of project ownership especially when a top-down approach to informal settlement upgrading is adopted. Further, inaccessible green technologies are a significant barrier to adopting efficient technologies. Upgrading activities have further been hampered by weak institutional and financial mechanisms because of high dependence on external funding. Unavailability of personnel with green skills affects

the adoption of GP. Misappropriation of funds and corruption greatly impacts the completion rates of projects in the settlements. Current IS upgrading practices do not appear to have incorporated maintenance into the agenda. This tends to create difficulty in follow-up maintenance of upgraded infrastructure. Lastly, the community is largely unaware of Green Practices and this implies that in majority of the informal settlements, dwellers were unaware of the green practices that they can access or use,

The relevance of the present research to the body of knowledge on sustainability in Kenya is buttressed by the fact that it has bridged the knowledge gap on how to attain sustainability through adopting local available eco-friendly activities within the urban context in Kenya. This research has gone beyond the conventional area of studies on squatter settlements and IS, which have been limited to identifying the problems posed by such settlements and finding solutions to them. The solutions which were mostly top-down in their approaches were geared towards upgrading projects that were very expensive and other times sustainable to adopting green practices which address basic issues like water, electricity, and waste which are sustainable.

In conclusion, in view of these findings, the study concludes that there was low integration of green practices based on the green practices that residents had adopted at the household level. Various stakeholders are involved in different projects during the upgrading process. In addition, adoption of green practices is associated with several benefits but its integration is affected by various factors.

5.3 Recommendations

The study therefore came up with the following recommendations.

a) National and the County government should increase enforcement of urban land and planning policy which can increase levels of adoption of green practices concepts. In order to alter the current scenario, it is recommended that an appropriate legal and institutional framework is developed to provide the necessary leverage required for adoption of green concepts in the informal settlement environment. Other than increased enforcement, education and training focusing on sustainability are some of the ways that are recommended to increase of green practices.

b) The county government have a key role in fast trucking uptake of the concepts through development of sustainability checklists during approval and implementation of the upgrading projects.

c) There is need of setting up flexible solar panels domes in the informal settlements to generate power, the government bearing a major portion of installation cost .The county government use of solar as a source of light for the street lights to reduce electricity costs. Funds saved should be used for other social infrastructure in the informal settlements.

d) Public awareness within the settlement on green practices should be conducted and more efforts should be geared towards promoting a culture of green practice especially among individual households in order to achieve sustainable energy use practices.

e) For sustainability to be achieved the local community should be empowered so that they can fully understand their roles as citizens and fully participate in monitoring and evaluations of community projects through capacity building.

5.4 Suggestions for Further Research

(a) There is a need to undertake a study on the role of the green economy as a pathway to sustainable urban renewal in informal settlement.

(b) A study should be conducted on exploring and identifying green building attributes that could be adopted for sustainable urban renewal.

(c) A study should be carried out on the effect of adopting green practices on attainment of SDGs.

(d) A study should be conducted in other informal settlements in other towns to compare the findings with the present study.

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APPENDIX I: LETTER OF INTRODUCTION

ELIZABETH JELAGAT MUREY

SCHOOL OF ARTS AND SOCIAL SCIENCES

DEPARTMENT OF GENDER AND DEVELOPMENT STUDIES

MOI UNIVERSITY P.O. BOX 3900 -30100

ELDORET.

DEAR SIR/MADAM,

THE RESPONDENT

RE: RESEARCH STUDY.

I am a post graduate student pursing PHD degree in Development Studies conducting an academic research on "**Integration of Green Practices in Upgrading of Informal Settlements in Eldoret, Kenya".**

The findings will be used by the various stakeholders undertaking upgrading like the government, development actors, Ministry of Housing and Urban Development, NEMA, physical planners and the community interested in getting a better understanding of the role played by green practices in upgrading of informal settlements. You are therefore requested to answer all the questions according to the instructions given to each, your answers will be treated as confidential. Please do not indicate your name. Thank you in advance for your co-operation and God bless you.

N/B In this research green practices will include practices that are adopted by individuals or stakeholders which allows efficient utilization of resources while minimizing pollution of environment. Thank you.

Yours faithfully,

Elizabeth Murey

APPENDIX II: QUESTIONNAIRE FOR THE HOUSEHOLDS HEADS OF SELECTED INFORMAL SETTLEMENTS.

Please answer these questions to the best of your knowledge. Please put a tick [ ] where appropriate. Do not include your name anywhere in the questionnaire.

a) **Background Details**

1.	Gender	Male [ ] Female [ ]
2.	Age	0 - 20 [ ] 21-35 [ ] 36- 50 [ ] >51 [ ]
3.	Please tick your education level	Non-formal [ ] Primary [ ] Secondary [ ] College [ ]
4.	Please tick your settlement	Munyaka [ ] Kamukunji [ ] Huruma [ ]
5.	How long have you lived in this settlement?	1 - 5 years [ ] 6 – 10 years [ ] 11 – 15 years [ ] Over 15 years [ ]
6.	What is your source of income?	Employed [ ] Business [ ] Casual labour [ ] Not employed [ ]

b) Green Practices being employed in Integration of green practices informal settlement upgrading

7.	What is the source of energy that you use for lighting?	a) Solar [ ] b) Electricity [ ] c) Lantern [ ] d) Candles [ ] e) Others (Specify) [ ]
8.	If electricity, what type of bulb do you use?	a) Energy savers [ ] b) Ordinary bulb [ ]
9.	What type of fuel do you use for cooking?	a) Gas [ ] b) Electricity [ ] c) Firewood [ ] d) Charcoal [ ] f) Kerosene [ ]
10.	If you have electronic appliances, what is your source of power?	a) Solar [ ] b) Battery [ ] c)Electricity [ ] c) Other (Specify) [ ]
	Are there any street lights around your place of residence	a)Yes [ ] b) No [ ]
12.	If Yes, what is the street and security lighting coverage?	a) Inadequate [ ] b) Adequate [ ] c) Other (Specify) [ ]
13.	What is the source of your house hold water?	a) Shallow well [ ] b) Stream [ ] c) Municipal piped water [ ] d) Water kiosk [ ] e) Harvested rain water [ ] f) Other (specify) [ ]
14.	Which one of the above source is the most reliable?	a) Shallow well [ ] b) Stream [ ] c) Municipal piped water [ ] d) Water kiosk [ ] e) Harvested rain water [ ] f)

		g) Other (specify) [ ]
15.	What is your proximity to the water source?	a) Inside the house [ ] b) Outside the house [ ] c) Common local are [ ] d) Outside the settlement [ ]
16.	For piped water systems, how long does it take to repair the pipes whenever there is a leakage or during maintenance	a) Immediately [ ] b) 1 day [ ] c) 2 days [ ] d) More than 3 days [ ] e) Other (specify) [ ]
17.	Do you harvest Rain Water?	a) YES [ ] b) NO [ ]
18.	If Yes, what is your storage capacity?	a) 70 – 100 litres [ ] b) 100 – 150 litres [ ] c) 150 – 200 litres [ ] d) 200 litres and above [ ] e) Other (specify) [ ]
19.	Do you recycle your used water?	a) Yes [ ] c) No [ ]
20.	If yes, how do you recycle the water?	a) Washing the toilet [ ] b) Cleaning the house [ ] c) Kitchen Garden [ ] d) Other (specify) [ ]
21.	How do you dispose your household waste?	a) Garbage Pit [ ] b) Collected by municipal [ ] c) Private garbage collector [ ] d) Other (specify) [ ]
22.	Do you recycle your household waste?	a) Yes [ ] b) No [ ]
23.	i) If yes, specify which ones? ii) At any given time, do you reduce the waste generated in your household?	a) Used plastic bottles [ ] b) Used plastic containers [ ] c) Other (specify) [ ] a) Yes [ ] b) No [ ]

	iii) Do you reuse waste in any way?	a) Yes [ ] b) No [ ]

24.	Tick the type of upgrading projects in your settlement	a) Street and security lighting [ ] b) Solid waste management [ ] c) Storm water drainage [ ] d) Water and sanitation systems [ ] e) Drinking water [ ] f) Solar installation [ ] g) Public parks and green space [ ] h) Foot path and bike path [ ] i) Vending platforms [ ]
25.	Who are the main stakeholders who have undertaken the various green practice initiatives in the upgrading of the settlement? (Mentioned above). Tick all that apply	a) Kenya Informal Settlements b) Improvement Program (KISIP) [ ] c) Kenya Slum Upgrading Programme (KENSUP) [ ] d) Non –Governmental Organisations(NGOs) [ ] e) Community Based Organisations (CBOs) [ ] f) Faith Based Organisations (FBOs) [ ] g) Residents [ ] h) County Government [ ] i) Private Sector [ ]

c) Evaluation of Integration process in informal settlement upgrading

26.	Did you participate in the upgrading process?	a) Yes [ ] b) No [ ]
27.	If Yes, at which level?	a) Planning [ ] b) Implementation [ ] c) Monitoring and Evaluation [ ] d) Other (specify) [ ]
28.	Tick the activities involved in drinking-water project in your settlement.	Identification of a suitable source in terms of quantity, quality, distance. [ ] Construction of a reservoir [ ] Improving distribution system to houses and standpipe. [ ]
29.	Tick the elements for storm water drainage involved in upgrading. (Tick all that apply).	Upgrading, improving or enlarging existing drainage channels. [ ] Construction of new drains along roads [ ] Upgrading or construction of culverts etc.[ ] Construction of a main drainage channel which collects storm water from the settlement. [ ]
30.	During heavy rains, how can you rate storm water drainage in your settlement?	a) Poor [ ] b) Fair [ ] c) Good [ ] d) Satisfactory [ ] e) Excellent [ ]

31.	If not satisfactory, how often are they maintained?	a) Often [ ] b) Once a month [ ] c) Once in three months [ ] d) Rarely [ ] e) Other(specify) [ ]
32.	What are the problems associated with poor storm drainage?	a) Flooding [ ] b) Destruction of housing and/ property [ ] c) Waterborne diseases [ ] d) Other (specify) [ ]
33.	Do you have a sewerage system in your settlement?	a) Yes [ ] b) No [ ]
34.	If yes, which type	a) Septic Tanks [ ] b) Latrine [ ] c) Sewer line [ ] d) Other [ ]
35.	Tick what was upgraded on sewerage system.	Sewage channels or ducts [ ] Trunk sewage channel or duct leading to a waste water treatment plant (WWTP) [ ] Provision of alternative sanitation infrastructure such as communal ablution blocks [ ]
36.	In your opinion, do you think green practices initiated in your settlement are sustainable? (In the	a) Yes [ ] b) No [ ]

	sense that, it generates a permanent improvement in the quality of life of residents)	
37.	If no, what are the reasons?	

d) Effects of green practices on sustainable informal settlement upgrading

Please respond by ticking (√) your perception on the following items indicating

KEY; (D) Disagree, (U) Undecided, (A) Agree

	Green Practise	**Impact**	**SD**	**D**	**U**	**A**	**SA**
38.	Solar	No electricity bills					
		Reduce cost of buying paraffin					
39.	Energy Saver	Reduced electricity bills					
		Reduced replacement of bulbs					
40.	Street light	Extension of business hours-increased income					
		Enhanced security					
41.	Foot paths, bike paths	Improve aesthetic beauty					
		Reduction in traffic accident					
		Reduction of time wasted due to congestion					
42.	Vending platforms	Better business operating conditions					

43.	Storm water drainage management	Reduced soil erosion					
		Reduced respiratory illnesses					
		Reduced waterborne diseases					
		Ground water recharge					
44.	Water management	Availability of water supply implies less incidences of waterborne diseases and improved health					
		Access to clean water helps residents save time and engage in other meaningful activities					
45.	Solid household waste management	Reduced littering					
		Improved sanitation					

e) The Dynamics of Implementation of Green practices

	Dynamics	**SD**	**D**	**U**	**A**	**SA**
46.	a) Initial cost of acquiring green practices might be too high because of low income					
	b) Time period of planning affects adoption of green practices					
	c) Stakeholders participation influences implementation of upgrading projects					
	d) Accessibility of green technologies leads to adoption of green practices					
	e) Availability of personnel with green skills affects implementation of green practices.					
	f) Appropriate policy and legal frame work on green practices affects integration					
	g) Project completion level determines integration of green practices					

	h) Misappropriation of funds and corruption affects completion rate of projects					
	i) Level of maintenance of facilities influences integration of green practices					
	j) The community's level of awareness influences adoption of green practices					

47. Suggest possible workable solutions to the above dynamics

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APPENDIX III: KEY INFORMANT INTERVIEW SCHEDULE

1. What is the source of power of the street lights and flood lights? It's operation mechanisms and who does the Maintenance?
2. Did the community participate fully in upgrading process in the settlements?
3. In the County level do you have any policies guiding energy access, water and waste management in the informal settlements?
4. Do you think the upgraded projects in the settlement have attempted to address the development needs of the people in terms of energy, water and waste management?
5. Comment generally on Sustainability of upgraded projects in the settlements.

    a) What measures have you put in place to ensure sustainability of the projects?

    b) Whose responsibility is it to do the maintenance?

6. In your opinion, what are the accrued benefits of informal settlements upgrading?

8. Identify and explain dynamics of implementation of upgrading programs in the settlements.
9. What are some of the workable solutions to the above dynamics?

APPENDIX IV: FOCUSED GROUP DISCUSSIONS

1. What are the main problems that you face in your settlement?
2. What is the main role of Settlement Executive Committee (SEC) in the settlements?
3. What has been upgraded in your settlement for the last five years?
4. Who are the stakeholders involved in upgrading projects in your settlements?
5. Did the community participate fully in the upgrading process?
6. In your opinion, do you think the upgrading of physical infrastructure has led to reduction in the destruction of the environment?
7. Do you think these Projects are sustainable?
8. What are some of the benefits that residents are enjoying after upgrading of the settlements?
9. What are the dynamics affecting the implementation of integrating green practices in informal settlement upgrading?

APPENDIX V: OBSERVATION GUIDE

1. Types of small business in the settlements
2. Gas refilling stations in the settlements/firewood selling points and Charcoal stores
3. Drainages constructed during upgrading
4. Improved roads and foot paths due to upgrading.
5. Streetlights and flood lights installed
6. Waste collection points
7. Source of water points(Stand pipe, water kiosk, shallow wells)
8. Electricity connections in the settlements

APPENDIX VI: RESEARCH PERMIT FROM NACOSTI

THIS IS TO CERTIFY THAT:
MS. ELIZABETH JELAGAT MUREY
of MOI UNIVERSITY, 3900-50100
eldoret,has been permitted to conduct
research in *Uasin-Gishu County*

on the topic: *INTEGRATION OF GREEN PRACTICES IN UP GRADATION INFORMAL SETTLEMENTS IN ELDORET TOWN*

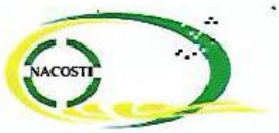
for the period ending:
24th October,2017

.....
Applicant's
Signature

Permit No : NACOSTI/P/16/80778/14207
Date Of Issue : 26th October,2016
Fee Recieved :ksh 2000

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

APPENDIX VII: RESEARCH AUTHORIZATION LETTER



NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

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Ref. No.

NACOSTI/P/16/80778/14207

Date

26th October, 2016

Elizabeth Jelagat Murey
Moi University
P.O. Box 3900-30100
THIKA.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"Integration of green practices in up gradation informal settlements in Eldoret Town,"*** I am pleased to inform you that you have been authorized to undertake research in **Uasin Gishu County** for the period ending **24th October, 2017.**

You are advised to report to **the County Commissioner and the County Director of Education, Uasin Gishu 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
Uasin Gishu County.

The County Director of Education
Uasin Gishu County.