



UNIVERSITY OF NAIROBI

**THE DEVELOPMENTS IN REAL ESTATE AND SUSTAINABLE URBAN
ENVIRONMENT: A CASE STUDY OF KILIMANI AREA WITHIN
NAIROBI CITY COUNTY.**

BY:

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DECLARATION

I, Katiambo Augustine Juma, hereby declare that this project is my own original work and has not been presented for a degree in any other university.

Signature.....

Date.....

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This project paper has been submitted for examination with my approval as a university supervisor.

Signature.....

Date.....

PROF. PAUL M. SYAGGA, PhD

DEDICATION

To my parents, Mr. and Mrs. Katiambo

Thank you for their un-relentless support both emotional and financial to ensure that I get where I am today.

You are special to me my family and my brothers and sister. You sacrificed everything considerably to ensure that I got education, even when there were no means. May Almighty God reward you abundantly!

To my Family; Abigail and Joseph Katiambo

Thank you for your sacrificial love that surpasses my understanding. Your companionship makes life easier and happier. You have always given me hope and brightness in all of my endeavors.

To my brothers and sisters

We have struggled together in search of education, knowledge and prosperity. May Almighty may God give you the desires of your hearts.

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ABSTRACT

Kenyan real estate includes all types of property ranging from single and multiple dwelling units residential developments, commercial (office space, retail space, shopping malls and hotel or restaurants), agricultural farm land and industrial blocks of (go-downs and warehouses, factories and light productions). The real estate development is a process by which initial land use of a designated neighbourhood or planning zone is transformed into new land use(s) in order to obtain the highest and best use of the land parcel(s). This development is mainly undertaken through change of use and extension of use through the approval by the local authority under the area of jurisdiction. The major challenges currently facing sustainability urban environment is the balancing of increased demand and supply for real estate property against sustainability in terms of adequate infrastructures and vegetation cover. The real estate developments in most of developing nations are led by demand rather than infrastructural capacity.

This research project explores the relationship between the developments in real estate and sustainable urban environment within Nairobi City County since the urban area has experienced massive developments in real estate in terms of increased property investment. These high rise developments have stressed the existing environment in terms of infrastructure capacity and green spaces. This study shall try to address the prevalence and the nature of the developments in real estate; the causes of land use variations as developments; the effects of the real estate developments on infrastructure services provision and vegetation cover within the study area. The study also focus sustainable environment aspects like; the carrying capacity of infrastructure; the integrity of the ecosystem and the biodiversity available.

The literature was reviewed to determine on how real estate development affects the general urban areas, and the possible merits and demerit of development models under the study. The target population was about 43,000 residents of Kilimani estate while the study population will be chief officers, departmental heads and general staff from the real estate firm managing properties. Simple random sampling was used to pick out specific houses across the study area. The sampling unit was land parcel while the sample size was approximately 50 houses. The data obtained from the study was sorted out, analyzed using descriptive statistics and presented using photographs, maps, charts, simple tables and graphs.

The findings of the study were: majority of the residents (52%) had been involved in change of use, while 30% had been involved in extension of use; there was a concern on sustainability of urban environment as a result of the real estate development. The residential land uses were the most developed levels of new developments followed by commercial land uses with apartments building dominating the area. The houses were of 3-7 floors with majority being 4 floors. The number of units within a single land parcel is at an average of 18 while the ground coverage is between 30% and 80% of the plot area. A number of challenges like stench smell from wastes and increased traffic jam, change in climate and weather. Telecommunication ranked the highest in sufficiency level with the least sufficient being the infrastructure services.

The key recommendations for sustainable urban environment includes: allocation of urban land uses using the infrastructure-led model for the entire urban area; develop a comprehensive infrastructure development; good land and real estate management and governance in public institutions responsible for urban land management; and environmental impact assessment and audit to evaluate the capacity of the urban environment. The other recommendations for this study are; the improvement of roads, garbage collection and water supply, restriction of development, improvement of security, improvement of drainage system; creation of all inclusive development process; and planting of trees within the neighbourhoods

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to the study.

Kenyan real estate includes all types of property ranging from single and multiple dwelling units residential developments, commercial (office space, retail space, shopping malls and hotel or restaurants), agricultural farm land and industrial blocks of (go-downs and warehouses, factories and light productions) (Masika, 2010). The real estate property development in Kenya has been soaring high in the past few years because of the perceived high rate of returns and fewer risks involved. The Kenyan population records an annual rise of about one million and out of this has arose a significant group of investors that is aggressively seeking investments in real estate property. This has had the effect of exerting pressure on sustainable urban environment due to the need for adequate infrastructure and contusive living environment and the increased demand for housing, especially in urban areas which has far outweighed the supply. An immediate obvious impact of limited housing in urban areas has led to a trend that has seen the sustainability of the urban areas in terms of adequate facilities; environmental conservation and infrastructure services.

The real estate development is a process by which initial land use of a designated neighbourhood or planning zone is transformed into new land use(s) in order to obtain the best use and maximum returns of the land parcel(s). These developments process are mainly undertaken through either demand-led or infrastructure led developments approaches. The demand-led real estate development approach involves subdivision, change of use and extension of use. These procedures go through local approving authorities before the implementation of the desired developments. The other approach in real estate development under infrastructure-led, is where the implementation of the long term zoning plan is guided by the available infrastructure. This zoning plan indicates all aspects of real estate to be developed in terms of; land use, plot/ground coverage, plot ratio, building heights, and building line among others. However all the two approaches above tend to follow the available regulations; although the demand-led approaches

may encourage the violation of the initial zoning standards, for the planning zone as had been intended in the urban land use plan or the zoning plan.

There is an urban challenge of balancing the increase in demand and supply for real estate against the adequacy of infrastructures and conservation of the green areas or vegetation covers in urban areas. This research project therefore, provides an insight on urban land use management focusing mainly on the effects of the developments in real estate on infrastructure and vegetation cover within Nairobi City County as one of the cities in the developing nations.

In recent past, Kenya has experienced an urban growth of population which has led to pressure on existing infrastructure and necessary services and an abrupt growth of informal or unplanned urban settlement. Nairobi City County is currently experiencing immense developments in real estate in many parts which are characterized by the various variations in the land uses. These land use variations exercises carried out are; change of user, extension of user, amalgamations, subdivisions and extension of lease. There is pressure on the low-density residential neighbourhoods within Nairobi area due to high rate of population growth. The Zones 3, 4 and 5 of Nairobi County planning zones where Kilimani area follows, are ideal for high-income of low-density residential neighbourhoods which are experiencing massive developments in real estate.

The purposes of renewal or redevelopment plans which provide basis for determining development applications on extensions of leases, extension of users and change of users, subdivision and amalgamation has provided a window for the demand-led real estate development in Kenya. Major Urban areas have experienced predominant land use variations as a sign of demand led developments in real estate. The land use variation exercises in Nairobi city have been carried out on either the following;

- A. Change of use and extension of use from agricultural to residential, multiple residential including apartments and town houses, commercial, industrial, multiple use (as specified) or public utility.
- B. Change of use and extension of use from residential to multiple residential, commercial, industrial, multiple uses (as specified) or public utility.

- C. Change of use and extension of use from public purpose to residential, multiple residential, commercial, and industrial or multiple uses (as specified).
- D. Change of use and extension of use from one form of commercial to another i.e. from office block to hotel, from retail shops to office block or wholesale or hotel.
- E. Subdivision of one large land parcel into two or more sub-plots
- F. Amalgamation of two or more land parcels into one large land parcel.

One of the challenges in Kenya due to urbanization is on its socio-economic significance. Therefore, without proper mechanism to monitor and manage the effects of land use variations and real estate developments may hamper the mandate of local authorities, central government, local communities as well as nongovernmental organizations to realize the perceived socio-economic and environmental development. This is as it has been highlighted in various development strategizes like Kenya Vision 2030, Nairobi Vision 2030, Economic Recovery Strategy and Millennium Development Goals among others. There is need for concerned effort to re-examine and monitor the land use trends within urban areas in order to achieve sustainability and effective service delivery. This shall enable all the stakeholders including Ministry of Housing and Urban Development who are in charge of land management in Kenya , Ministry of Devolution and planning under which the county government are coordinated, Ministry of transport, roads and public works, Ministry of water and environment, the County Governments in-charge, private developers, and urban community. These stakeholders in the real estate industry shall be engaged in sustainable urban environment such as appropriate land uses, provision of adequate infrastructure and environmental conservation among others. The challenge implementing the land use plans effectively within the stipulate period if currently facing the Kenya urban development and land management system. This research project therefore provides insight on urban land use management focusing meanly on the developments in real estate against the zoning plans within Nairobi city with special reference Kilimani area.

This research project explores on how the developments in real estate have affected sustainable urban environment within the neighbourhoods of Nairobi City County since the urban area has experienced demand-led developments in real estate. The land parcels originally meant for single dwelling, have been converted into either multiple residential units, commercial units or mixed uses hence increasing pressure on the urban environment contrary to the intended land uses

under the zone plan. This research project will therefore provides a perfect platform of engaging with policy makers both in real estate development and land use management on the best way Nairobi city can manage and guide the real estate development. This shall assist in improving the living standards of all the inhabitants but more so to meet the high demand for real estate property in the City. This is deemed to be important since real estate property and management is a multi-sector exercise which can accommodate integrated ideas that are needed for preservation of biodiversity and other ecosystem services while on the other hand meeting the high demand for space and real estate property

1.2 Problem Statement

The key challenges land use management within urban area are; the enforcement and compliance with the zoning regulations due to weak enforcement and widespread non-compliance; and the housing deficit especial for low and middle class population. The private sector has been allowed to venture into provision of housing in order to bridge the gap in provision of housing. As a result of the private investment and urban growth, the one green leafy suburb in Kenyan neighbourhoods like Kilimani, Lavington, Kileleshwa, Loresho, Westlands and Thompson estates in the City of Nairobi are scenes of high-rise residential and commercial developments. The observed trends within these neighbourhoods show the deterioration of the urban environments. The estates are characterized with flooding during rainy season; there is loss of trees and green spaces. Additionally as observed during reconnaissance, green fields and vegetations in the study area have been changing. According to the former Town Clerk, John Gakuo, the developments in real estate are demand-led development and not the intended infrastructure-led development which could have followed zoning regulations of the Nairobi City County (Daily Nation, December 19, 2005). These high rise developments have strained the existing environment in terms of infrastructure capacity and the available green areas.

This research project proposes to examine how the demand-led real estate developments brought about by the processes of variations in land uses may have impacted the infrastructure services and green fields within Kilimani area of the Nairobi city. The research study also evaluates the levels at which these developments in real estate leads to deterioration in urban environment in terms of infrastructure service delivery and availability of vegetation cover.

The Environmental conservation elements which should entail conservation of the riparian reserves and protection of open spaces being used as recreational areas and enhancing the implementation of a policy toward a green environment in the urban area are scarce in Nairobi city county have been charged. A rapid scan of the study area indicated that real estate development have outpaced the intervention measures under development control which could have ensured protection of future urban environment. These developments in real estate have mainly been driven by the demand for residential houses, commercial blocks and office blocks. There had been a public outcry from the residents in Nairobi's neighbourhoods on the nature of developments which are led by demand for real estate. These residents have particularly expressed their concerns that these real estate developments are being carried out without a commensurate upgrading of the existing level of infrastructure to support the housing, commercial and office developments. This is likely to have unprecedented negative impacts on both the existing infrastructure and the entire urban environment. (Munyua Mwaura 2006).

This research study shall therefore examine the previous land uses as compared to the current and proposed land uses of land parcels and their resultant impact on the urban environment. It shall also analyze the policy frameworks available which are meant to ensure sustainable urban area.

1.3 The objectives of the study

This research project aims at determining the extent in which the demand-led development in real estate may have impacted on the sustainability of the urban environment. Therefore the following objectives shall be achieved.

- i. To determine the nature and causes of developments in real estate within Kilimani estate.
- ii. To determine the impacts of the real estate developments on infrastructure services provision within Kilimani estate.
- iii. To evaluate the impacts of the real estate developments on vegetation within Kilimani estate.

1.4 The Research questions.

The main question for this research study is to determine whether the development in real estate through change of use and extension of use are the best practice to achieve sustainable urban environment. In answering the above main question, the following questions shall be addressed in detail:

- i. Which are the nature and causes of developments in real estate within Kilimani estate?
- ii. How have the real estate developments impacted the infrastructure services provision within Kilimani estate?
- iii. What are the impacts of the real estate developments on the vegetation within Kilimani estate?

1.5 The scope of the study

The study shall focus on the new and upcoming real estate developments in the recent years within Kilimani area of Nairobi City. The study shall focus on those developments which fall under the original zoning plan of the area under zone 4 of Nairobi planning zones of commercial and residential properties. The study area of Kilimani estate is mainly multiple residential uses of massionates, bungalows, flats and apartments. However, the area also has other real estate property which houses commercial uses like Retail shops, Private and Public offices and hotels. Most of these land uses are still new or were development within the recent years through the approval by the Nairobi city county. The study area was originally zoned to accommodate residential area of massianates and bungalows especially for single dwelling units. However due to many factors for real estate development, land owners have been permitted by the Nairobi City County for alternative uses hence surpassing the initial zoning requirements for the planning zone under Infrastructure-led development.

Therefore this research shall be carried out focusing on the ability of the urban environment to sustain the increasing developments in real estate under: the infrastructure service provision; and the conservation of vegetation. The study is focused on both property whose land uses has been varied and those property whose land use has not been varied within the study area. The Nairobi City County, the property owners and the service providers shall be the key respondents in carrying out this research.

1.6 Justification of the study.

According to Singleton (1993), the most suitable place to carry out a research is where the researcher can reach fast and easily. The Kilimani estate is easily reached areas of Nairobi City County where there are pronounced unsustainable urban environment. The land use variations, increased demand and supply and the increase real estate investment have been exercised and new development for the real estate can be easily identified.

Though some research has been done within the area, the effect of the demand-led developments in real estate on urban environment has not been researched. This study aims at addressing the possible impacts that the demand-led developments have on the urban environment as compared to the infrastructure-led development would have had on the sustainable urban environment. It also intend to discover at level at which real estate transition form of single dwelling to multi dwelling leads to deterioration of urban environment. Last important aspect of this study is to derive the best procedure and model which can be used to ensure sustainable urban land and real estate. Therefore, this study is timely because this development is in its advance stages in Nairobi City County and Kenya as a whole. Kilimani estate is highly affected by the real estate developments and the study has identified this area as a good representation of the other parts of the city and country where such practices are in their advance stages.

A number of literature review has been studied in which the information gap was realised. Among the literature studied include: the National Land Policy, National Housing Policy, Physical Planning Act, Kenya Vision 2030, Nairobi Vision 2030, Millennium Development Goals and Economic Recovery Strategy on Empowerment and Wealth creation. Apart from the above documents, their are other written literatures which have aided to discover this information gap. This research will therefore fill an important research and information gap in real estate industry and urban land management at large. The results of this study are therefore expected to be useful in further implementation of urban land management and development of exclusive Urban Land Policy in Kenya.

1.7 Organization of the study

This research project is organized into five different chapters each having a specific section of the research.

Chapter one is an introductory. It contains the problem statement, objectives, hypothesis, research methodology, scope and the significance of the study as well as defining the key terms in the study.

The second Chapter discusses the literature related to the study and the theoretical model developed that acts as a basis of the research. It includes various relevant definitions as enumerated by different authors; the policies, legislations and international treaties governing sustainable urban environment; the nature and level of real estate development; effects of real estate developments on infrastructure and environment. A theoretical framework is established to act as benchmark for the study.

The third Chapter illustrates the case study area and methodology. In the chapter, the characteristics of the study area are provided. The procedures used in sampling, the sample and methods used in collection and analysis of data are highlighted.

Chapter Four presents the responses and analyses of various respondents to whom questionnaires were administered as well as oral interviews conducted. The problems encountered in carrying out the research are also highlighted as well as hypothesis testing.

Chapter Five entails the main findings of the research and conclusions. The proposed appropriate management framework to ensure sustainable urban land management is presented in this chapter. Suggested areas of further research are mentioned.

1.8 Definition of key terms

- **Sustainable development:** Sustainable development is the improvement or growth that meets the needs of the present conditions without compromising the ability of future conditions or generations to meet their needs.
- **Unsustainability:** This can be referred to a state at which development are being done either beyond their capacity of supporting eco-systems or development which cannot be done for a long time provided the same conditions prevails hence the resource may not available for the future generations.
- **Urban environment:** this an area where many buildings have been developed to yield high income and both the working and the living areas are closely placed together with the support services like schools and hospital with minimal empty or green spaces

available. The urban area may be plagued with several challenges like the vehicular (both personal and commercial) parking space and the movement from and to the work stations.

- **Green fields:** this refers to virgin land that is characterized by indigenous trees and grass or thatches and without structures in an urban area. When there is a project for real estate development, there is definitely interference with the vegetation on the land.
- **Green spaces:** Green space is the land that is either wholly or partially covered with vegetation like; grass, trees and shrubs. Green space in urban area is used for recreations parks, court yards, community gardens or common area for a multi-dwelling development, and cemeteries among others.
- **Sustainable urban environment:** The sustainable urban environment involves ensuring the available resources in the urban areas are well managed in order to serve the future generations in terms of ecosystem integrity, carrying capacity and biodiversity.
- **Real estate development:** It encompasses soil and everything below it to the centre of gravity and everything above it to the sky and anything that is permanently fixed to soil.
- **Land Use:** Land use involves the usage and access to natural resources on land in order to benefit on its output and yields such as pastures for grazing land in rural areas, and human settlements for urbanized areas. Land use can also be defined to include the social and economic importance like homesteads and market areas which may be managed or left unmanaged.
- **Land use Variations:** Land use variation means complete replacement of one use by another, for instance a shift from one land use category to another or it may also mean additional of an another use to existing uses to have more than one use. It also involves the changing of the size of land in order to add or replace the land uses.
- **Demand-led development:** This refferes to development which depends on the dynamics of free spending economy led by the high demand and low supply of the products. The developments carried out under this model in the real estate leads to activities on like change of use, extension of use and subdivision of large tracks of land into small plot in order to provide avenue for expenditures on real estate property.
- **Infrastructure-led development:** This is where the long-run development is based on public infrastructure such as roads, sewerage, piped water and waste management as the

main engine of growth in a given urban area. The proposed developments are evaluated based on the capacity of the infrastructures.

- **Effects of development:** This is the impact observed or experienced as a result when something is done or happens: an event, condition, or state of affairs that is produced by an action caused by the real estate development.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

This chapter will highlight on the literature of how real estate development, the approaches of developments and how they affects the general urban area and in the Kenya as well as in the international arena. It also focuses on the sustainable urban environment emphasizing on the aspects of environmental sustainability. Most importantly literature on real estate development, sustainable environment and related laws will be discussed.

2.1.1 Real estate development in Kenya

The revival of Kenya's economic led to the construction and real estate sector to rise with projected annual increase of about 16.7 percent. According to the Economic Recovery Strategy for Employment and Wealth Creation government report of 2008, the country experienced a growth in the GDP from 2.3 percent in 2002 to 4.2 percent in 2007. In recent years, the real estate market has gained more interest from investor seeking opportunities that offers less risks and payoff that lays between the more risky and the less risky investment segments (Jones Lang Lasalle, 2011; Geltner and Miller, 2007).

A survey conducted by Hass Consultants in association with CFC Stanbic bank in the year 2010 revealed that the Kenyan real estate sector has been vibrant for the past decade between the years 2000 to 2010. The market was able to withstand the waves caused by both local and international financial recessions an indication of a sharp contrast to international property markets; it has also survived. The report also revealed that capital the level of returns from Kenyan real estate market is much stronger than the gains from US and UK real estate market. There has been also an increase in rental prices which are seams stable and on the rise for a longer period which are unlikely to fall. The real estate property market in Kenya has grown rapidly and become an important source of economic growth. Over the last ten years between the years 2000 to 2010, those who invested in real estate earned higher value for their money in form of annually returns as compared to other investment avenues like the Nairobi Stock Exchange (NSE); this implies that it is more profitable to invest in real estate in Kenya for the long-term investments (Jivanjee,

2010). The Kenyan banks have realized this lucrative sector and are offering mortgage products to attract Kenyans. Many middle class Kenyans now prefer to purchase their own homes rather than be tenants (Mwithiga, 2010).

2.1.2 Land Use Zones in Kenya.

Land use zones provide an organized format in which sections or part of the urban area can be developed. These uses can be generally categorized under residential, commercial and industrial uses. Each sections of the urban area are assigned development standard concerning the development of real estate/buildings as laid out by the local authorities.

Table 2-1: Recommended densities for neighbourhood development in Kenya.

Type of Dwelling	No. of Dwelling Per Hectare	Space Allocation Per Dwelling (M ²)
<u>Bungalow Detached</u>		
Low density	10	1000
Medium density	16	500
High density	35	285
<u>Semi Detached And Row Housing</u>		
Low density	20	417
Medium density	32	333
High density	70	250
<u>Multi-Family Dwellings</u>		
Low density	50	200
Medium density	60	167.6
High density	70	142.8
Special Density	133	75

Source: Physical planning handbook 2007

2.1.3 Land use planning in urban areas

Urban planning is a process of determining, controlling or directing changes in orderly through the allocation of space on land in a manner to ensure the urban areas are habitable and sustainable. It involves plan preparation and development control (Handbook 2007). Land use planning in urban area involves designating uses of land parcels in order to ensure the conservation and protection of the human habitat. It is based on the environmental, physical and socio-economic conditions of a give area. These conditions are evaluated through analysis of a number of goals for the area and assessment of the actual value of the available ecosystem in a given area. The outcome of the assessments gives the indication of the rational steps which

should be taken to safeguard the future uses of land. Through a negotiation process with all stakeholders, the result is in form of decisions made on how land should be allocated for specific uses and the standards to be complied with in development. These are prepared in form of the various types of plans and its implementation is done by the concerted efforts of technical, professional, administrative and legal expertise.

2.1.4 Types of land use

2.1.4.1 Residential land use

Residential areas are the main places of habitation for the town residents. However, some residents may be found residing in commercial areas. Residential is normally the highest land use in a town. Residential areas may be made up of organized estates and neighborhoods.

2.1.4.1.1 Estates

An estate is a spatial unit provided with basic infrastructure facilities like water roads and electricity among others and has an identity. These units may be demarcated through roads or other physical features like rivers or streams. The units may have service centers or nodes within the minimum walking distance of all the habitats. The population of the estate should be able to support the services within the physical entity. It is recommended that an estate shall have 100 households on the average.

Low density areas are mostly occupied by high income earners. These areas are mostly located outside the CBD due to their nature. They are designated in zone 4, 5 and 6 according to Nairobi City Council Zoning Guide, department of planning. The low density areas are suitable for single-family residential neighborhoods like churches and schools.

Medium density areas are located relatively closer to the CBD. Mostly occupy zones 8 and 10. They include at list middle income earners who are lower than the low density residents but higher than the high density residents.

High density residential areas consist of the low income earners who occupy the largest percentage of the total population. They are mostly within the CBD and near the town centers. Mostly they are semi-skilled workers. This category is also suitable for professional office development and limited neighborhood.

2.1.4.2 Commercial land use

This type of land is usually designated for commercial, retail services and office uses and is mostly located within the Central Business District (CBD) of an urban area. Commercial land uses are categorized into four levels that are administered primarily through zoning district classification: Neighborhood commercial; Community commercial; Interchange commercial and Service commercial.

2.1.4.3 Industrial land uses.

They are intended to cater for a wide range of industrial uses such as manufacturing, processing, warehousing, wholesaling limited commercial practices. They are divided into three sub categories that are administered through zoning district classification which include: - Industrial park, light industrial park and heavy industrial park. In Kenya this lands are mostly found within Industrial area, of Nairobi city

2.1.4.4 Public purposes

This include land meant for functions like; health services, administrative areas, law and order under (Administrative Use, Police stations, Law courts and Prisons), community centers (churches, mosques, temples, post office library and fore stations)

2.1.4.5 Recreational land use

Recreation is the sum total of all human, social-cultural and economic activities that enhances the therapeutic status of the mind. It brings a relaxation of the body and mind. Recreational areas can be private or public. Recreational land use is widely used for family gathering and friends and picnics. The land parcel being used for fishing, shooting or other sporting activities can also be classified under recreational land. The other sports activities like quad biking and motor bikes are noisy pursuits hence located away from the residential area although they are also under recreational use.

2.1.4.6 Agricultural land use

Agricultural land is the type of land parcel where activities that enhances agricultural production for both crops and livestock are carried out. This land is either arable where crops are grown; or pastoral land meant for animal grazing.

2.1.4.7 Educational land uses

The provision of educational services is tied to residential location. The educational institutions include nursery, primary and secondary schools; universities and colleges. The planning for educational uses require having the details and relevant information to determine the amount of space needed. In all cases educational land uses should be integrated to other uses so as to harmony and movements of pupils in the urban areas.

2.1.4.8 Public utilities land uses

A public utility is the infrastructure meant for provision of a public service like transport, sewerage, garbage collection, Electricity/power, Telephone, Cattle dips, holding grounds and water and trade area meant to support human live. Other emerging utilities include Tree Nurseries and Agricultural produce collection centers e.g. Tea and Milk outlets. Public utilities are managed and administered by bodies set up by the public.

2.1.4.8.1 Transport land use

This type of land use generally caters for all transport and accessibility modes. Litman (2014) asserts that transportation planning decisions influence land use directly by determining the amount space necessary for transport facilities and indirectly by affecting the positioning and design of the real estate developments. In Kenya transport land includes; road reserves, Air ports, Railway lines and stations, and Bus parks and stations.

2.1.4.9 Others land use

2.1.4.9.1 Open /deferred land use

This is an area set aside or conserved through protection for future development. The purpose of deferred land or open space may include the preservation or conservation of a natural historic character, ecological sites, aesthetic and endangered species; the conservation of land or water areas against pollutions and contamination. Open space reserves may be within the urban area, within the suburban of a city. The land may be preserved through zoning the land or overlays where development is limited and controlled to create areas for future development within a community or region.

2.2 Infrastructure-led Real Estate development

This is where the long-run development is based on public infrastructure such as roads, sewerage, piped water and waste management as the main engine of growth in a given urban area (P. Agénor 2006). The proposed developments are evaluated based on the capacity of the infrastructures as outlined in the local physical development plans within the zoning plans.

2.2.1 Zoning plan.

The zoning plan is one of the four subsector plans in a Local physical development plan (PDPs) (Handbook 2007). The plan serves as a an advisory document meant to indicate how real estate properties within the region should be developed. Other subsector plans in a local physical development plans are; Part development plans, subject plan and action plan. The Local Physical Development Plan as a long term direction for the development of real estate in an area or part of an urban area.

A master plan is another direction document which is prepared in accordance with the land use standards and all laws and designs applicable to ensure infrastructure facilities and proposed developments are in harmony and shall be functionally related and compatible.

2.2.2 Real estate development control in kenya

Development control is a process which ensures the proposed real estate developments are in line with the laid down guidelines, regulations and standards within the planning policy of the area. The development control also involves enforcement of the approved plans during the implementation period to guarantee sustainable urban environment. The policy guidelines are developed based on the infrastructure-led development approach in a given planning area.

The Physical Planning Act Cap 286, section 29-33 provides development control process. These sections together with the regulations, prescribes the authorities involved, the procedures, penalties and the various forms to be used in administering development Control matters.

2.2.2.1 The development control standards

According to physical planning act Cap 286 of laws of Kenya, the development controls allow, control, restrict or prohibit the types of development that will be put up in certain designated zones. The development controls ensure that the following are achieved during the real estate development especially in urban areas;

- There is order and proper development of land and land related real estate property.
- There is guard against injurious use of real estate especially on environment.
- Ensuring that there is conformity of implementation and proposals of projects within the neighbourhood
- Guarding against the abuse of land and real estate property during the development.
- Guarding against environmental degradation within the planning zones and neighbourhoods.

Some of the control standards that are applied by the relevant authority and real estate professionals are;-

A. **Zoning:** This entails segregating of space within a physical development plan into classifications of uses and standards. The basis of planning for real estate property lies in the functional relationship between land and the various competing users to which it can be put. In other words, it is the orderly land use arrangement to avoid incompatibility and conflicts within the selected zones.

Zoning is meant to enhance the compatibility of all the uses; avoid nuisance within the selected zone; protects neighbourhoods; preserves environment and controls urban sprawls; brings sanity and order within the neighbourhoods; and maintains land value;

Zoning can be achieved through either: Plot size and bulk; Plot ratio and coverage - where in most cases 75% is the maximum plot/ground coverage; Building lines/Setbacks -this is the distance between the construction area and boundary of the property; Distance between the building; Buffer zones -green areas to break or separate one land use to the other; and Way leaves and reserves - these are rights of way created mostly for utility like sewer lines. Below is an extract of zoning guide for the study area (Zone 4).

Figure 2-1: Zoning guideline for Zone 4 governing the study area

ZONE	AREAS COVERED	G-C %	PR %	Dept Ref. Map	TYPE (S) OF DEVELOPMENT ALLOWED	MIN. AREA (Ha.)	REMARKS/POLICY ISSUES
3	Parklands			CP/FP/XXX	Commercial/Residential (High-rise Flats)	0.05	
	• Commercial	50	100				
	• Residential	35	75				
	City Park Estate /Upper Parklands	35	75				
	Westlands			CP/FP/XXX	Commercial/Offices/Residential (High Rise Flats) – Four Storeys Max.	0.05	
	• Westlands CBD	80	240				
	• Westlands/Museum Hill						
o Block 1 Commercial	80	200					
o Block 2&3 Offices & Highrise Residential	35	80					
o Block 4 Offices	80	200					
o Block 5 Commercial/Residential Hotels							
4	Spring Valley			CP/FP/XXX	Residential (Apartments allowed on sewer only) – Four Storeys Max.	0.05	• Policy Under Review
	Riverside Drive						
	Kileleshwa	35(s)	75(s)				
	Kilimani	25(u)	25(u)				
	Thompson						
Woodley							
5	Upper Spring Valley			CP/FP/XXX	Low-Density Residential One-Family House	0.2(u) 0.1(S)	• Maisonettes Allowed On Sewered Areas Of Lavington
	Kvuna	25	25				
	Loresho						
	Lavington /Bernard Estate						
	o On sewer	35	75				
o Unsewered	25	25					
6	Muthaiga	25	25	CP/FP/XXX X	Low-Density Residential	0.2	Single Family Dwelling
	New Muthaiga						

Source: Nairobi City Development Ordinances and Zones, 2009

- B. Building codes:** These are regulations set to limit how and with what the new structures are built. They also control rules occupancy and service standards of the new structure, spell out inspection and enforcement policies for the local authorities.
- One has to ensure one’s plans approved with sections and clear detail under Kenya’s building code. It should entail information like building materials, occupancy rates of housing, level of service provision and should allow the city inspectorate as far as the building is concerned.
- C. Extension of a lease:** The main objective of the extension of lease is to allow for flexibility in planning due changing circumstances. Extension of a lease applies to public or government land subject to certain conditions.
- D. Density controls:** Density has been defined in the physical Planning Act as the maximum number of persons permitted to reside as the case maybe on any area of land. Density is an aspect of zoning that specifies the number of persons per hectare within the zones area (Chapin, 1965).
- E. Approval of building plans:** The following guidelines as stipulated in the Physical planning regulations 1998 are considered while approving the building plans for a given real estate

development; zoning regulations of the area; existing physical development plan; building lines; setbacks; plinth area; canopies; height of buildings; access and parking; loading bay; density; plot coverage and provision for alternative water storage for the building where possible.

2.2.2.2 Objectives of Development Control

The general objectives of development control are:

- a) To ensure that implementation of physical development projects conform to approved physical development plan.
- b) To recommend enforcement actions in case of contraventions against plan proposals and/or development standards.
- c) To evaluate development applications that may have injurious implications to man, the physical and biological environment and socio-economic activities.
- d) To ensure that planning regulations, standards, and procedures are reviewed from time to time in order to manage emerging concerns and resolve conflicts.
- e) To secure optimal use of land and ensure that planning decisions are rational.

2.2.3 Environmental impact assessment and audit:

Environmental Impact assessment (EIA) is a process of where the experts carry out analysis of the possible effects of a given real estate development will have on the environment. The process helps to bring out negative and positive impacts and how they are likely to affect people, their property and the environment. The possible measures that should be taken to mitigate the negative impacts are also identified. This process helps to prevent the possible adverse effects and ensures sustainability of the urban environment. The safety of the urban environment is achieved at all stages of a project-planning, design construction, operation, monitoring and evaluation as well as decommissioning in case a proper EIA process is carried out, then. According to EMCA 1999, the objectives of the EIA process is to: identify impacts of a project on the environment; predict likely changes on the urban environment as a result of the development; evaluate the impacts of the various alternatives on the proposed project; propose mitigation measures for the significant negative impacts of the proposed project on the urban environment; generate baseline data for monitoring and evaluate of the impacts including mitigation measures during the project cycle and highlight urban environment issues with a view

to guiding policy makers, investors, stakeholders and government agencies to make environmentally and economically sustainable decisions.

2.3 Demand-led Real Estate development

The demand-led real estate development approach involves subdivision, change of use and extension of use which goes through local approving authorities before developments are allowed. This approach in real estate development which is driven by the ability of the developer to spend on construction hoping that there is available market for the property. In this case the developer ensures he achieves the highest and best use of the land. The approach involves several aspects of physical planning in Kenya under Cap 286 of the physical planning Act.

2.3.1 Land use variations and transformation in Kenya

Land use variation in Kenya is derived from the process allowed through Physical Planning Act Cap 286 of 1996 whereby the original use of a certain land parcel is either changed to another use or added more use(s). This process is carried out by the Local Authorities within the area of jurisdiction and currently under the County Government through an application made by land use professions (Registered Physical Planner). Land use variation exercises can be either through change of use, subdivision or extension of use of which they fall under *third schedule* of Physical Planning Act on *renewal or redevelopment plans*. One of the purposes of renewal or redevelopment plans is providing a basis for determining development applications on extensions of leases, extension of users and change of users.

The county authority have the powers to allow or deny the proposed land use variation whereby they pass communication to the Ministry of Land Housing and Urban Development through director of physical planning to issue the final verdict on the envisioned land use variation

2.3.1.1 Change of user, Extension Lease and Extension User

The main objective of these is to allow for flexibility in planning due changing circumstances. The following factors should be considered before a change user, extension lease, extension of user is approved: A physical development plan of the area, Land Reference and title where applicable, Defined location and size of the land, Current user of the land; Proposed/intended user; Area zoning regulations; Period for comments should be well indicated; The size of the box

notification to be 4cm by 8cm in minimum size and Billboard advertisement placed on site, the notice.

Figure 2-2: Images showing the newspaper extractions for land use variation.



Source: Standard Newspaper November 2013.

2.3.1.2 Planning Brief

The planning brief is a document prepared by registered physical planner in order to advise the local authority on the proposed real estate development (Change of use, extension of use or extension of lease) prior to allow the development. The brief shall contain but not limiting to the following: Planning policy; location plan; situational/site analysis; neighborhood; analysis/compatibility with existing developments; Infrastructural and social services; landownership; size of property/user; environmental impact assessment; an advertisement in two local dailies and existence of an approved plan.

2.3.1.3 Subdivisions:

The process is carried out to ensure that the resultant subplots are accessible; the expected population is in accordance with available real estate developments and with minimal consideration to the provision of services, like water, sewer, roads and drainage. The proposed real estate development is done in isolation to the compatibility with surrounding developments; the preservation of the aesthetic/beauty of the urban area. It therefore allows land to be availed to the market to give better returns and allows for pressure on infrastructure provision.

2.3.2 Highest and Best Use principle under demand-led development

Most land areas are suited for a variety of uses. The highly valued land found in most central business districts could be used for forestry, grazing, crop production, or residential purposes as well as for commercial uses. The land owners allocate their land resources in accordance with the concept of making quick returns within allowable uses. Depending on the criteria used, this return may be measured in strictly monetary terms, in tangible and social values, or in some combination of these values. Real estate property can be considered being under its best use when it is being utilized in a manner that give the highest comparative value compared to other uses (Johnson et al. 1954).

2.4 Causes and effect of real estate development

2.4.1 Causes of Real Estate developments in urban area

There are a number of causes that can be attributed to the increase in real estate development in a given urban area. These factors can be further classified into two broad categories; under demand and supply of housing as shown below.

2.4.1.1 Availability of land

Land today is a precious commodity, commanding respect from both public and private entities. Private builders and aspiring landowners battle it out for their own personal footprint. The main causes of developments in real estate either under demand-led or infrastructure-led is the availability of land on which the property is to be set on. The availability of land includes the strategic toward ensuring there is space for setting up housing for the urban areas.

2.4.1.2 Demand for Housing

Rapid urbanization leads to rising demand for real estate developments in urban setting. The following are other factors, which are responsible for housing demand in urban areas:

1. **High Class Residential Area:** The influence of social values and customs have led to a group of people including the high and upper middle income earners to get housing or accommodation in a given urban neighbourhoods. The resultant situation is the higher demand of real estate housing in the area as there is scarcity of land mostly in urban area.
2. **Foreign Remittance:** A high percentage of all remittance to Kenya and Nairobi City in particular goes into the development of real estate properties especially in good residential houses within high end residential neighbourhoods. This is because the investment in urban land and real estate in general are considered the best protection against inflation (Mowla, Q. A. 2004).
3. **Commercialization:** The general perception of many investors is on how developments like school, colleges, universities, shopping malls, shopping centers and other institutions can pay back the value of investment as soon as possible hence they attract residents and who intern increase the demand for real estate housing.
4. **Transport Provision:** The need to conveniently access the city centre for search of jobs and commercial services has made many urban dwellers to reside in area with easy access to these places. However most of urban areas for developing countries lack sufficient transport system to make their people comfortable in the movement

2.4.1.3 Supply for Housing

The scarcity of land and high land value in urban area are the major reasons which have led to low supply of real estate for housing. This low supply of real estate can be attributed to the following specific reasons identified below:

1. **Low land- man ratio:** Based on the context of the land and man ratio, the supply of land and housing has been made low, especially Nairobi city which is one of the most populated city in the world.

2. ***High land value:*** Based on factors like the location of land, land accessibility, availability of infrastructure services and the use of land within the neighboring areas, among others determine the value of land within an urban area like Nairobi. These factors contribute to the increase of land values therefore leading to housing shortage.
3. ***Amount of buildable and prime land under governmental jurisdiction:*** A large size of land in Kenya and Nairobi in specific is under the jurisdiction of public institutions including the central government, City County government and parastatals. The level of use for this type land tenure has affected the overall supply of housing in Nairobi city.
4. ***High house rent and low rent- income ratio:*** House rent and rent-income ratio in Nairobi is supposed to appreciate in the event of high demand and low supply. This not being the case a many people tent to spend a lot on house rent than the required 10% therefore a large portion of income being spent on housing.
5. ***Faulty public intervention:*** Some of the interventions for provision of housing in urban areas like Slum upgrading program have become infective due to either poor monitoring and implementation or inefficiency in management of public sector project. Therefore lack of public effective interventions for provision of housing has led to high low supply in order to meet the demand of urbanization.

2.4.2 Effects of Real Estate Development on urban area.

The effects of real estate development on the urban area can be described by the level of environmental degradation and the level of new structures including residential and commercial buildings accompanied by the excessive commercialization of the industry.

2.4.2.1 Rapid Growth of High-Rise Apartments:

The increased urban population has increased the need for multi dwelling units including apartments and flats. This type of real estate development has adverse impacts on the urban environment through the following ways:

- i. **Mixed Land use:** The building with high number of floors are developed covering a large portion of land parcel hence allowing less common and open spaces as the court

yards. Buildings designed for retail stores are becoming more viable along key transport corridor within the urban neighbourhood and CBD.

- ii. **Community and common Space:** Community or common spaces like the courtyards, children's playing area, swimming pool, and faunas among others are likely to be provided in Multi dwelling residential apartments in the study area. This provision in real estate development may lead to loss of green area, destructions of indigenous species and pressure on infrastructure services like storm water and electricity within the urban area.
- iii. **Interference with physical nature:** High-rise buildings like the apartments and storey office blocks have adverse impacts such as the interference with sunlight, airflow, odor, temperature, noise, and dust within the urban area.
- iv. **Impacts on Urban Utility Services:** The high-rise apartments are likely to create pressure on the urban utility services like increased consumption of water, electricity, increased vehicular traffic along the streets or high volume within the communication channels, increased production of solid waste and more uptake of sewerage along the sewer lines. Therefore when high-rise buildings like apartment are development within an urban area there are likely effects on the adjacent area within the urban area.
- v. **Impacts of miscellaneous internal factors:** Internal factors like the need for alternative power supply, the pollution of sound, pressure on sufficient parking lot, lack of outdoor children play area are some of the impacts the high level residential development.
- vi. **Socio-Cultural Impacts:** The development of high rise buildings impede on personal privacy and the social bonds due to the influx of people with different socio-cultural practices. The other socio-cultural effect brought about the high-rise apartments in the urban area is the psychological problems such as claustrophobia.
- vii. **Hazards:** The natural and man-made hazards which are likely to occur in urban area and the level casualties in the urban area are higher than in rural area. The fire hazard as a man made hazard is mostly experienced in urban area and in apartments.

2.4.2.2 Impacts Due to Commercialization:

The excessive commercialization of urban activities has various impacts on the urban environment as identified below:

- a. Although the plots of urban area may primarily be meant for residential use with defined standard, the bungalows and Masonettes have been converted into multi dwelling residential cum commercial units which some of which don't follow the building standards. The urban area is turned into high class neighbourhood causing urban problems such as dampness, shadow, disruption of air flow, turbulence of air flow, chillness hence unsustainable urban environment.
- b. Excessive commercialization also hampers privacy among the residents of the urban area, increases the level of water consumption and energy usage leading to frequent blackouts, and vehicular traffic congestion in case where the city lacks proper traffic network.
- c. The current owners of real estate property an urban area are the second or third generation owners and are likely to be more than one. These properties have undergone subdivisions and some transferred through sales.

2.4.2.3 Impacts on Health:

Too much noise of under construction projects and excessive vehicular movements of completed projects, intolerable level of dust, blighted living condition induced by lack of sunlight and air flow in and adjacent to high-rise apartments, together are responsible for a lot health problems of the inhabitants of an urban area.

Due to the close spacing of the high-rise commercial building blocks, a significant number of buildings falls into the shadow zone of the adjacent blocks which result is the inadequate supply of sunlight for the adjoining residential apartments which is not a healthy condition for occupants of these apartments.

A number of health problems such as asthma, hypertension dizziness and respiratory problems as well as fever have also been found to be due to the degradation of the living resulting from the excessive commercialization in the urban area.

Most of solid wastes that are generated by both residential and commercial activities are dumped at roadside pit. The main problem of garbage disposal in the urban area is insufficient number of open garbage bins. The garbage accumulated usually exceeds the capacity of the bins due to excessive commercial activities.

The other effects of real estate development that can be attributed to urban environment are as follows:

- **Storm Water Runoff:** The Natural surfaces and courtyards are often replaced by buildings and infrastructure like footpaths and access roads that prevent infiltration creating water runoff during rainy seasons.
- **Waste and material:** Architects and builders typically do not design homes with easy renovation or deconstruction in mind. Homes/buildings often undergo many renovations over their lifetimes, or complete building removal is carried out to make room for a newer home.
- **Water Use:** High amount of water being used up in increased development. Residential properties consume high amount of water than commercial properties.
- **Air and Atmosphere:** High amount of carbon dioxide emissions, with residential unit producing slightly more than commercial property.
- **Energy Use:** high level of energy consumption with the residential property consuming higher energy than the commercial.

2.4.3 Demand led and infrastructure led developments

Table 2-2: Comparison between demand led and infrastructure led developments

	Demand led development	Infrastructure led development
1	Development is based on single unit of the real estate	Development are based on compound of real estate hence rationality in development
2	Development is based on financial capacity of the real estate developer	The real estate developments are based on policy framework such as master plan of the urban area.
3	Real estate property standards are implemented based on the demand and supply for housing.	Real estate property standard are implemented based on the available infrastructure and the capacity of the ecosystem
4	The real estate development do not provide for revision in case of unsustainable urban environment.	The real estate development allows for revision and control in case of environmental threats by increasing the infrastructure capacity.
5	The real estate development is bureaucratic for approval before development is allowed	The real estate development requires less approval before the development is allowed.

2.5 Sustainable urban environment

The urban environment includes a settlement with buildings, and good infrastructure services with home of key public institutions. The settlement contributes to high level of real estate development mostly at the expense of the ecosystem. The transformation from traditional to sustainable systems requires interdisciplinary application of professions in the designing, construction, operation and maintenance of the built environment.

2.5.1 Environmental sustainability

Environmental sustainability can be defined as providing for the current population with required needs and services without compromising the needs for the future generations within healthy ecosystems of an urban area. Environmental sustainability includes keeping the interests of nature through conservation and protection while emphasizing on preservation and building the capacities of environmental components to support ecosystem. Responsible decisions are made in order to minimize negative impact on the environment. This is usually concerned with developing comprehensive processes that will lead to the activities to lust for the future generations (Bueren 2012).

Environment systems include the place where raw materials for human needs are obtained form. At this level obtaining of these resources must be within regeneration demands and capacity to maximize their value and control the production of waste especially for industries and other pollutants. People have to live within the limitations of the available environmental systems and resources. Therefore environmental sustainability needs conservative usage of available resources for a stable population. This requires maintaining and protecting the available natural capital as both a provider of economic inputs and an absorber of economic outputs (World Bank, 1986).

An environmentally sustainable system must maintain a stable resource base, avoiding over-exploitation of renewable resource systems or environmental sink functions, and depleting non-renewable resources only to the extent that investment is made in adequate substitutes. This includes maintenance of biodiversity, atmospheric stability, and other ecosystem functions not ordinarily classed as economic resources.

- **Ecosystem integrity:** Human activities like these activities include land development, logging, mining, hunting and other recreational activities, suppressing natural disturbances such as fire or flooding, and introducing exotic species affect the natural landscape and, also may alter the structure and composition of an ecosystem hence it may not operate normally.
- **Environmental carrying capacity:** This is generally defined as the population of organisms that can be accommodated at a without depleting the available resources in the ecosystem. It may be difficult to evaluate level of sustainability in human population for a particular regions or the earth as a whole, except for isolated populations at scales like urban neighbourhoods, because of uncertainty level adaptability and assumptions needed for the entire ecosystems.
- **Biodiversity.** The biodiversity of a particular area refers to the total of all plants, animals, fungi and microorganisms present in that area, including all of their individual variations and all of the interactions between them.

2.5.2 Sustainable urban development challenges

The key global challenges to sustainable development has been driven by trends, such as changing demographic profiles of the area and social-economic dynamics, advancements in technology and trends towards environmental degradation. The current development strategies in urban area are not enough to ensure sustainable urban development, according to World Economic and Social Survey 2013. Moreover, relying on “business as usual” scenarios presents clear risks, because evidence is mounting that:

- Rapid urbanization, especially in developing countries, calls for major changes in the way in which urban development is designed and managed, as well as substantial increases of public and private investments in urban infrastructure and services;
- The impact of climate change threatens to escalate in the absence of adequate safeguards and there is a need to promote the integrated and sustainable management of natural resources and ecosystems and take mitigation and adaptation action in keeping with the principle of common but differentiated responsibilities;

- Hunger and malnourishment, while decreasing in many developing countries, remain persistent in other countries, and food and nutrition security continues to be an elusive goal for too many;
- Income inequality within and among many countries has been rising and has reached an extremely high level, invoking the spectra of heightened tension and social conflict;
- Energy needs are likely to remain unmet for hundreds of millions of households, unless significant progress in ensuring access to modern energy services is achieved;
- Recurrence of financial crises needs to be prevented and the financial system has to be redirected towards promoting access to long-term financing for investments required to achieve sustainable development.

2.5.3 Principals of sustainable development

There are seven principals which guides the Environmental protection agency. This are:

1. *Pollution Prevention:* The principle considers the ability of a product or service's to affect the environmental hence advocating for early preventive decision.
2. *Multiple Attributes:* The principle views the environmental attributes to secure development as numerous and a single attribute can obscure other environmental impacts that might cause equal or greater damage.
3. *Life-Cycle Perspective:* The principle considers the potential environmental impacts for a development in all stages of product or service's life cycle, starting with raw materials acquisition, through manufacturing, packaging and transportation, distribution, use, maintenance, or disposal.
4. *Magnitude of Impact:* This principle considers the scale at which the product is likely to have prominence over the impacts on environmental, and the degree to which an impact can be reversed.
5. *Local Conditions:* Factor in where and how a product or service is used when evaluating environmental impact.
6. *Competition:* Incorporate environmental attributes of products and services in competition among vendors.

7. *Product Attribute Claims*: Examine product attribute claims carefully and rely on more than one information source to evaluate environmental attributes.

2.5.4 Sustainability aspects in urban environment

1. Energy costs through ensuring less energy is consumed in the households through energy saving appliances like light bulbs,
2. Waste production and management. Through the reduction of waste generated from the neighbourhoods and an elaborated framework for dispose.
3. Social security through ensuring there is privacy and confidential within the neighbourhoods
4. Eco-System Integrity through informed decisions on the possible impacts and hazards through human activities.
5. Carrying Capacity for the available infrastructure services and environmental elements like open space and ventilation corridors.
6. Proper maintenance and conservation of the available biodiversity through preservation of endangered species.

2.5.5 Sustainability Theory

The sustainability element in the development came up after a report of 1972 Rome meeting. The sustainability theory prioritized and integrates social responses to environmental and cultural problems facing the current and future generations. The sustainability theory has deferent models like the economic, ecological, religious and political models which when combined they covers the entire ecosystem. Sustainability implies the capacity to keep an entity, its outcome, or process over time. By focusing on the ecological dependency of economic and social systems, sustainability illuminates the mutual effects between environmental degradation caused by human activities and the perils to human systems presented by global environmental problems. The concept of sustainability thus raises a question how can a given activity successfully maintain itself and its goals without exhausting the resources available?

2.5.5.1 Ecological Models of sustainability

Ecological models propose to sustain biological diversity and ecological integrity. That is, rather than focusing on opportunity or capital as the key unit of sustainability, they focus directly on the

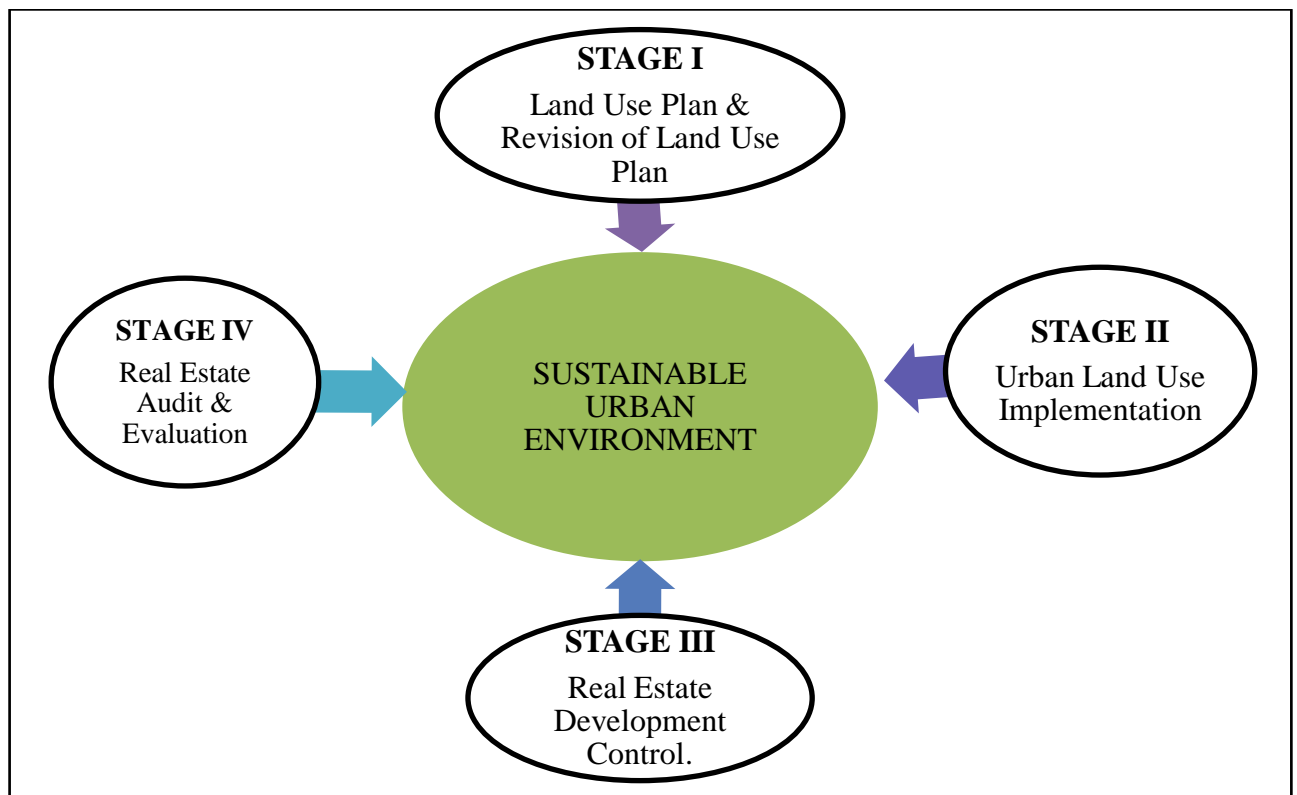
health of the living world. Within this model, there are two major ways of deciding which ecological goods to sustain:

- From an anthropocentric point of view essential natural resources should be sustained, as should those ecological systems and regenerative processes on which human systems rely.
- From an eco-centric point of view species should be sustained for their intrinsic value, as should ecological systems as generators of creatures with intrinsic value.

2.6 Conceptual model for infrastructure-led development in real estate.

From the literature reviewed above, it is evident that the urban environment is being damaged by the demand-led development in the real estate industry under the transformations of land uses. Therefore in order to achieve sound urban environment, the following model under infrastructure-led development with five stages should guide the urban land use management. At each stage, the several activities have to be undertaken under the guidance of professionals in real estate in order to ensure sustainable urban environment. The stages can be summarized under the figure below.

Figure 2-3: Infrastructure-led model of real estate development in urban areas.



Source: Author July, 2015.

i. Stage I: The Formation of Land Use Plan;-

- Zoning guidelines and standards for the urban area. These standards are meant to ensure that the available natural resources can withstand the future developments of the given area within a stipulated period of maybe 10-20 years. After which a new guidelines shall be prepared.
- Real estate development plan/ road map. This shall involve the ideal types of real estate properties to be developed based on the expected demand and supply. At the same time is shall propose the levels of real estate development within the give urban area based on carrying capacity of the environment.
- Planning for the infrastructure utilities and services. This activity involves provision of enough support infrastructures for the projected real estate developments in terms of; water, sewerage, electricity, storm water drainage, and transport network among others.
- Definition of land use capacity and budgets. This is where the land use plan defines the expected maximum holding capacity of persons per square unit (meters, kilometer, or feet). The capacity shall be used to protect the biodiversity by regulating the amount of human activities in the area. The capacity shall also define the expected human activity brought about by developments in real estate.
- Environmental mitigation and conservation. This will include outlining the appropriate mitigation measures to be taken on possible impacts from the proposed land uses. These impacts will occur during and after implementation of the foreseen real estate developments and action plan for the prevention and management of foreseeable damages on urban environment during the land use management cycle. The activity shall also highlight key environmental features that shall be retained and conserved with each actor given their roles in the conservation of these environment features.

ii. Stage II: Implementation of the urban land use:

- Allocation of urban land uses. This process involves assigning the individual land parcels with suitable land uses. The land or property owner may not be allowed to alter or vary the assigned land use until the next planning period or the expiry of the land use plan. Land uses must be properly arranged so that they do not interfere with one another and can meet each other's needs as much as possible; this goal is a challenge of urban land-

use planning. The land uses which leads to conflict are well placed within the urban area with clear modes of mitigating possible conflicts.

- The comprehensive infrastructure development. This will involve an actualization of the proposed infrastructures in order to serve the expected real estate properties within the urban area. All the concerned institutions shall actualize their goals on infrastructure provision with the aim of making the residents comfortably accommodated within the urban area.
- Environmental development and mitigations. The process will entail the development of actual frameworks like for environmental protections. This will involve the needed amount of waste to be generated per unit area, how the expected waste shall be discarded from the area in order to improve or maintain the current status of the urban environment. The benchmarks and environmental checklist is defined in order to facilitate good stewardship.
- The real estate designing and modeling process. This process involve the rational utilization of available land in the urban area by setting up real estate properties which are ideal as prescribes under land use planning. The designed real estate should enhance sustainable urban environment through protection of the available ecosystems and preservation of green areas.

iii. Stage III: The Control of real estate developments

- The enforcement of land use standards and regulation to ensure that the laid down developments are achieved within the limits set out.
- Control of carrying capacity of the ecosystem. At this level, the expected population within a given area shall be define and whenever is reaches the threshold, the authority shall ensure no further additional population. The carrying capacity shall be defined at a given square unit area in terms of number of residential buildings, or commercial buildings.
- Preservation of biodiversity and ecological damages. At this level the biodiversity shall be conserved or enhances through additional mitigation measures on the environment. Any foreseeable damages to existing biodiversity should be arrested managed in order to ensure minimal destruction of the ecology.

- Mitigation and conservation of the urban environment. This is where the expected environmental effects as outlined in the land use plans are managed and controlled in order to ensure less harm to the urban area. Mitigation measures are upheld throughout the entire real estate development process.

iv. State IV: Urban Land use audit and evaluation.

- Evaluation of infrastructure capacity. The infrastructure capacity depends on the way it is utilized by the current developments in real estate. Therefore an assessment will be done to determine whether the infrastructure are optimally used, or are overloaded by the development trends. In case of further expansion of variation of the real estate developments within the urban area, the proposal shall be made to ensure the availability of adequate infrastructure facilities.
- Evaluation of real estate development demand and supply. There are various other factors that affect the demand for real estate like: the price of substitutes and compliment; the investor's preference; the consumer's preference; the availability of credit the cost of borrowing; price of housing and income of customers. On the other hand suppliers will attempt to maximize their profits by increasing the quantity offered for sale. The factors determining the supply of real estate are; the skilled labour; the easy accessibility of credit; the efficient builders; the availability of land; the price of property and supply of real estate property. Therefore there will be a thorough assessment of this factors within the urban area in order to make sure that's there is a balance. On doing this, the recommendations are made for the next planning period on re-planning stage.
- Audit of the urban biodiversity. This entails gathering of ecological information and using the same information to know what is available within the urban areas. It entails a detailed review of a single site, used to inform the writing of a site management plan.
- Evaluation of the urban population trends. This shall include the understanding of the components of population change within the urban area through the use of population information available. It will also involve the understanding of the impact of population size, composition, and distribution on urban environment. The parameters of the urban population shall be used to ensure control of real estate development in order to avoid extra pressure on the ecosystems.

- Evaluation of current zoning standards and guidelines. This shall involve the detailed audit of the standards currently being followed in order to implement developments in real estate. The audit of these standards should reveal the effectiveness and their appropriateness in the implementation of urban land use and management

v. Revision of urban land use plan

First, redevelopment of infrastructures and utilities by increasing their capacities in order to cater for new developments as envisaged under auditing and evaluation. This is followed by the development of new zoning guidelines and standards. The new standards may relax the existing or tightened them in order to make the urban environment conducive for urban dwellers and free from the environmental hazards. Later then there is redevelopment of real estate development plan based on the current development trends, demand and supply of real estate. Another activity is when reallocation of land uses is done. This is land uses are altered in order to allow new levels of real estate. This is an important window for property owners to develop the property of their interest. However this should be advised and factored into the new land use plan.

CHAPTER THREE

3.0 STUDY AREA AND RESEARCH METHODOLOGY.

3.1 Introduction

In this chapter some of the characteristics of the study area and methodology of the study are highlighted so as to acquaint the reader to the study area prior to data analysis in chapter four and recommendations in chapter five.

3.1.1 The study area

Kilimani area is mainly a residential area of upper middle income and high income level located in the outskirts of Nairobi City. This area is about 20 minutes and 7 km from the City Centre. The Kilimani location occupies an area of about 1500 hectares. The area borders Lavington Estate, Kilimani estate, Woodley estate and Kawangware residential estate. The area has a number of public and private institutions like Law Society of Kenya, Kenya Human Rights Commission, and Braeburn and Rusinga Schools. These facilities are major attraction in the real estate development and increase in population of the area.

3.1.1.1 Geographical Position and Size.

The study area is the Kilimani estate within Kilimani location of Westlands division. The estate is located to the west of the Nairobi city centre and about 4 Km from the city. In 2009, Kilimani ward had a population of about 43,122 within 16.10 square kilometer.

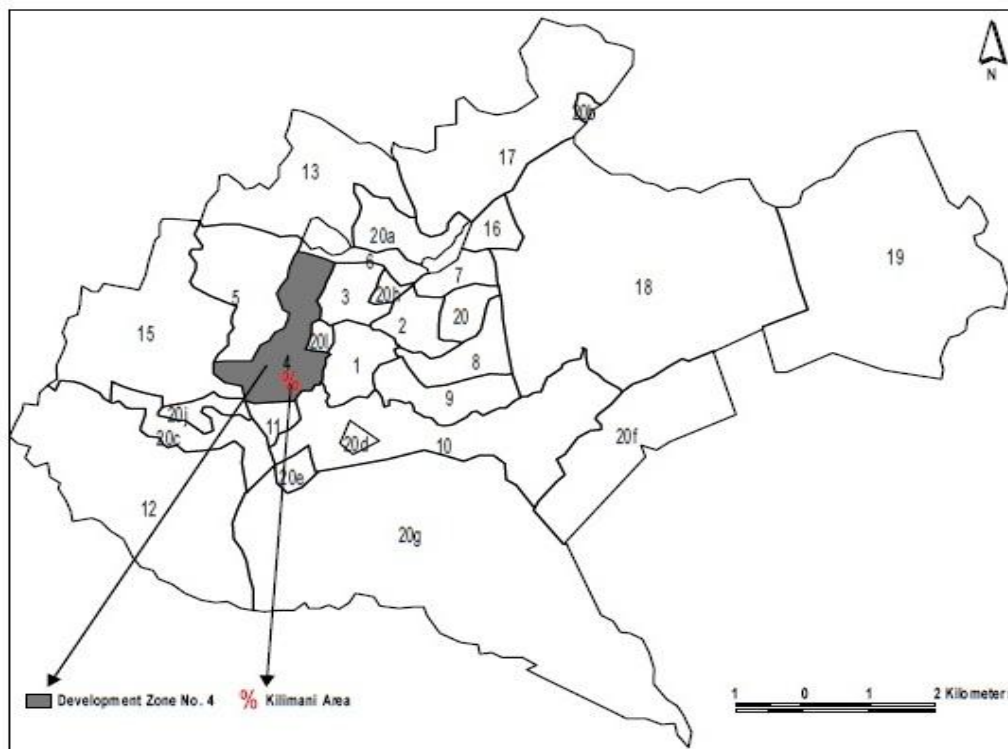
3.1.1.2 Topography and Drainage

The Kilimani estate is on high ground of about 1700–1800 meters above the sea level and is characterized by rugged topography. Nairobi city is adjacent to the Ngong Hills, which are located to the west. Mount Kenya is situated far north and Mount Kilimanjaro is towards the south-east of Nairobi city and therefore has lesser effects on Nairobi's weather conditions. Both mountains are visible from Nairobi on a clear day. The Nairobi River and its tributaries traverse through the Nairobi County.

3.1.1.3 Characteristics of Kilimani estate as the study area

Kilimani estate is residential neighbourhood located in zone 4 of the 20 planning zones of Nairobi City County as shown on the figure below. It is predominantly high-income low-density zone. Originally the area was exclusively a high-income low-density residential area. The area has impulsively transformed into a middle and Upper Income high density zone because of the high level of real estate developments of apartments and flats; and commercial offices and retail blocks. Many of the new developments in Kilimani location, particularly for commercial use, have been put up in the recent past. The other developments of the bungalows and maissonettes that were once the predominant building type have been demolished with high rise buildings having taken their place. From the 1980s there has been a high influx of professional offices for private individuals and organizations and other non-residential uses like shopping mall, and retail centers. Ngong' road and Argwings Kodhek road are fast transforming into commercial corridors with centers such as Hurlingham, Yaya centre, Valley Arcade, Caledonia, and Adams Arcade, Junction mall, Uchumi hypermarket and Nakumatt Prestige Plaza forming some of the retail developments.

Figure 3-1: Land Use Policy Zones of Nairobi City showing Zone 4



Source: City Council of Nairobi, 1996)

Figure 3-2: The delineation of the study area



3.2 Research Methodology

This section describes the procedures and methodology that were followed in conducting the study. It discusses data collection, sampling methods and procedures, statistical parameters and data analysis.

3.2.1 Data Collection

A research using a case study is designed as a form of qualitative analysis and involves a careful and complete observation of the social unit which can either be a person, family, an institution, a cultural group or the entire community, (Kothari 1990). This research seeks to obtain information that describes the existing phenomenon by asking individuals about their perceptions, values and attitudes. For this particular study the case area is Kilimani estate within Nairobi City County. It is there often necessary to sample about 10% of the population provided that the resulting sample is not less than 30 and not more than 1,000 units (Arleck and Settle 1995). The data collection has been categorized into two, which are; secondary data collection and primary data collection.

3.2.1.1 Secondary data collection:

This form of data collection was mainly through library research. The library research was conducted by reviewing written materials and paper works related to the area of study. These include information from textbooks, daily newspapers, journals, articles, and published and unpublished thesis.

The secondary data was sourced from libraries, government departments and internet. Through these written materials information like the causes and effects of real estate developments were obtained in relation to the scope of the study. The government publications also provide the information on policies and legal frameworks which governs the scope of the study scope. Regulations governing physical planning, land development and environmental conservations were obtained through secondary data collection.

Google earth and studies on land uses patterns within Kilimani area were used to analysis the transformations in real estate within the study area. The transformation was traced way back in the year 2001 until the current year within the study area. This application provided critical

images on vegetation covers, existing real estate and significant changes in real estate property in the study area dating as earlier as 2001 to date.

3.2.1.2 Primary Data collection

Primary data was obtained through:-

i) Visual Inspections and Observation

A reconnaissance visit was conducted before the research began in an effort to scan and familiarize with the area. This enabled the researcher to get a general overview of the study area and this contributed substantially in the problem statement chosen. The units of observation included new and recently developed real estate properties. This captured the real situation in the ground including residential apartments and commercial blocks, storm water drainage, sewerage system, traffic flow and courtyards among others, which respondents would be reluctant to share willingly. More physical inspections and observation were later undertaken in the course of the study. Properties with original developments of bungalows and Masonettes within the study area were also observed. In addition, photographs were taken to capture the actual situation.

Units of Observations

- New and recently developed real estate property in the study area. The researcher observed several developments like the recently developed residential and commercial property. These developments were observed in relation to the impacts being experienced on the urban environment within the neighbourhood and entire urban setup.
- Nature of the new and recently developed real estate property developments. The nature of developed were based on the individual property in relation to existing urban environment. The observation was based on whether the real estate development interferes with the state of the neighbourhood in terms of height ground coverage and plot ration among others.
- Current state of the infrastructure, and environmental condition in the study area. The observation focused on the state of repair, capacity and efficiency of the infrastructure and environment. In this case the observation focused on the vehicular traffic flow during peak hours, storm water drainage systems and electric energy supply. The

observation also focused on the vegetations within the individual land parcels, and the nature of green spaces available.

ii) Oral Interviews

Face to face interviews with key informers were undertaken. This method is usually very effective due to its flexibility in allowing for clarifications of questions asked. The key informers in this study were; the director in the physical planning department, Nairobi City County and professionals in real estate development. They gave information on what informs their decision when granting or refusing permission for real estate development. They also gave their opinions on what are the causes and effects of unsustainable urban environment in the study area. Moreover, they gave their views on the state of the current management frameworks to regulate real estate development, specifically on whether the current policy, legal institutional, public participation and land use planning frameworks are adequate to guide their operations in dealing with sustainable urban environment in the study area. During the interview sessions, the researcher asked questions pertinent to the study.

iii) Questionnaires

The research demanded that some qualitative aspects of the stakeholders concerned are captured, which can only be adequately captured by administration of questionnaires by the researcher. The questionnaires were administered to the households as the users of real estate properties. The views and perception on the study scope of the respondents were recorded through the questionnaires. The key data captures through questionnaires were; challenges being experienced within the neighbourhood, the sufficiency of the available infrastructures, and the effect of development in real estate on the urban environment among others.

3.2.2 Target population

Target population as described by Borg and Grall (2009) is a universal set of study of all members of real or hypothetical set of people, events or objects to which an investigator wishes to generalize the result. The target population of this study will be residents of Kilimani estate while the study population shall be households, developers in charge of developments, and the real estate firm managing properties within Kilimani estate. Mugenda and Mugenda (2003) explained that the target population should have observable characteristics to which the study

intends to generalize the result of the study. This definition assumes that the population is homogeneous.

3.2.3 The Sample

Sampling ensured that elements of a population are selected as riding representative of the population (Keya et al, 1989). Due to the time factor and the unavailable information on the exact number of the target population, the researcher chose random sampling technique in selecting the sample representatives. According to (Cooper et.al (2003), random sampling frequently minimizes the sampling error in the population and maximizes on time consumption. This in turn increased the precision of estimation methods used. Given that the researcher cannot be everywhere at once or take every possible view point at the same time, the researcher need to get to the general population through a sample. Owing to the nature of the study; the director of physical planning in the Nairobi City County, tenants and real estate development experts (real estate valuers, physical planners and property developers) were sampled through the random method. The category of the respondents are the people best placed to provide the required information for this study with a total 69 respondents were targeted as shown in the table 3-1 below.

Table 3-1: Response Rate of the Questionnaires Administered & Interviews

Respondent	Total number issued	Response	Percentage (%)
Professionals (Real Estate Valuers & Physical Planners)	10	7	70
Real Estate Developers	8	5	63
Director of Physical Planning Nairobi City County	1	1	100
Households/Local residents	50	45	90
TOTAL	69	58	Average = 84

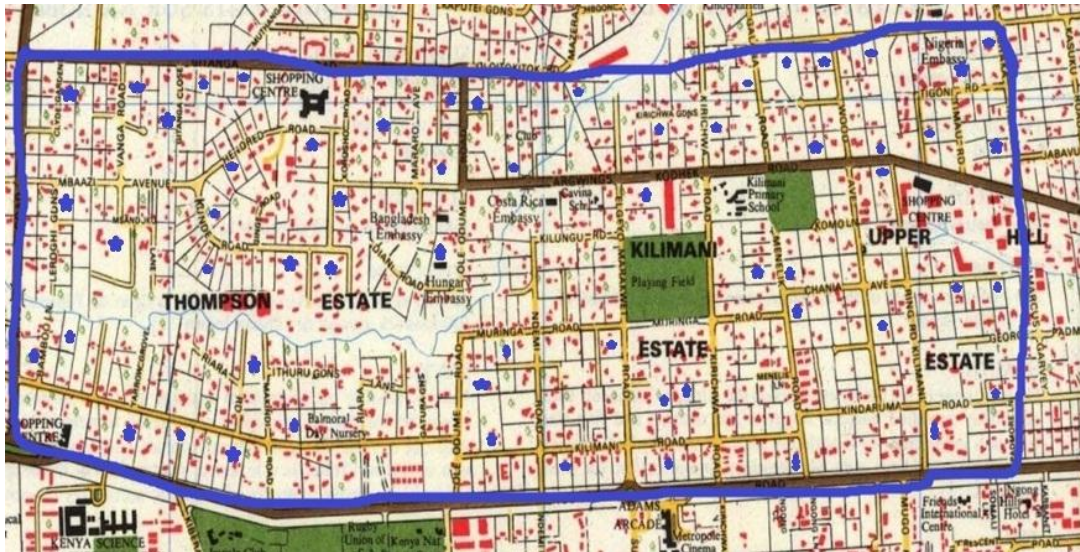
Source: Researcher, June 2015

3.2.3.1 Household sampling

Random sampling was used purposely to choose households within Kilimani estate in order to avoid cost and time implications. Simple random sampling was used to pick out single house in each neighbourhood, to be given the questionnaire on behalf of the land parcel. The sample households were selected bases on development blocks created by the road network. About 25 blocks were indentified which covers the entire study area. In each of the 25 blocks indentified, two questionnaires were administered. The sampling unit was land parcel while the sample size

was approximately 50 houses. The questionnaires were given to a single household representing the entire developed plot. The information sought here was to know how sustainable is the current developments in real estate within the study area.

Figure 3-3: Map showing criteria used for households sampling.



Source: Researcher, June 2015

3.2.3.2 The sampling of developers

Random sampling was used to choose the real estate developers within Kilimani estate. These developers were identified based on the notices which had been set up within the study area and through online information through jengaweb.com platform. About 16 developers were identified in which 8 of them were randomly chosen to be given the questionnaire on behalf of the real estate developers. Out of the 8 picked, 5 gave back their responses. The statistics obtained were then used to make inferences.

3.2.3.3 The sampling of real estate professional

These categories of respondents were identified randomly based on the roles they have played in the real estate development within Kilimani area. Property managers and estate agents were picked based on notices for letting and property sales which had been set up and advertised within the study area. The other planners and valuers were identified for Nairobi city county's reported projects within the study area. About 25 professionals were identified in which 10 of them were randomly chosen to be given the questionnaire on behalf of the real estate developers.

Out of the 10 picked, 7 gave back their responses. The statistics obtained were then used to make inferences.

Mugenda (1999) has stated that; while administering questionnaires, a response rate of 50 per cent is adequate for analysis and reporting, 60 percent is a good response while above 80 per cent is very good. Therefore, response rate in this research was very good.

3.2.4 Data collection Instruments

The instruments used in this study included questionnaires. Primary data was collected by the use of questionnaires. The questionnaire was directly asking details relating to real estate development and environmental issues of the study. The structured questions were used in an effort to conserve time and money as well as to facilitate easier analysis as they are in immediate usable form.

3.2.5 Data analysis procedure

The raw data collected was collated to aid simplification. Coding and checking for completeness was done to ensure that the questionnaires are duly filled. Summaries were then prepared after analysis and tabulation using Statistical Package for the Social Science (SPSS) software. Tabulations and frequencies were used for easier and faster analysis. Descriptive statistics, measures of central tendency and those of dispersion were used to analyze the data. Microsoft excels was also used to aid in the analysis.

3.2.6 Data presentation

The analyzed data shall be represented in the form of frequency tables, graphs and pie charts. Textual descriptions of the findings shall also be used to further explanation to the results obtained by the researcher in his field survey.

Qualitative data shall be presented as narratives. Tables were preferred for presentation since they present data in an orderly manner and are easy to interpret while reducing the explanatory statements to minimum. Photographs and Google images were used to present the past and present scenarios since images help present data in a better manner and can be understood easily without the need for a lot of explanation.

CHAPTER FOUR:

4.0 DATA ANALYSIS AND PRESENTATION

4.1 Introduction

This chapter presents the data that has been obtained from the field on urban sustainable urban environment and real estate developments within Kilimani estate. The research was conducted on sample size of 69 respondents from property developers, tenants/local residents and chief officers from the real estate firm managing the real estate properties within Kilimani estate. A total of 58 respondents completed and returned the questionnaires duly filled in making a response rate of 84%. The study made use of frequencies (absolute and relative) on single response questions. On multiple response questions, the study used Likert scale in collecting and analyzing the data whereby a scale of 5 points were used in computing the means and standard deviations. These were then presented in tables, graphs and charts as appropriate with explanations being given in prose.

4.2 Nature of real estate development

4.2.1 Types of real estate development

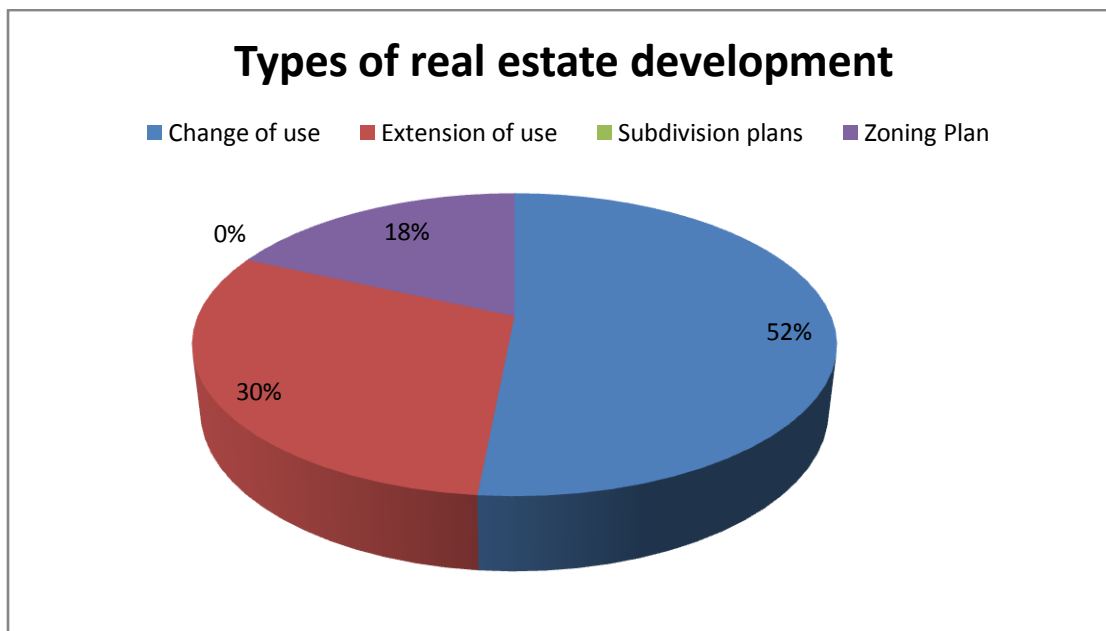
On the nature of real estate developments, over 55% amounting to 33 of 58 sampled had been involved. The respondents were requested to indicate which types of real estate development each have been involved within Kilimani Estate. About 33 respondents alluded to have been involved in any of the two approaches of developments as asked during the data collection. Over 80% of the respondents were involved in demand-led development of real estate while only 18% are involved in infrastructure-led development under zoning plan. Under the demand-led development, change of use was the most prevalent real estate development with over 50% of the respondents while extension of use was about 30%. None of the respondents pointed out to have been involved in the subdivision planning as show in table 4-1 and figure 4-1 below.

Table 4-1: The nature of real estate development in Kilimani estate

Types of real estate development	Frequency	Percentage %
Change of use	17	52
Extension of use	10	30
Subdivision plans	0	0
Zoning Plan	6	18
Total	33	100

Source: Field Survey, June 2015

Figure 4-1: The nature of real estate development in Kilimani estate



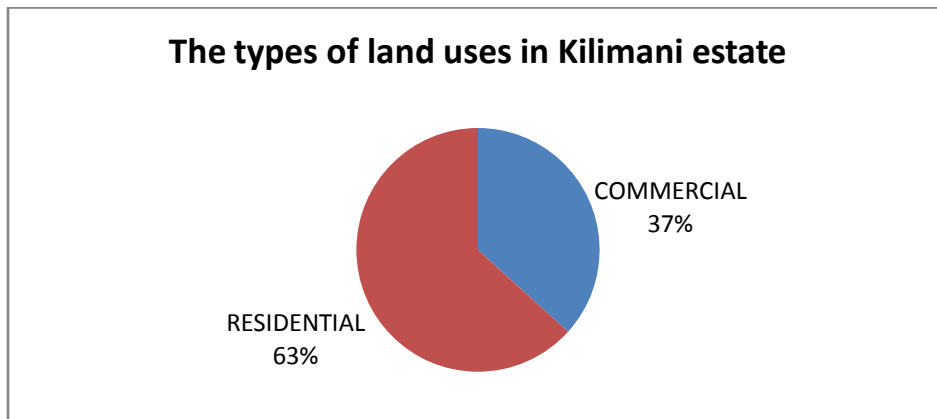
Source: Field Survey, June 2015

4.2.2 The levels of new and proposed developments within Kilimani area

4.2.2.1 Types of land uses

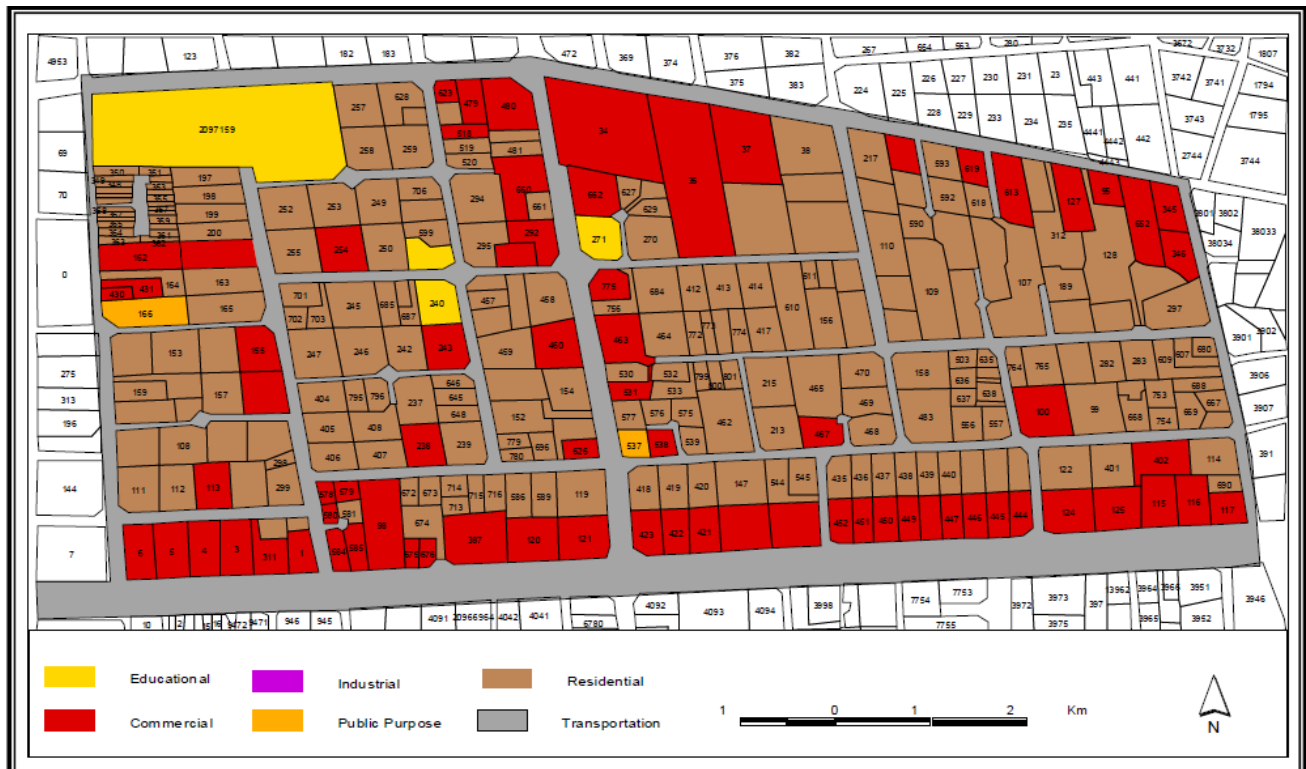
The respondents were asked to indicate the types of land uses within the Kilimani area in which they operate within. Residential land uses were the most responses as over 63% of the respondents indicated they stay within kilimani area. On the other hand 47% indicated they work within commercial land uses within kilimani area as shown in the figure 4-2 bellow.

Figure 4-2: Types of land uses as indicated by respondents within Kilimani estate



Source: Field Survey, June 2015

Figure 4-3: Land use pattern of a section of Kilimani estate



Source: Rutto 2008

4.2.2.2 Housing types

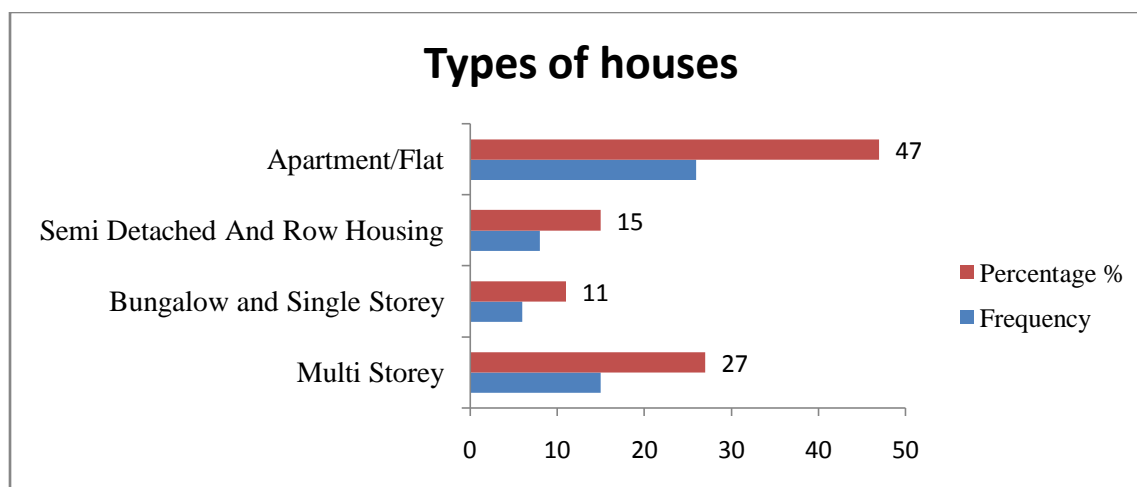
The respondents were asked to indicate the kind of houses within the Kilimani area in which they operate in. The flats/apartments were the most type of houses available within Kilimani area with about 47% while Bungalow and single storey was the least with about 11% of the respondents.

Table 4-2: The kind of houses within the Kilimani area

Types of the houses	Frequency	Percentage %
Multi Storey	15	27
Bungalow and Single Storey	6	11
Semi Detached And Row Housing	8	15
Apartment/Flat	26	47
TOTAL	55	100

Source: Field Survey, June 2015

Figure 4-4: The type of houses within the Kilimani area



Source: Field Survey, June 2015

4.2.2.3 Floors of the current developments

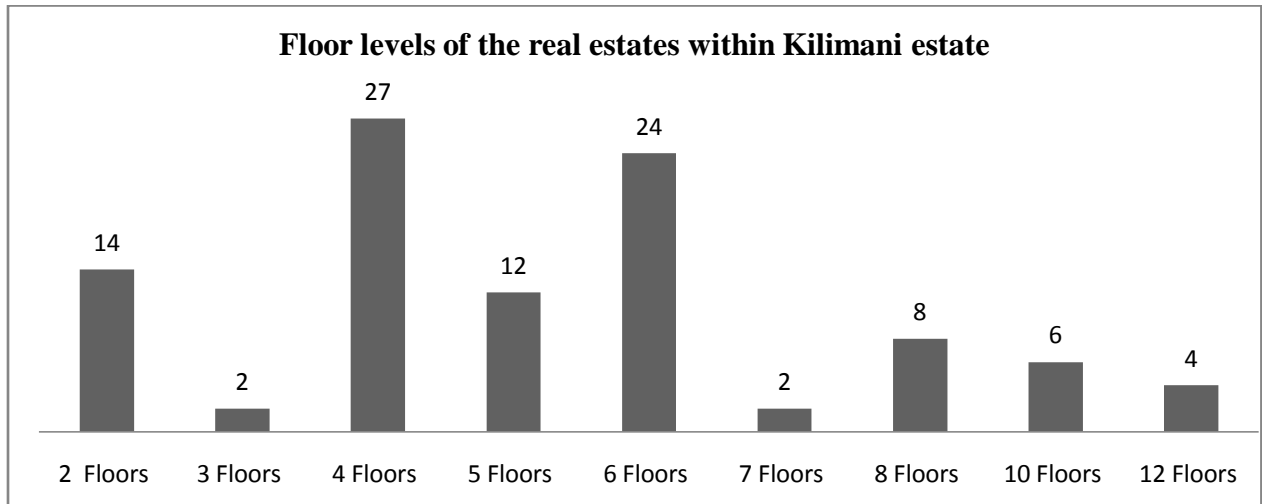
The respondents were asked to indicate the number of floors the house they operate within the Kilimani area has. Most of the houses are made up of four (4) floors, on the other hand 7 and 3 floors were the least number of houses within the study area as shown in the table 4-3 below.

Table 4-3: The number of floors for properties in Kilimani area

Number of floors	Frequency	Percentage %
2	7	14
3	1	2
4	13	27
5	6	12
6	12	24
7	1	2
8	4	8
10	3	6
12	2	4
TOTAL	49	100

Source: Field Survey, June 2015

Figure 4-5: The frequency of the number of floors for properties in Kilimani area



Source: Field Survey, June 2015

4.2.2.4 Ground level coverage per land parcel

The respondents were asked to indicate the number of units within the given plot they operate within the Kilimani area has. The current development in terms of total number of units within a single land parcel were indicated by the respondents. On average 18 units are said to have developed within a single plot. The minimum number being 4 while the maximum number being about 48 units as show in the table 4-4 below.

Table 4-4: Statistics of current development in units of occupancy per plot

Mean	18.55
Median	12.00
Std. Deviation	11.28
Range	44
Minimum	4
Maximum	48

Source: Field Survey, June 2015

4.2.2.5 Current development in terms of ground coverage

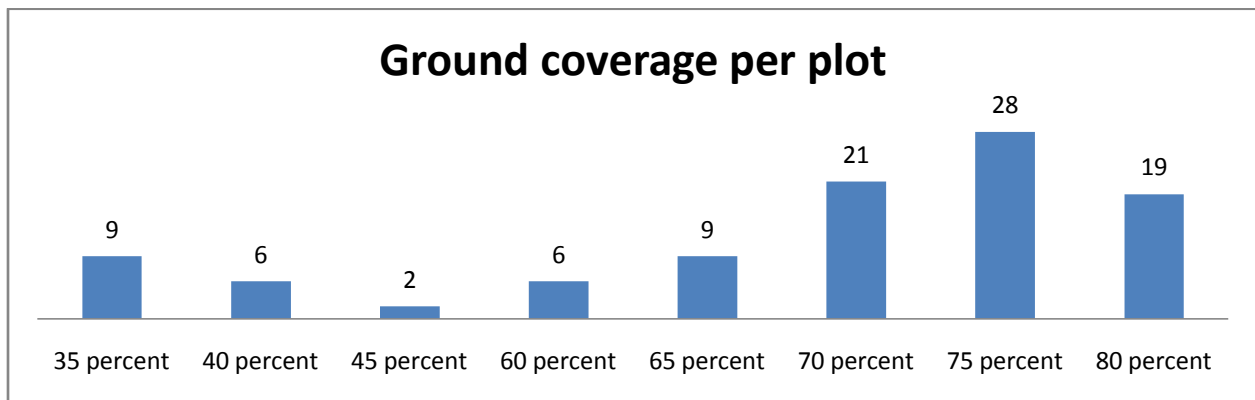
The respondents were asked to indicate the approximate ground coverage the house they operate within the Kilimani area ocupys. The highest ground coverage was about 80% of the plot area while the least coverage was at 35% of the total land size as shown in the table 4-5 below.

Table 4-5: The frequency of the ground coverage per plot

Ground coverage level	Frequency	Percentage %
35 percent	5	9
40 percent	3	6
45 percent	1	2
60 percent	3	6
65 percent	5	9
70 percent	11	21
75 percent	15	28
80 percent	10	19
TOTAL	53	100

Source: Field survey June 2015

Figure 4-6: The frequency of the ground coverage per plot

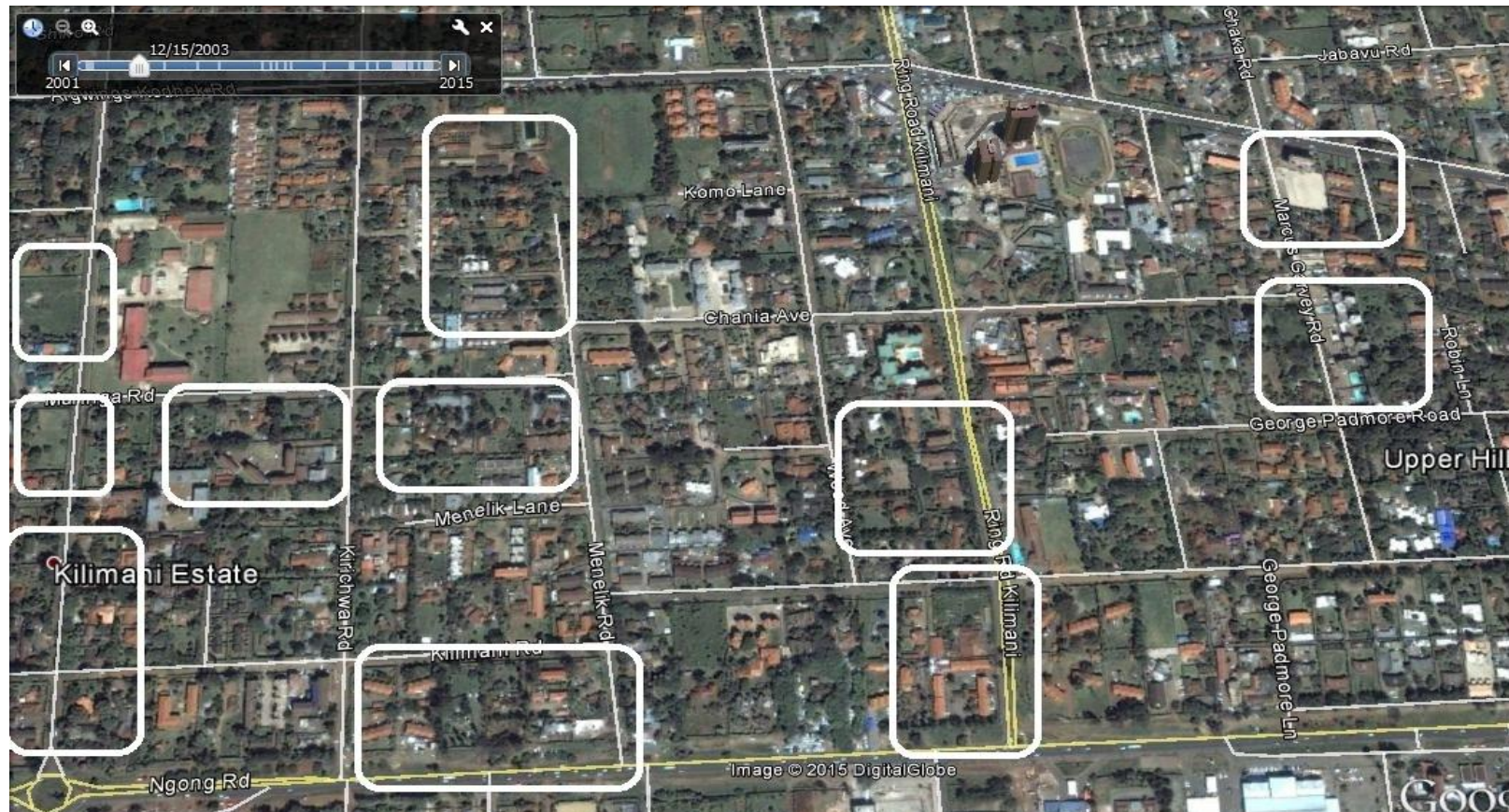


Source: Field Survey, June 2015

4.2.3 Prevalence of real estate development in the study area

Based on the google images obtained, there has been tremendous developments in real estate within the study area. Most of the neighbourhoods have been transformed from single or low house development to highrises and storey houses within the Kilimani area as shown in the figure 4-7 below.

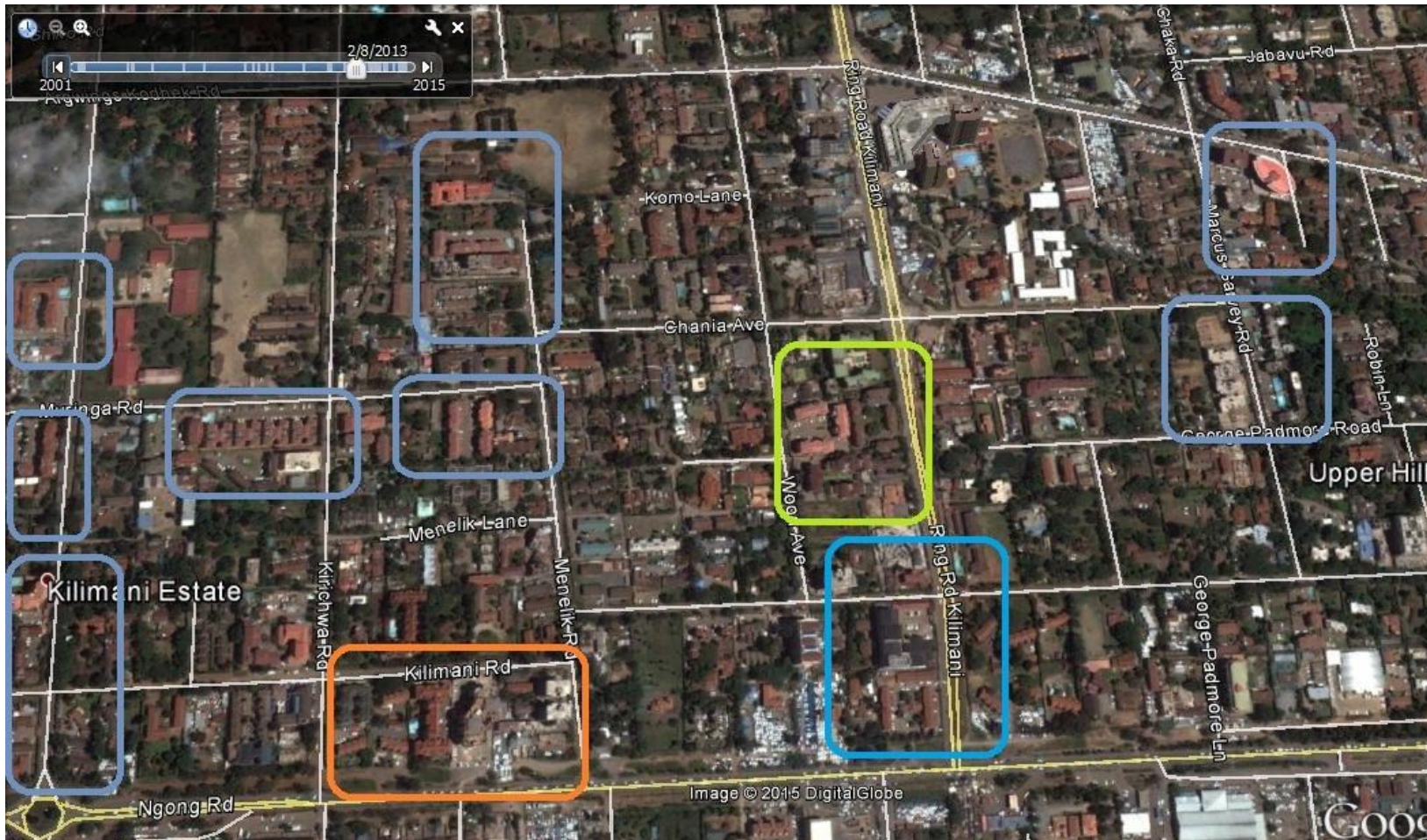
Figure 4-7: Low house developments within Kilimani area



Source: Google earth 2003

A comparison of a number of neighbourhoods and streets (shown through circles) indicate a development in real estate. Within a range of 11 years, it was observed that a number of neighbourhoods have been transformed as shown on the figure 4-8 below.

Figure 4-8: Mass development within Kilimani area



Source: Google earth 2014

4.3 Causes of real estate developments

The respondents were asked to indicate what do they view as the reasons for the current development in real estate developments within the study area. A number of causes were identified with high demand and low supply of housing within the study area being perceived as the key reason. On the other hand permission for development from authority was the least reasons for development as shown in the table 4-6 below.

Table 4-6: Reasons for developments in real estate.

Causes of real estate developments	Frequency	Percentage %
Availability of resources for development	10	15
The high value of land within the area	15	22
The development trends of the neighbouring land parcels	8	12
The willingness to invest in real estate development	7	10
There is high demand and low supply of housing within the study area	18	27
The permission for development from authority	4	6
There are low risks accompanied by investing in real estate.	5	7
TOTAL	67	100

Source: Field Survey, June 2015

4.4 Housing typology and sustainable urban environment.

The study targeted commercial and residential real estate developments within the Kilimani area. Based on the four different types of housing under the two categories of real estate the following were the findings obtained from the field.

4.4.1 Bungalows and single storey houses

This type of housing do not have adverse effects on urban environment as observed in the land parcel within the study area. The plot area still have a large portion of its area covered by green vegetation and indigenous trees. The plots also releases less water runoff to the adjacent road and drainage systems. Most of the rainy water are able to infiltrate within the land parcel. Additionally land parcels under this level of use are surrounded by life fence which also in turn act as air purification through intake of excess carbon dioxide.

Figure 4-9: Old Bungalow and Green courtyards along Galana road in Kilimani area



Source: Field Survey, June 2015

4.4.2 Semi detached and row housing

This type of housing has a low degree of effect to the urban environment as observed in the land parcel within the study area. The land parcels have relatively been developed thus interfering with the original vegetation cover and indigenous trees. However due to the fact that the infrastructures within the area had been developed to accommodate this type of housing. Therefore the urban environment are are only affected on the element of vegetation cover rather than the infrastructures. Most of the land parcels under this level of housing are surrounded by concrete fence and gates. Therefore is also low level of infristration due to high portion of courtyards being covered by concrete.

4.4.2.1 Multi dwelling residentials or apartment.

This type of housing has a significant degree of effects to the urban environment as observed in the land parcel within the study area. The land parcels are highly developed thus interfering with both the original vegetation cover and indigenous trees; and the surrounding infrastructure services receive more volume than had been planned for hence affecting the urban environment.

Therefore the urban environment are are largely on both elements of vegetation cover and the infrastructures services provision.

Figure 4-10: New residential developments along Lenana road in Kilimani area



Source: Field Survey, June 2015

Figure 4-11: Upcoming apartments for residential development along Argwings Kodhek road in Kilimani area.



Source: Field Survey, June 2015

4.4.2.2 Multi Storey

This type of housing has a significant degree of effects to the urban environment as observed in the land parcel within the study area. The land parcels are highly developed thus interfering with both the original vegetation cover and indigenous trees; and the surrounding infrastructure services receive more volume than had been planned for hence affecting the urban environment.

Therefore the urban environment are largely affected on both elements of vegetation cover and the infrastructures services provision.

Figure 4-12: Recent multi storey commercial developments along Galana and Lenana roads in Kilimani area.



Source: Field Survey, June 2015

Figure 4-13: Upcoming multi storey building along Lenana road in Kilimani area.



Source: Field Survey, June 2015

4.4.3 The real estate developments and infrastructure services

4.4.3.1 Level of Infrastructure services provision.

During data collection, the respondents were asked to indicate the level of sufficiency of the current infrastructure in relation to the new developments in real estate. The question was intended to determine the capacity of the available infrastructural facilities. In general, water and sewerage services was said to be moderately sufficient; the roads and transportation was lowly

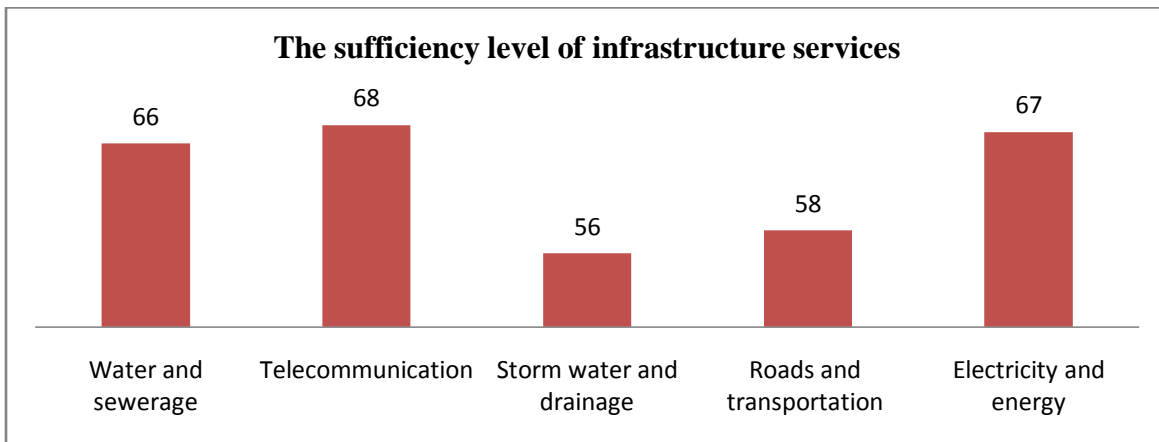
sufficient; Storm water and drainage was moderately sufficient; electricity and energy was also moderately sufficient and finally telecommunication was also moderately sufficient. In order to rate the level of sufficiency, score were assigned to each category of response. For low sufficiency, a weighted score of 1 was awarded while the weighted score of 5 was awarded to number of responses who said the infrastructure is very greatly sufficient. The percentage of sufficiency was determine out of 250 as shown in the table 4-8 and figure 4-15 below. Telecommunication ranked the highest in sufficiency level at 68%; electricity and energy supply was at 67%; water and sewerage was at 66% and roads and transport was at 58%. Finally storm water and drainage was the least sufficient infrastructure at 56%.

Table 4-7: The sufficiency of infrastructure services

Infrastructure services	Score for sufficient in 250 score	Percentage
Telecommunication	171	68
Electricity and energy	167	67
Water and sewerage	166	66
Roads and transportation	146	58
Storm water and drainage	141	56

Source: Field Survey, June 2015

Figure 4-14: The sufficiency of infrastructure services



Source: Field Survey, June 2015

Figure 4-15: High vehicular traffic near Valley Arcade and Kilimani primary school along Argwings Kodhek road in Kilimani area



Source: Field Survey, June 2015

Figure 4-16: Evidence of water flooding along Argwings Kodhek and Galana roads in Kilimani area



Source: Field Survey, June 2015

Figure 4-17: Blockages of storm water drainage system along Galana and Lenana roads in Kilimani area



Source: Field Survey, June 2015

4.4.4 The challenges on infrastructure services .

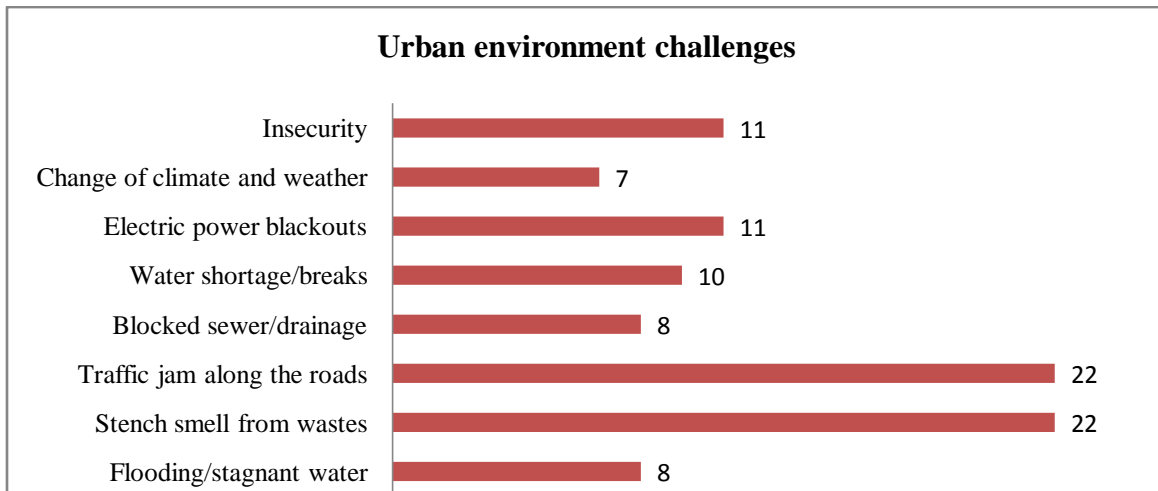
The respondents were asked to indicate the challenges which they perceive to have been brought about the real estate developments within the study area. A number of challenges were raised with both stench smell from wastes and increased traffic jam being the most experienced challenges. On the other hand change in climate and weather was the least challenge experienced as shown in the table 4-7 below.

Table 4-8: General effects of real estate to the neighbourhood.

Challenges experienced	Frequency	Percentage %
Stench smell from wastes	16	22
Traffic jam along the roads	16	22
Electric power blackouts	8	11
Insecurity	8	11
Water shortage/breaks	7	10
Flooding/stagnant water	6	8
Blocked sewer/drainage	6	8
Change of climate and weather	5	7
TOTAL	72	100

Source: Field Survey, June 2015

Figure 4-18: General effects of real estate to the neighbourhood



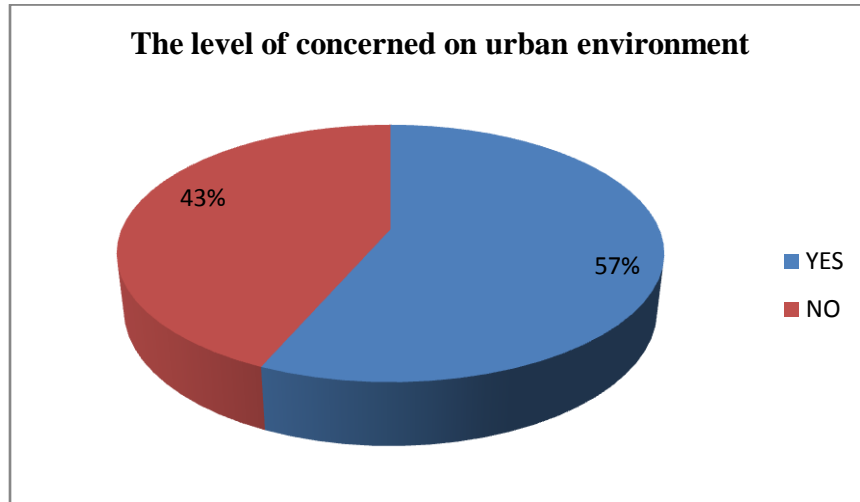
Source: Field Survey, June 2015

4.5 Real estate development and urban vegetation

The respondents were asked if they are concerned with the level of sustainability in urban environment as a result of the current development in real estate. Over 55% of the respondents

alluded to have concerns on the sustainability of the environment. The rest 43% are not concerned as shown in the figure 4-19 below.

Figure 4-19: The percent of concerned respondents on the urban environment



Source: Field Survey, June 2015

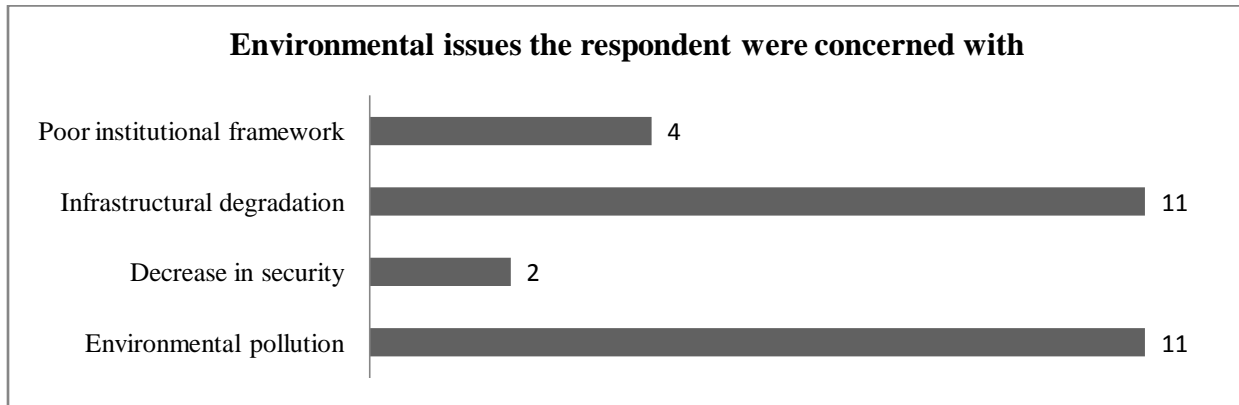
The respondents were also asked to mention the issues which makes them concerned as a result of the developments and the level of sustainability in urban environment. The respondents pointed out that they are more concerned with both the level environmental pollution and the infrastructure degradation. The least concerned environmental issue was the Decrease in security; however some also mentioned the poor institutional framework in terms of corruption and stakeholder involvement in the real estate development.

Table 4-9: The issues that respondents are concerned with on urban environment.

Environmental Issues concerned	Frequency
Environmental pollution	11
Decrease in security	2
Infrastructural degradation	11
Poor institutional framework	4
Total	28

Source: Field Survey, June 2015

Figure 4-20: The issues that respondents are concerned with on urban environment.

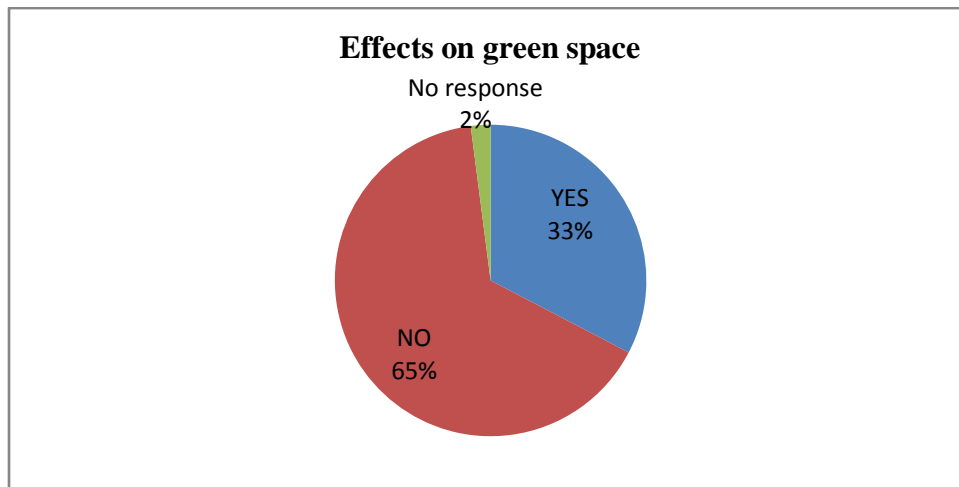


Source: Field Survey, June 2015

4.5.1 The effects of developments on green spaces.

The respondent were asked to indicate if they were concerned about how the developments have affected the available green spaces as an element of urban environment. Only 33% said to be concerned on the green spaces as a result of real estate developments. The other 65% said that they aren't concerned with the impacts on green spaces caused by the real estate development. The remaining 2% did not reply on the question asked as shown in the figure 4-12 below.

Figure 4-21: The view of whether the development affects the urban environment



Source: Field Survey, June 2015

4.5.2 Environmental concerns on green spaces

The respondents were also asked to indicate the level of concern of the current development in real estate in relation to the green spaces as an environmental sustainability element. The

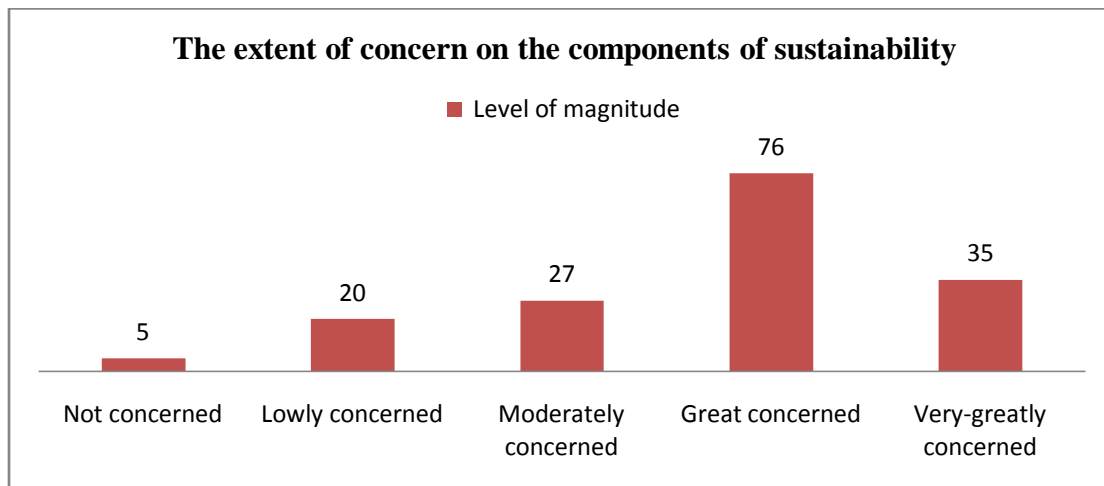
question was intended to determine the respondents view on the ecosystem and biodiversity as factors on the urban environment. In general, the respondents were greatly concerned on impact of the green space as shown in the table 4-9 below. In order to determine the magnitude of these concerns, scores were assigned on each category of the response. For not concerned response, a weighted score of 1 was awarded all the way to the weighted score of 5 which was awarded to number of responses who said that they are very greatly concerned with the green spaces. The maximum score for the level of concerns will 250; however the response from the field study is 163, which accounts to about 65.2%.

Table 4-10: The level of concern with effects of the development on the green space

Level of concern	Environmental sustainability	Level of magnitude
Not concerned	5	5
Lowly concerned	10	20
Moderately concerned	9	27
Great concerned	19	76
Very-greatly concerned	7	35
Total	50	163

Source: Field Survey, June 2015

Figure 4-22: The level of concern with effects of the development on the green space



Source: Field Survey, June 2015

Figure 4-23: Extensive destruction of fauna and flora for real estate development



Source: Field Survey, June 2015

Figure 4-24: Some of current conserved vegetations within Kilimani estate



Source: Field Survey, June 2015

4.5.3 Urban environment mitigation measures.

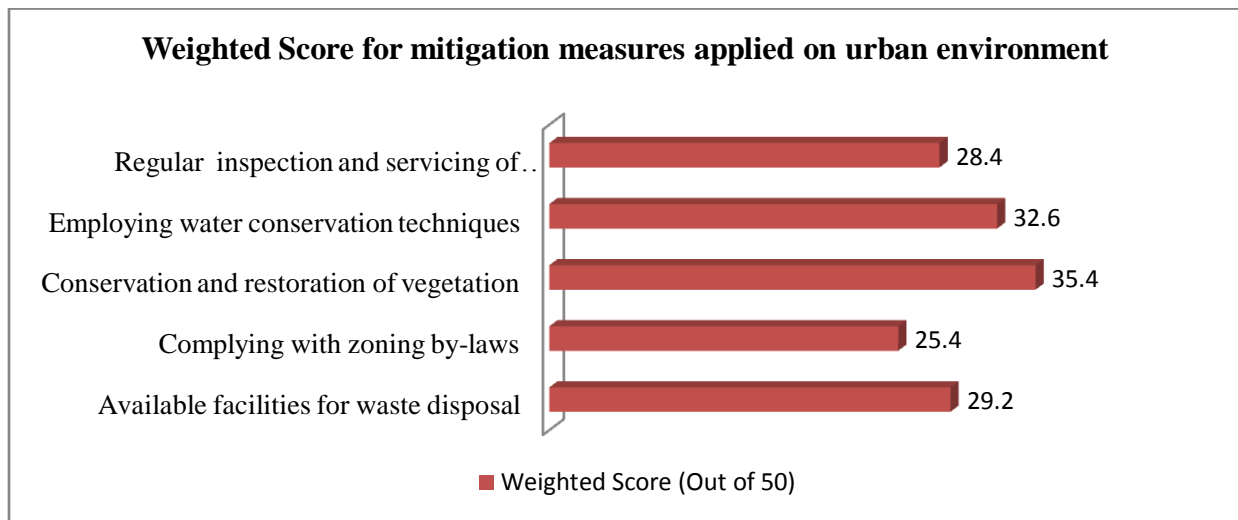
The respondents were asked to indicate the level of satisfaction in which the environmental mitigation measures have been implemented on the new developments in real estate within Kilimani area. The question was intended to determine whether there are enough efforts to conserve the urban environment. In general, the conservation and restoration of vegetation can be well implemented as it is scored the highest weighted level of satisfaction at above 70%. This was followed by the employment of water conservation techniques at 65.2%; then the available facilities for waste disposal at 58.4%; and regular inspection and servicing of drainage at 56.8%. The mitigation measure taken within the area is the complying with zoning by-laws which was at 50.8% as shown in table 4-10 below.

Table 4-11: Level of satisfaction on mitigation measures

Mitigation measures	Weighted Score (Out of 50)	Percentage Level of satisfactory
Available facilities for waste disposal	29.2	58.4
Complying with zoning by-laws	25.4	50.8
Conservation and restoration of vegetation	35.4	70.8
Employing water conservation techniques	32.6	65.2
Regular inspection and servicing of drainage	28.4	56.8

Source: Field Survey, June 2015

Figure 4-25: Mitigation measures applied on urban environment



Source: Field Survey, June 2015

4.5.4 Recommendations on urban land use management framework

The respondents were asked to give the appropriate recommendations on ways in which real estate developments can ensure sustainable urban areas. Over 25% of the respondents recommended the improvement of roads infrastructure with over 15% recommending the improvement of security as another appropriate way for developments in real estate. The other notable recommendations are: the improvement of drainage system; the creation of all inclusive development process; the improvement of water supply; planting of trees and the improvement of garbage collection system among others as shown in the table 4-12 below.

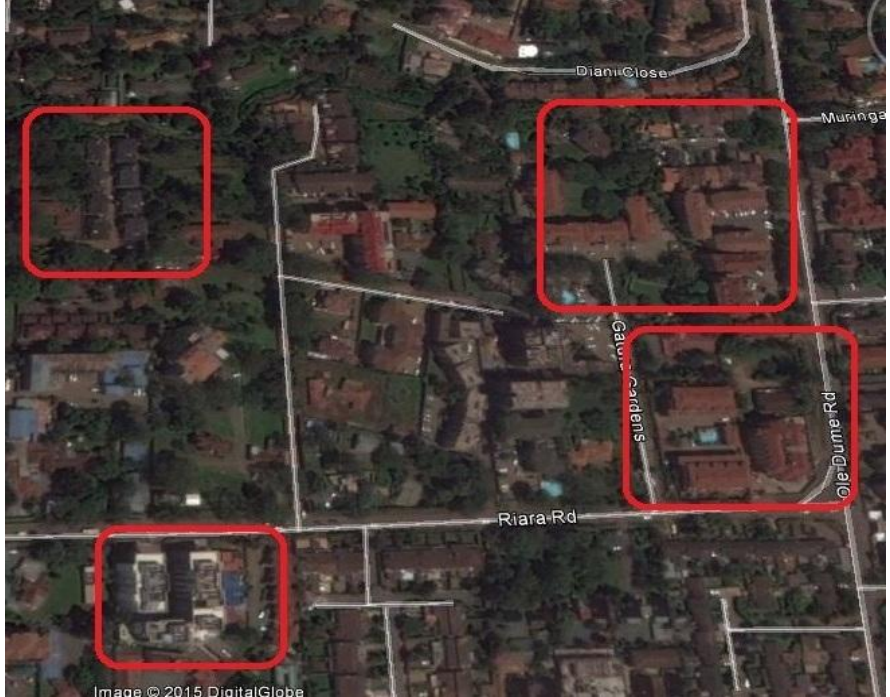
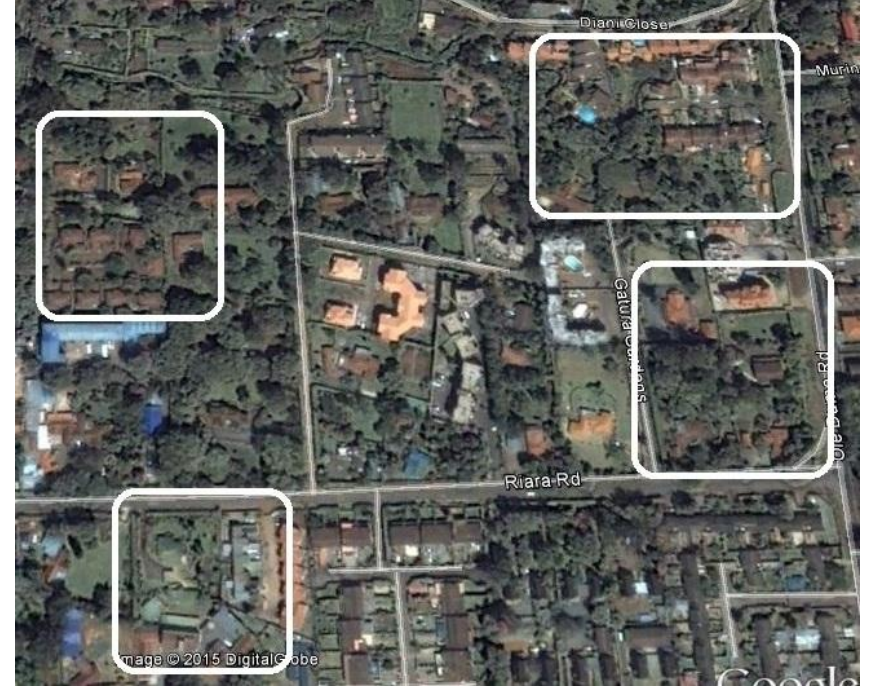
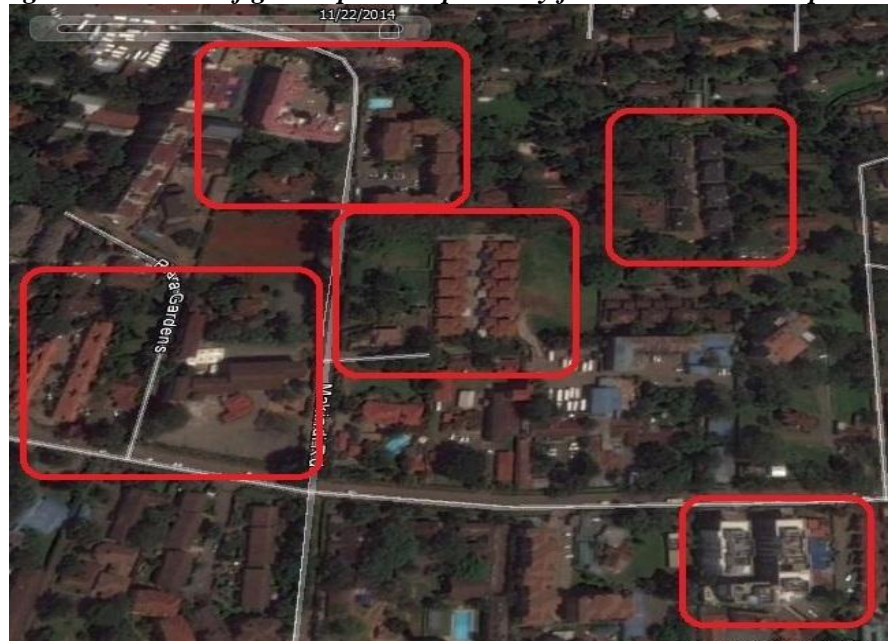

Table 4-12: Recommendations on proper real estate developments within Kilimani estate.

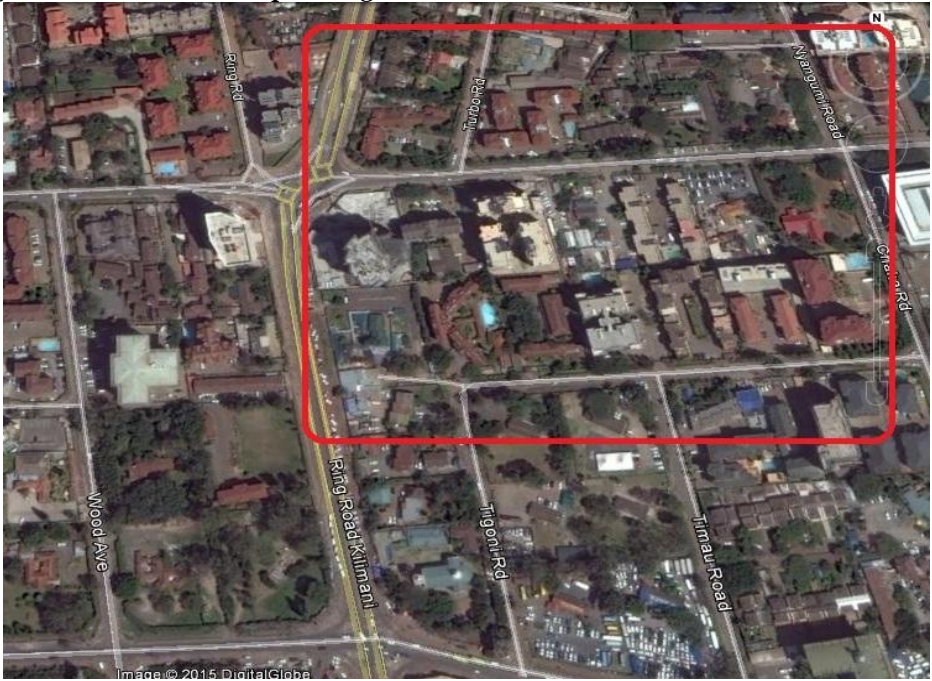
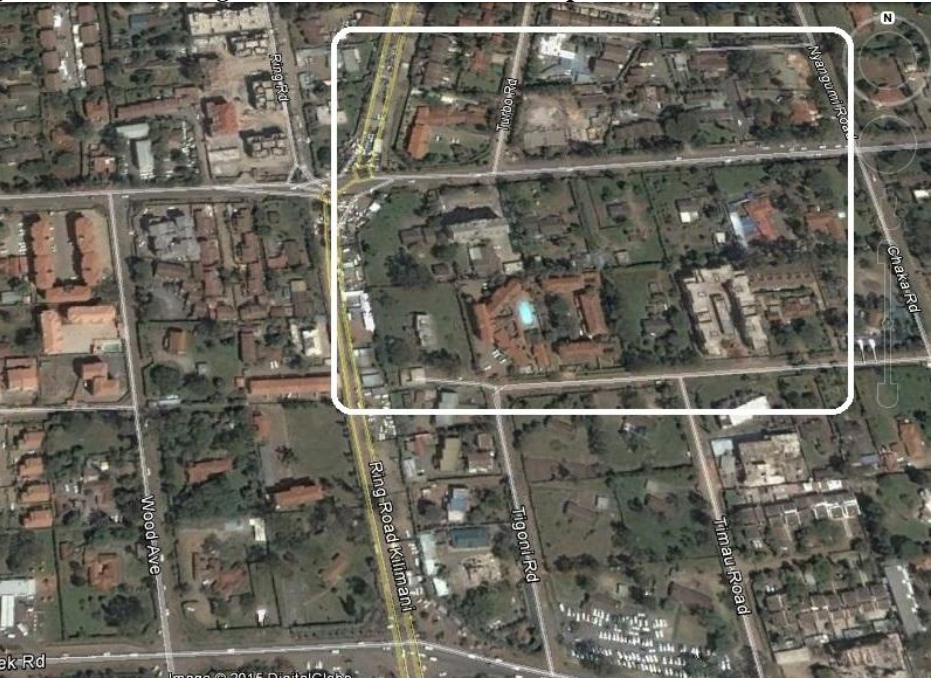
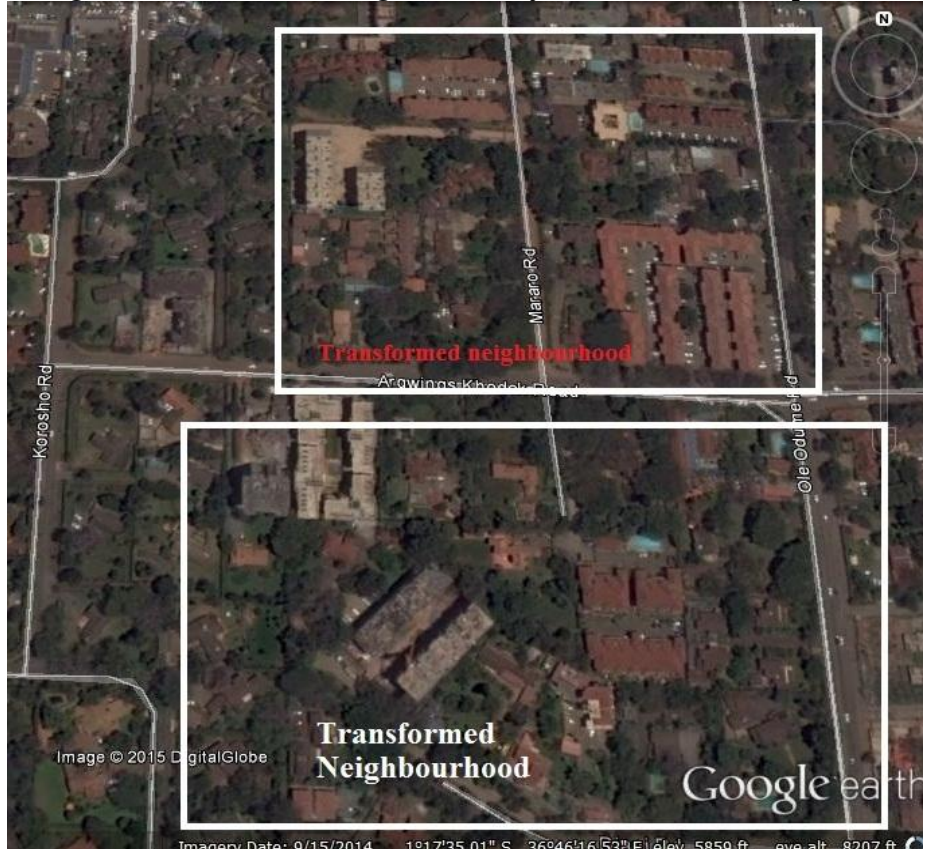

Recommendations	Scores	Percentage %
Improve on road infrastructure	12	26
Improve on security	10	22
Improve on drainage system	6	13
Create an all inclusive committee to deal with urban environment	4	9
Improve on water supply	3	7
Planting of more trees to improve the climate and weather	3	7
improve telecommunications in the area`	2	4
Regular and improvement of garbage collection	2	4
Improve on human labour within the area	1	2
Improve on environmental conservation	1	2
Improve electric and energy systems	1	2
Check on mobile network connectivity	1	2

Source: Field Survey, June 2015

4.6 Scenario analysis of the study

The key indicators to guide the increase in real estate developments were revealed by literature review. The aerial images obtained from as early as 2001 to as current as 2015 were compared in order to justify the extent of developments and urban environment.

No	Impacts	Current state of the study area	Previous state the study area	
1	Increased supply of residential developments	<p>Figure 4-26: Massive residential development within Kilimani estate</p> 	<p>Figure 4-27: Low level residential development in Kilimani estate</p> 	<ul style="list-style-type: none"> • In 20014, the same land parcels have been developed into a multiple or multi-unit of apartments and flats. • In 2003 the land parcels had developed with single dwelling units,
2	Loss of vegetation	<p>Figure 4-28: Loss of green spaces to pave way for real estate development</p> 	<p>Figure 4-29: The former green spaces that have been cleared</p> 	<ul style="list-style-type: none"> • In 2003 the land parcels was well endowed with vegetation and green space while developed with single dwelling units, • In 20014, the same land parcels which had trees have been cleared to pave way for development of multiple or multi-unit of apartments and flats.

<p>3 Increase in build up area</p>	<p>Figure 4-30: The redeveloped neighbourhood in Kilimani area</p> 	<p>Figure 4-31: The neighbourhood with less build up area</p> 	<ul style="list-style-type: none"> • In 2004 the neighbourhood was less covered with buildings and brown areas while developed with low level residential development single dwelling units, • In 2015, the same neighbourhood has been filled with buildings and high-end development of commercial storey, multiple or multi-unit of apartments and flats.
<p>4 Transformed neighbourhood</p>	<p>Figure 4-32: The urban neighbourhood filled with new developments</p> 	<p>Figure 4-33: The urban neighbourhood with less development</p> 	<ul style="list-style-type: none"> • In 2002 the neighbourhood was less covered with buildings and brown areas but had more vegetation while developed with low level residential development single dwelling units, • In 2014, the same neighbourhood has been filled with buildings and high-end residential development of multiple or multi-unit of apartments and flats which have transformed the neighbourhood.

5	Increased supply of residential developments	<p>Figure 4-34: Commercial corridor with massive development</p> 	<p>Figure 4-35: Commercial corridor with low level developments</p> 	<ul style="list-style-type: none"> • In 2006 the commercial corridor had less developments in real estate along Ngong road while developed with low level commercial buildings, • In 2015, the same commercial corridor has been filled with buildings and high-end development of commercial storey, multiple or multi-unit of apartments and flats.
6	Poor conditions of the infrastructure	<p>Figure 4-36: The poor state of infrastructure within study area</p> 	<p>Figure 4-37: Well developed road infrastructure in neighbouring estate</p> 	<ul style="list-style-type: none"> • The neighbouring estate of Kileleshwa and Lavingtone have adequate road infrastructure well maintained to cater for the level of real estate within their neighbourhoods • Some parts of the study area within Kilimani estate have infrastructures which are in poor conditions due to increased pressure of their capacity.

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents a summary of the findings presented in chapter four and the conclusions made by the researcher from the findings. The chapter also presents the recommendations made by the researchers. All this is done in respect to the stipulated objectives.

5.1.1 Summary of the study

The purpose of this study was to investigate the effects of real estate development like change of use, extension of use and subdivision or amalgamation among others on the urban environments. The study also aimed at identifying gaps in the process of urban land use developments which may lead to unsustainable urban area. Employing a descriptive cross sectional design and quantitative information, the study targeted a number of developments within Kilimani area. Random sampling provided a sample of 50 households, 8 real estate developers and one local authority. Data was collected from sampled respondents using a semi-structured questionnaire. Data was analyzed with the help of SPSS version 15 for windows. The findings of the study as per the objective were:

On the prevalence of real estate development in the study area, Over 80% of the respondents were involved in demand-led development of real estate while only 20% are involved in infrastructure-led development under zoning plan. Under the demand-led development, change of use was the most prevalent real estate development with over 50% of the respondents while extension of use was about 30%. None of the respondents pointed out to have been involved in the subdivision planning as

On the concerns on sustainability of urban environment as a result of the real estate development; over 55% of the respondents alluded to have concerns on the sustainability of the environment, the rest 43% are not concerned of the environment.

The respondents pointed out that the level environmental pollution and the infrastructure degradation had been their main concerns during the developments. The least concerned environmental issue was the Decrease in security; however some also mentioned the poor institutional framework in terms of corruption and stakeholder involvement in the real estate development.

On the levels of new and proposed developments within Kilimani area, the residential land uses were the most developed at about (63%) of the respondents indicated they stay within kilimani area. On the other hand 47% indicated they work within commercial land uses. On the type of land use, the flats/appartments were the most type of houses available within Kilimani area with about 47% while single storey was the least with less than 5% of the respondents. Most of the houses are made up of four (4) floors, on the other hand 7 and 3 floors were the least number of houses within Kilimani estate as the study area. The total number of units within a single land parcel were indicated by the respondents and on average 18 units are said to have developed. The minimum number being 4 while the maximum number being about 48 units. The highest ground coverage of the houses within Kilimani area was about 80% of the plot area while the least coverage was at 35% of the total land size.

On the challenges perceived to have been brought about the real estate developments within the study area. A number of challenges were raised with both Stench smell from wastes and increased traffic jam being the most experienced challenges. On the other hand change in climate and weather was the least challenge experienced.

On the level of sufficiency in the infrastructure in relation to developments in real estate and the capacity of the available infrastructural facilities, water and sewerage services was said to be moderately sufficient; the roads and transportation was lowly sufficient; Storm water and drainage was moderately sufficient; electricity and energy was also moderately sufficient and finally telecommunication was also moderately sufficient.

On the level of concern of the current development in real estate in relation to urban environment, many of the respondents were moderately concerned on economic sustainability; most of the respondents were also greatly concerned on environmental sustainability; most of the

respondents were also greatly concerned with the social sustainability. Finally most of the respondents were moderately concerned with Human/capital sustainability.

On the environmental mitigation measures that have been implemented on the new developments in real estate within Kilimani area. The respondents were greatly satisfied on conservation and restoration of vegetation; the respondents were both moderately satisfied and greatly satisfied on how there has been employment of water conservation techniques; the respondents were also greatly satisfied with the regular inspection and servicing of drainage; the respondents were also moderately satisfied with the available facilities for waste disposal and servicing of drainage. Finally the respondents were lowly satisfied with complying with zoning by-laws.

On the appropriate recommendations on ways in which real estate developments can ensure sustainable urban areas. Over 25% of the respondents recommended the improvement of roads infrastructure with over 15% recommending the improvement of security as another appropriate way for developments in real estate. The other notable recommendations are: the improvement of drainage system; the creation of all inclusive development process; the improvement of water supply; planting of trees and the improvement of garbage collection system among others

5.2 Conclusions

The study has established that there has been as prevalence in real estate development as a result of many factors; availability of land and property for development, increase in demand for residential and commercial properties, increase in urban population, the economic growth as a result of remittances, high class residential and commercial spaces and provision of transport, the expansion of urban infrastructure, sub-division of urban land into unviable sizes, and lack of public participation in land use conversions. Other causes include; the low supply of real estate property in the current market, the low returns in the previous real estate ventures, the high value of land, a significant size of buildable land being under the public land and faulty public interventions on housing programs like slum upgrading. These have been noted to be interrelated.

Further the research has established that the management framework on urban land use and real estate development is either inadequate or ineffective. The policy, legal and institutional frameworks are non-existent or new or inadequate and/or ineffective. Further, there is lack of

public participation and extensive consultation in urban land use planning and real estate development. According to literature reviewed, these are must to ensure sustainable urban environment.

5.3 Recommendations

In the light of the above findings, the researcher recommends the following that are pertinent to appropriate management and regulation of urban land and real estate development:

1. Allocation of urban land uses.

The land parcels should be allocated their suitable land uses using the infrastructure led model of development during the initial master planning stage of the entire urban area. This will ensure that the land or property owner is not be allowed to alter or vary the assigned land use until the next planning period or the expiry of the land use plan. Land uses are properly arranged so that they do not interfere with one another and can meet each other's needs as much as possible; this goal is a challenge of urban land-use planning. The land uses which leads to conflict are well placed within the urban area with clear modes of mitigating possible conflicts.

2. The comprehensive infrastructure development.

Before the implementation of the entire land use master plan for given town or city, an actualization of the proposed infrastructures should be undertaken in order to serve the expected real estate properties within the urban area. All the concerned institutions should actualize their goals on infrastructure provision with the aim of making the residents comfortably accommodated within the urban area.

3. Good land and real estate management and governance

There is need for public institutions responsible for both urban land management and general environment should conduct their affairs and manage real estate development in a transparent and rational manner in order to guarantee sustainable use of land resources. The process of decision-making and the process by which decisions are implemented should be well informed and for the national's current and future interests. Good land management and governance will ensure that relevant policies, laws, effective institutions and meaningful public participation are effectively developed and implemented to guide sustainable urban environment. These practices

will also prevent or reduce the levels corruption, reduce government instability and ensure meaningful public education, all of which may contribute to poor urban land and real estate management.

4. **Environmental Impact Assessment and audit**

It is proposed that all the proposed major developments in the neighbourhood, which are likely to have adverse negative impacts, should be subjected to Environmental Impact Assessment (EIA), in accordance with the provisions of Environmental Impact Assessment regulations of 2003. This proposal should be enforced by National Environment Management Authority (NEMA) in conjunction with the City Council. The above institutions should carry out an audit of the urban biodiversity which entails gathering of ecological information and using the same information to know what is available within the urban areas. They should also evaluate the capacity of the urban environment to sustain the population trends.

5. **Other recommendations**

Preservation and conservation of vegetation within the area. Some land parcels within the urban area which had less than 10% or no building should be indentified and conserved to act preservation site. The vegetation will also help in air purification within the neighbourhood due to the increased level mechanization and emission of toxic gases especially carbon dioxide which is taken up by plants.

Landscaping within the neighbourhoods. Where there will be replacing of trees and grass which had been removed before and during construction of the real estate. The landscaping should be done in a manner to ensure proper functioning of the available storm water system in the urban areas. This should also be done to minimize water runoffs from the residential and commercial properties.

Increase the ratio of green space to plot sizes to at least one third. The additional green space or open space shall allow for additional infiltration during and after rainy seasons. It will also provide room for increased ventilation and personal or social security for the urban dwellers.

Establishment of water reservoirs especially within land meant for public utilities like the schools hospitals and chief of district headquarters. This will ensure steady flow of water within the neighbourhood.

Encourage tradeoff on elevations and skylines where properties with higher level should not be development in succession or adjacent to each other. One should give out the privilege to develop a tall building to other through sharing of the right on the other building. This should be encouraged in cases where tall developments have already come up.

5.4 Areas of Further Research

1. This research proposes further research on the possibility of enacting appropriate institutional framework involving public-private partnership in the sustainable real estate development. This framework should be broad based to include housing and physical infrastructure provision alongside environmental conservation.
2. The study mainly focused on real estate development for private developers; however the public land within the urban area has uniqueness in real estate development. The research proposes for further studies on public land management and maximization of returns during real estate development.
3. The study concentrated in the Nairobi city which is largely cosmopolitan, the researcher recommends a similar study be carried out in a growing urban area with unique urban features like physical barriers and economic drives for comparative analysis. More research should also go focus into the type of development projects being undertaken and their effect on the environment.

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APENDIXES

Appendix I: Questionnaire for the Real Estate Developers.

University of Nairobi
Department of Real Estate and Construction Management

QUESTIONNAIRE FOR THE REAL ESTATE DEVELOPERS

This questionnaire is in aid of a research project being conducted by Mr. Augustine Juma Katiambo, MA in Valuation and Property Management student at the University of Nairobi, to facilitate investigation of: *the effect of developments in real estate property on sustainable urban environment*. This is carried out in recognition of the fact that urban areas can only be sustainable if there exists a responsive and effective framework on developments in real estate property. The information sought here is for academic purposes and will be treated with utmost confidentiality.

Name of the developer/ real estate development company

1. For how long have you been developing properties in Kilimani Estate?
2. How many real estate properties have you developed within Kilimani area?
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3. Have you been involved in the current developments in real estate property within Kilimani estate?
 - a. Yes
 - b. No
4. If your answer to question number 3 above is yes, are you concerned the level of sustainability in urban environment?
 - a. Yes
 - b. No
5. If your answer to question number 3 above is yes, which types of real estate development have you been involved within Kilimani Estate? (*Tick where appropriate*)
 - a. Change of use
 - b. Extension of use
 - c. Subdivision plan
 - d. Zoning Plan
 - e. Others (Specify)
6. What were the reasons for engaging in the above developments in real estate?

7. Before the current development, what was the previous use on the land you are undertaking development within Kilimani estate.

Land Use	Type of house	Number of floors	Number of units	Approximate plot coverage	Others
Commercial	Multi storey				
	Single storey				
	Bungalow				
	Massionate				
Residential	Apartment/flat				
	Bungalow				
	Massionate				
Agricultural	Bungalow				
	Massionate				
	None				

8. Which other environmental features were within the land parcel before
- a. Trees
 - b. Life fence
 - c. Flours
 - d. Shrubs
 - e. Crops/garden
 - f. Others (specify)

9. What is the proposed or current development you are undertaking within Kilimani estate?

Land Use	Type of house	Number of floors	Number of units	Approximate plot coverage	Others
Commercial	Multi storey				
	Single storey				
	Bungalow				
	Massionate				
Residential	Apartment/flat				
	Bungalow				
	Massionate				

10. Indicate to what extent of your concern on the following components of sustainability as a result of real estate property development in Kilimani estate, where 5 is to a very great extent 4 to a great extent 3 moderate extent 2 low extents and 1 no extent. *(Tick where appropriate).*

Sustainability Components	5	4	3	2	1
Environmental sustainability: Vegetation, air, sound, fauna and flora, Health, and climate among others.					
Economic sustainability: Income, Expenditure, Employment and Taxes and duties among others.					
Social sustainability: Cultural behavior, ethnicity language, Education, and family among others					
Human sustainability: leadership, Land use; Urban form, governance and empowerment among others					

11. How do you rate the level of satisfaction in which the following environmental mitigation measures have been implemented on the new developments in real estate within Kilimani area, where 5 is to a very great satisfied 4 to a great satisfactory 3 moderate satisfactory 2 low satisfactory and 1 no satisfactory. *(Tick where appropriate)*.

Environmental Mitigation measures	5	4	3	2	1
Conservation management and restoration of the vegetation and garden through clearing vegetation and landscaping					
Employing water conservation techniques like using the required amounts to prevent wastages and use of water conserving taps.					
Regular inspection and servicing of the drainage facilities					
Available suitable facilities for the collection, segregation and safe disposal of the wastes.					
Complying with zoning by-laws on development standards					

12. Can you rate the current capacity of the infrastructure services against the developments in real estate? Where 5 is to a very great sufficient in supply and 1 to no supply. *(Tick where appropriate)*.

Services	5	4	3	2	1
Water Sewerage services.					
Roads and Transport service					
Storm water and drainage					
Electricity and energy services					
Telecommunication services					

13. Explain the challenges faced each of the infrastructure services within Kilimani area

a. Water Sewerage services

.....

b. Roads and Transport service

.....

c. Storm water and drainage

.....

d. Electricity and energy services

.....

e. Telecommunication services

.....

f. others (Specify)

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.....
.....

14. In your opinion, has the developments in real estate affected the environment within the Kilimani estate?

- a. Yes
- b. No

15. Indicate the level of your agreement with the following statements on the effect of development in real estate on environment where 5 is strongly agree 4 agree 3 moderately agree 2 Disagree and 1strongly disagree

Statement	5	4	3	2	1
There is reduction in number of trees and green areas within Kilimani estate.					
There is change in weather as experienced within Kilimani estate.					
There is increase in brown land coverage through concrete, sand and stones within the estate					
There is a lot of noise within the estate					
The air within the estate has been polluted.					
There is increase in solid waste generation within the estate					
There is increase in water runoff within the estate					

16. What are your recommendations on appropriate ways of real estate development in order to ensure sustainable urban areas?

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Appendix II: Questionnaire for the Kilimani Households.

University Of Nairobi
Department of Real Estate and Construction Management

QUESTIONNAIRE FOR THE KILIMANI HOUSEHOLDS

This questionnaire is in aid of a research project being conducted by Mr. Augustine Juma Katiambo, MA in Valuation and Property Management student at the University of Nairobi, to facilitate investigation of: *the effect of developments in real estate property on sustainable urban environment*. This is carried out in recognition of the fact that urban areas can only be sustainable if there exists a responsive and effective framework on developments in real estate property. The information sought here is for academic purposes and will be treated with utmost confidentiality.

Name of the respondent (*optional*)

1. For how long have you been living in Kilimani Estate?
2. When was the property you operate in constructed?
3. Are you aware of the current developments in real estate property within Kilimani estate?
 - a. Yes
 - b. No
4. If your answer to question number 3 above is yes, which types of real estate development have you been involved within Kilimani Estate? (*Tick where appropriate*)
 - a. Change of use
 - b. Extension of use
 - c. Subdivision plan
 - d. Zoning Plan
 - e. Others (Specify)
5. If your answer to question number 3 above is yes, are you concerned the level of sustainability in urban environment?
 - a. Yes
 - b. No
6. What are your concerns by the developments on the level of sustainability in urban environment?

7. What were the reasons for engaging in the above developments in real estate?

8. What is the current development you occupy within Kilimani estate?

Land Use	Type of house	Number of floors	Number of units	Approximate ground coverage	Others
Commercial	Multi Storey				
	Single storey				
	Bungalow				
	Massionate				
Residential	Apartment/flat				
	Bungalow				
	Massionate				

9. Which of the following challenges to you experience within the neighbourhood?

- Flooding/stagnant water
- Stench smell from wastes
- Traffic jam along the roads
- Blocked sewer/drainage
- Water shortage/breaks
- Electric power blackouts
- Others (Specify) _____

10. Indicate to what extent of your concern on the following components of sustainability as a result of real estate property development in Kilimani estate, where 5 is to a very great extent 4 to a great extent 3 moderate extent 2 low extents and 1 no extent. (*Tick where appropriate*).

Sustainability Components	5	4	3	2	1
Economic sustainability: Income, Expenditure, Employment and Taxes and duties among others.					

11. How do you rate the level of satisfaction in which the following environmental mitigation measures have been implemented on the new developments in real estate within Kilimani area, where 5 is to a very great satisfied 4 to a great satisfactory 3 moderate satisfactory 2 low satisfactory and 1 no satisfactory. (*Tick where appropriate*).

Environmental Mitigation measures	5	4	3	2	1
Conservation management and restoration of the vegetation and garden through clearing vegetation and landscaping					
Employing water conservation techniques like using the required amounts to prevent wastages and use of water conserving taps.					
Regular inspection and servicing of the drainage facilities					
Available suitable facilities for the collection, segregation and safe disposal of the wastes.					
Complying with zoning by-laws on development standards					

12. Can you rate the current capacity of the infrastructure services against the developments in real estate? Where 5 is to a very great sufficient in supply and 1 to no supply. (*Tick where appropriate*).

Services	5	4	3	2	1
Water Sewerage services.					
Roads and Transport service					
Storm water and drainage					
Electricity and energy services					
Telecommunication services					

13. Explain the challenges faced each of the infrastructure services within Kilimani area

g. Water Sewerage services

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.....
.....

h. Roads and Transport service

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.....
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i. Storm water and drainage

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.....
.....

j. Electricity and energy services

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

k. Telecommunication services

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.....
.....

l. others (Specify)

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.....
.....

14. In your opinion, has the developments in real estate affected the environment within the Kilimani estate?

- a. Yes
- b. No

15. Indicate the level of your agreement with the following statements on the effect of development in real estate on environment where 5 is strongly agree 4 agree 3 moderately agree 2 Disagree and 1strongly disagree

Statement	5	4	3	2	1
There is reduction in number of trees and green areas within Kilimani estate.					
There is change in weather as experienced within Kilimani estate.					
There is increase in brown land coverage through concrete, sand and stones within the estate					
There is a lot of noise within the estate					
The air within the estate has been polluted.					
There is increase in solid waste generation within the estate					
There is increase in water runoff within the estate					

16. What are your recommendations on appropriate ways of real estate development in order to ensure sustainable urban areas?

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Appindexes III: Data Analysis And Workings

A. Calculation of weighted score for level of satisfaction

Level of satisfaction	Complying with zoning by-laws	Weighted scores	Available facilities for waste disposal	Weighted scores	Regular inspection and servicing of drainage	Weighted scores	Employing water conservation techniques	Weighted scores	Conservation and restoration of vegetation	Weighted scores
Not satisfactory	6	1.2	4	1	7	1.4	4	1	1	0.2
Lowly satisfactory	21	8.4	12	5	13	5.2	6	2	9	3.6
Moderately satisfactory	16	9.6	21	13	13	7.8	18	11	12	7.2
Great satisfactory	4	3.2	10	8	15	12	17	14	18	14.4
Vary greatly satisfactory	3	3	3	3	2	2	5	5	10	10
Total Scores	50.0	25.4	50.0	29.2	50.0	28.4	50.0	32.6	50.0	35.4
Percentages		50.8		58.4		56.8		65.2		70.8

B. Calculation of weighted score for sufficiency level of infrastructure provision

Infrastructure services	Not sufficient	Weighted score (X*1)	Lowly sufficient	Weighted score (X*2)	Moderately sufficient	Weighted score (X*3)	Great sufficient	Weighted score (X*4)	Very greatly sufficient	Weighted score (X*5)	Total Weighted score	Percentage
Water and sewerage	2	2	11	22	15	45	12	48	10	50	167	67
Roads and transportation	8	8	15	30	7	21	13	52	7	35	146	58
Storm water and drainage	7	7	13	26	15	45	12	48	3	15	141	56
Electricity and energy	5	5	9	18	15	45	7	28	14	70	166	66
Telecommunication	5	5	6	12	15	45	11	44	13	65	171	68