



UNIVERSITY OF NAIROBI

**LAND-USE TRANSFORMATION AND CHANGES IN PERI-URBAN LIVELIHOODS
IN KISII MUNICIPALITY, KISII COUNTY, KENYA**

BY

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REG NO. B63/12734/2018

**A THESIS SUBMITTED IN FULFILMENT OF THE REQUIREMENTS OF THE
AWARD OF A DEGREE OF MASTER OF ARTS IN PLANNING IN THE DEPARTMENT
OF URBAN AND REGIONAL PLANNING, FACULTY OF BUILT ENVIRONMENT
AND DESIGN, UNIVERSITY OF NAIROBI, KENYA**

DECLARATION

I, **Makori Douglas Momanyi**, hereby declare that this research is my original work and has not been presented in any other university for examination or award of any other degree.



Signed **Date:** 8th June, 2021

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This thesis has been submitted for examination with our approval as university supervisors.



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Prof. J. N. Ayonga

ACKNOWLEDGEMENT

This work could not have been completed without God's presence in my life. I wish to thank Him for all His graces and mercies.

I wish to sincerely acknowledge my supervisors Prof. Jeremiah N. Ayonga and Dr. Elizabeth K. Wamuchiru for their guidance and insightfulness in the course of my studies and in the preparation of this thesis.

I acknowledge with thanks Dr. Fridah Mugo for intensive insights on carrying out research work and constant reminder that I have an obligation to do things right and at the right time.

I sincerely appreciate each and every person who made this work successful.

I also acknowledge my work colleagues. Thank you for the patience, encouragement and standing in for me while I was away from work place.

To the rest of my friends whom I cannot mention their names, I say thank you for your encouragement.

DEDICATION

This research project is dedicated to:

1. The farmers, who, in their own wisdom, saw it wise to conserve their lands for the current and future generations by avoiding the influences of peri-urbanization.
2. My spouse, my children, my parents, my siblings and my friends for their encouragement for me to reach the pinnacle of academia.

ABSTRACT

Currently, more than 50% of the global population lives in towns and cities and the trend is likely to continue. Despite the importance of peri-urban areas as food production zone, increase in urban population has subjected agricultural land in peri-urban regions to severe pressure from a number of different and competing land uses. Eventually, resulting to transformation of quality and quantity of peri-urban agricultural land. This research therefore, aimed at establishing factors responsible for transformation of agricultural land to urban uses; its effects on peri-urban livelihoods; coping mechanisms; and proposing suitable peri-urban land-use planning options to overcome its undesirable effects. The study employed both simple random and purpose sampling techniques in aiding collection of field data and information. The former technique was used to collect data from farmers and land buyers while the latter from government offices. The field data was subjected to both descriptive and quantitative techniques for analysis, and finally presented using mean scores, percentages, tabular and graphical formats.

Using mean scores, the study established that land inheritance practices, price of land, demand for residential housing, improved accessibility, and rising value of agricultural land in urban use, cost of rent at peri-urban area, and customary land tenure are the most significant factors of land-use transformation in the study area. Similarly, using mean scores, the study identified decline/loss of land holding sizes, decline of food production, irregular subdivision and transformation of agricultural land, decline of plant and animal species, decline/loss of farm income, and formation of new social networks as the most significant effects of land-use transformation in areas outside Kisii municipality.

Further, the study established that residential income is the main source of income to farmers in the study area. To address the land-use transformation and its undesirable effects, the study recommended for development of physical and land use plan; zoning and classifying peri-urban land uses; development of policies and legislations for acquisition and transfer of development rights; promote land appropriation and banking; adopt urban containment and rural policies such new ruralism, and compact and polycentric city models. Finally, the study recommended further scientific studies on minimum allowable and economically viable land holding sizes; economic ways of providing affordable housing to remedy undesirable consequences of land-use transformation.

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ABBREVIATIONS AND ACRONYMS

SDG	Sustainable Development Goals
KNBS	Kenya National Bureau of Statistics
GoK	Government of Kenya
KTRH	Kisii Teaching and Referral Hospital
NSP	National Spatial Plan
NLC	National Land Commission
LRT	Light Rail Transit
TOD	Transit-oriented Development
KIG	Key Informant Guide
SPSS	Statistical package for Social Sciences
CBD	Central Business District
USAID	United States Agency for International Development
NLP	National Land Policy
GWASCO	Gusii Water and Sewerage Company
KERRA	Kenya Rural Roads Authority
KPLC	Kenya Power and Lighting Company
PDR	Purchase of Development Rights
TDR	Transfer of Development Rights
TOD	Transit-oriented Development
NLUP	National Land Use Policy
LCB	Land Control Board
KCMB	Kisii County Municipal Board
NGOs	Non-governmental Organizations

CHAPTER ONE: INTRODUCTION

1.1 Background to the study

Currently, more than 50% of the global population lives in towns and cities and the trend is likely to continue (United Nations, 2015). Despite the importance of peri-urban areas as food production zone (Gunilla et al, 2016), increase in urban population has subjected agricultural land in peri-urban regions to severe pressure from a number of different and competing land uses and transformation of agricultural land to urban use is swift (ibid). Webster (2002), argued that availability of relatively cheaper lands has made these areas suitable for investment; thereby making cities expand outwards. Thus, resulting to transformation from rural agriculture with strong mixed farming system, into peri-urban landscape with strong imprints of urbanization.

In Europe and North America, development of peri-urban areas took place in the last half of 20th century during the process of industrialization and urbanization. Eventually, cities expanded outwards leading to changes in urban population, lifestyle and welfare, and governance (Busck et al, 200□; Piorr et al, 2010). In south East Asia and South America, development of peri-urban areas was caused by industrialization, availability of land, and public policies (Webster, 2002). For instance, in Beijing, between 19□9 to 1978, urban areas expanded from 109km² to □□0km² and most of the developments took place along the arteries towards near suburban areas. In South America, Aguilar (2008) explained that peri-urban development took place inconsistently in all directions beyond the built-up area. Webster and Muller (200□), attributed this to migration from smaller towns and cities leading to loss of farmland, socio-spatial segregation, and deconcentration of diverse urban activities.

In Africa, peri-urban development took place due to pervasive urbanization and sprawling of urban areas (Lasisi et al, 2017; Angel, et al, 200□). Particularly, in Nigeria, since 19□0s, exponential population growth has led to overcrowding, distortion of cityscapes, formation of new urban centres, and loss of arable land (Lasisi et al, 2017). In South Africa, peri-urban development was ascribed to migration of black people to former white highlands and the failure of the state to police peri-urban boundaries (Sadiki and Ramutsindela, 2002). The integration of urban and peri-urban areas exacerbated poverty of blacks due to payment of urban service charges.

From the foregoing discussions, land-use transformation in peri-urban areas is a global phenomenon and Kenya's urban areas are not left out in the prevailing global demographic and spatial flux. Ayonga (2019), noted that land-use transformation started to take root with the introduction of exclusionary colonial planning laws and policies. And this, to date, has continued to cause a reduction in quantity and quality of land for farming and disturbing livelihood strategies of peri-urban residents (Thuo, 2010; Anyamba, 2016). However, the phenomenon of land-use transformation in Africa is still understudied, making this inquiry necessary.

1.2 Statement of the research problem

In Kenya, traditionally, land was owned communally and individuals neither had powers to subdivide nor transform its use from one form to another. Nevertheless, with the coming of the colonialists, private tenure system was introduced. This system of land holding, which allowed individuals to own, subdivide and dispose land at will, in turn facilitated land as a tradable commodity in the market; thereby giving birth to land-use transformation especially in urban and peri-urban areas.

The phenomenon of agricultural land-use transformation is not only a local phenomenon rather it is a global concern which affects the economy, the environment, and food security of all the countries, rich and poor (Al Tarawneh, 2014). Thus, resulting to altering the livelihood strategies and displacement of agricultural land use in peri-urban areas (Angel, et al, 2005; United Nations Population Fund, 2007). In the world, regions and countries including North America, South America, United Kingdom, Canada, Australia, China, India, Nigeria, South Africa among others, are grappling with the challenges brought by land-use transformation. In developed countries, land-use transformations are mitigated through planning of urban and rural settlements primarily to promote sustainable livelihoods. While this assertion is true for such countries, in developing countries, development of peri-urban areas is largely unplanned leading to sporadic, spontaneous and haphazard growth which in turn causes loss of farmland.

In Kenya, despite agriculture supporting 70% of the country's employment and food (Kisii County Government, 2018; Kisii County Government, 2018), land-use transformation remains a challenge affecting not only peri-urban arable land but also the residents. Particularly, in peri-urban areas of Kisii municipality, land-use transformation has contributed to a reduction of food production and

per capita income particularly due to a reduction in minimum land holding sizes (ibid). Furthermore, it has exposed peri-urban residents to environmental, social and economic challenges including outpacing the provision of basic social and infrastructure services. Appendix 7, 8 and 9 shows how transformation of agricultural land to urban use has been occurring over the years outside the core of Kisii municipality.

The Kenya's National Spatial Plan (2010), National Land Policy (2009), National Land Use Policy (2017), constitution of Kenya (2010), and land act (2012), have all identified land-use transformations as an area that requires attention of land management authorities to protect arable land from encroachment by urban activities. These laws and policies requires land to be used efficiently, optimally, productively and sustainably for the benefits of all Kenyans. However, rapid proliferation of land-use transformation has contravened these requirements thereby thwarting the achievement of the objective of Vision 2030 and the global Sustainable Development Goals (SDGs), especially on goal number 1, 2 and 11; to end poverty, hunger, and sustainable cities and communities respectively (United Nations, 2019).

Whereas the development of peri-urban areas triggers land-use transformations, the process varies from place to place due to different political, legal, economic and socio-cultural factors. Because of this, scholars have studied the various aspects of land-use transformations in different localities to establish its causes, inform planning intervention and secure sustainable development. However, the studies failed to investigate specific factors causing land-use transformations to overcome its undesirable consequences. Therefore, this study aims to fill this missing gap by establishing the specific factors, effects, and adaptation strategies to cope up with undesirable effects of land-use transformations in areas outside core Kisii municipality. To address this gap, research will strive to establish why, despite availability of open space in the inner municipality, people still have preference for land at its periphery?

1.3 Research questions

The study sought to address four research questions. These were:

1. What are the factors of land-use transformation in peri-urban areas of Kisii Municipality?
2. How does land-use transformation affect the livelihoods of peri-urban residents of Kisii municipality?

3. How do peri-urban residents cope with undesirable consequences of land-use transformation?
4. What planning options exist to mitigate the challenges of agricultural land-use transformation that emerge in peri-urban areas?

1.4 Research objectives

The main purpose of the study was to establish the factors of land-use transformation and how the phenomenon affects the peri-urban areas including the peri-urban residents. The study was guided by specific objectives which were:

1. To determine the factors of land-use transformation in peri-urban areas of Kisii Municipality;
2. To establish how land-use transformation affect the livelihoods of peri-urban residents;
3. To examine the coping mechanisms by peri-urban residents in overcoming undesirable consequences of land-use transformation; and
4. To propose planning options to mitigate undesirable effects of agricultural land-use transformation in peri-urban areas.

1.5 Study hypotheses

In this study, it was hypothesized that:

Null hypothesis

H₀₁: There is a significant difference between rental and farm income; a factor which leads to land-use transformation in favour of urban use in the area of study.

Alternative hypothesis

H_{a1}: There is no significant difference between rental and farm income in the area of study, a factor which leads to land-use transformation in favour of urban use.

Null hypothesis

H₀₂: There is no significant difference in the cost of development between the core municipality and outside it; a factor which favours investment in peri-urban areas.

Alternative hypothesis

H_{a2}: There is a significant difference in the cost of development between the core municipality and outside it; a factor which favours investment in peri-urban areas.

1.6 Justification and significance of the study

The phenomenon of land-use transformation may result to haphazard developments, land use conflicts and eventual undesirable effects on the environment, the economy and on the social behaviours of the peri-urban communities. Hence, if not controlled, the haphazard use of the peri-urban lands will continue to take precedence and thus worsening the situation. Therefore, this study was conducted with the main aim of providing solution to problems facing development of peri-urban areas. The findings of this study can be replicated to other towns facing similar challenges of land-use transformation.

□□ Scope and limitation of the study

This research was limited to establishing the factors, effects, and coping mechanisms to undesirable effects of transforming agricultural land to urban use including peri-urban planning options to mitigate haphazard peri-urban development. The study was carried out in areas to the south and outside the core municipality, engulfed within latitudes $0^{\circ}1'00''\text{S}$ and $0^{\circ}02'00''\text{S}$ and longitude $33^{\circ}01'01''\text{E}$ and $33^{\circ}07'10''\text{E}$, and covering a total land mass of 10 km^2 .

□□ Definition of terms

This study made use of terms to understand the phenomenon of land-use transformation. It was prudent to define and explain all of them as used, but the study concentrated on major ones only. The first term was '*land-use*,' which denotes the activities, classification, and uses, and often determined by economic returns, socio-cultural practices, and public policies (Government of Kenya, 2017; Bhatta, 2010). In the context of this research, land use is regarded as a dynamic process which involves the use of land for a particular purpose, which in this case implies man's varied economic activities geared towards improving wellbeing. Secondly, *land-use transformation* is an administrative process entailing subdivision, registration and conversion of the original agricultural land use to urban uses. The third term was '*peri-urban area*' which according to Rakodi (1998) is a transition zone between fully urbanized land in the cities and areas

in predominantly agricultural use. But, according to this research, peri-urban area is a ‘mixed’ or ‘integrated zone’ where competition for land for urban and agricultural use exist side by side. The fifth term was ‘*peri-urban development*’ which is the transformation of the form and/or the function of land for the continuity of an activity. The sixth term was ‘*livelihood*’ derived from the word life lode, the ‘way of life,’ which refers to the means of securing the basic necessities (food, cloth, shelter and clothing) (Carney et al, 1999). With respect to this research, *livelihood* was used to represent the set of activities the peri-urban inhabitants are engaged in in order to meet the aforementioned necessities to satisfy basic household needs. And lastly, ‘*livelihood strategies/coping mechanisms*’ are actions by an individual or individuals to improve upon or maintain their current well-being or to cope with impoverishment, using a stock of livelihood assets at their disposal (Rakodi and Lloyd-Jones, 2002). The researcher retained this definition for use in the research.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter provides an in-depth understanding of the phenomenon of land-use transformation resulting from peri-urbanization/sprawling of towns and cities. These included definition and concepts of peri-urbanization; factors, effects and coping mechanisms of land-use transformation; policies and legal frameworks and explanation of land-use transformation; and existing planning options for peri-urban areas. It concluded with establishment of a conceptual framework which defined the variables for measurement to address the research problem and objectives.

2.2 The concept of land-use transformation

□□□ Peri-urban area

The term 'peri-urban' is used to describe spaces between the city and rural areas undergoing urbanization (Lambert, 2011; Aberra and King, 2005; Simon et al, 2004; Cavailhès et al, 2004; Ramachandran, 1989). It is a transition zone between urban and rural land predominantly agricultural areas (Rakodi, 2002). The central component in many definitions is that peri-urban area is under rapid change and consists of mixed land use activities (Adell, 1999). Sadiki and Ramutsindela (2002), attributed rapid change to urban expansion as opposed to rural change. Therefore, when viewed in this sense, peri-urban is an extension of the city, not only through the ecological footprint, but also by economic and social processes.

Varkey and Manasi (2019), argued that the term peri-urban can be used in three different contexts - a place, a process and a concept. Common among these contexts, peri-urban area is a transitional zone characterized by intense interaction, linkages, flow of goods and services, and resources between urban and rural areas. Based on this observation, the peri-urban concept transcends the definitions considered solely in terms of geographical location and spatial land use to include physical and socio-cultural transformations (Nyarko and Adu-Gyamfi, 2012; Wegedie, 2018; Wanjiru, 2015). Mandere et al (2010), observed that peri-urban areas are places of competition for resources whose outer limits is determined by maximum daily commuting distance from inner city. Since it lies outside a legally defined geographical jurisdiction (urban boundary),

determination of its end point pose a challenge due to a continuous gradation of residential and non-residential land use.

2.2.2 Urban sprawl

The term urban sprawl is commonly used to describe the physical expansion of urban areas. The European Environment Agency (200□), described sprawl as the physical pattern of low-density expansion of large urban areas, under market conditions, and takes place, mainly in the surrounding agricultural areas. The sprawling of towns is the leading edge of urban growth and it implies lack of and/or inadequate planning and control of land subdivision. Thereby, leading to patchy, scattered and strung out, with a tendency for discontinuity (ibid). It leap-frogs over areas, leaving agricultural enclaves. Sprawling urban areas are the opposite of compact cities - full of empty spaces that indicate the inefficiencies in development and highlight the consequences of uncontrolled growth. In any case, low-density populated areas extend far beyond the centres of cities, with new urban areas spreading along the transportation corridors. Sprawling/peri-urbanization is attributed to the need to realize new lifestyles in areas outside inner city.

2.2.3 The process of land-use transformation in peri-urban areas

According to Webster and Muller (2004), the transformation of arable land occurs through the process of peri-urbanization. Peri-urbanization is a process, often highly dynamic, in which rural areas at the outskirts of cities become more urban in character (Webster, 2002). Therefore, the expansion of cities infuses the phenomenon of land-use transformation due to rise in population of inner city at peri-urban areas (Bruegmann, 2006; European Environment Agency, 2006). Furthermore, Bruegmann (2006), explained that with continued economic growth and expanding networks of public transport, urban population, especially the middle class, would slowly migrate towards the suburban areas and surrounding rural areas. The migration to the periphery is further influenced by transfer of inner city functions (Bogue, 1959; Ardeshiri and Ardeshiri, 2011; Terfa, Chen, Zhang, and Niy, 2020). Thus, resulting to demand for land for residential development (Habibi and Asadi, 2011; Haregewoin, 2001).

Brueckner (2000), attributed the phenomenon of land-use transformation to three market failures. The first arises from failure to account for the social value of open spaces when arable land is converted to urban use. The second arises from failure on part of individual commuters to

recognize the social cost of congestion created by their use of the road network, which leads to excessive commuting and cities that are too large. In this case, commuters incur substantial costs, which include out-of-pocket expenses of vehicle operation and congestion which prolongs commuter's trip hence 'time cost.' Although this extra congestion is slight, its impact is significant because many other commuters are affected. Additionally, because costs are also borne by other commuters, the commuter himself has no incentive to take them into account. This missing incentive constitutes a market failure, and it means that commuting on congested roadways looks artificially cheap to individual commuters.

The last arises from a failure of real estate developers to take into account all the public infrastructure costs generated by their projects. This is because the new cost of physical and social infrastructure is shared among all of the residents rather than charged directly to those who require the new infrastructure. As a result, infrastructure is priced approximately at average cost rather than marginal cost. Because of this, homeowners are able to pay a higher purchase price for their houses than if the correct tax were levied. Thus, making developers to offer more for agricultural land than would be possible if the correct tax burden were levied on new homeowners (Brueckner, and Fansler, 1983; Brueckner and Kim, 2003).

However, in regions where agricultural land is more productive and its value high, Brueckner and Fansler (1983) explained that cities tend to be compact because productive land is more resistant to urban expansion. Hence, the argument that land-use transformation results to decline of arable land is misplaced because the value of farm output is fully reflected in the amount agricultural users are willing to pay for the land (Brueckner, 2000). Therefore, a successful bid implies that a society values buildings and other structures built on land more than the farm output that is foregone. Brueckner (2000), concluded that if farmland became truly scarce and in need of preservation, its selling price would be high, making land resistant to urban encroachment.

2.2.4 The nexus between actors and land-use transformation

According to Piore et al (2010), outward expansion of cities has made areas outside it (rural-urban fringe) prime target for land-use transformation. Pichler-Milanović (2005), observed that two actors are responsible for land-use transformation - the moving actors (households of different incomes levels) and non-moving actors (landowners, developers and local government

authorities). The moving actors are the inner city residents in need of affordable and attractive residential areas with high quality, infrastructure, safety and security, a cleaner environment, nearby open space and reasonable accessibility to urban work place. Under the influence of demand and supply, Brueckner (2000) explained that land-use transformation would then take place when non-moving actors are able to bid away additional land from agricultural land users. A successful bid implies that land has more economic returns in its developed urban state than agricultural use.

□□□Key actors responsible for land-use transformation in Kenya

In the peri-urban areas, there are various actors involved in effecting the use and management of freehold land. The main actors in land development in the peri-urban areas of the municipality include the national (central) government and its agencies. The national government is a formal institution and the main actor because land as a property must be managed and administered by the administrative units which have public authority bestowed under the laws and policies governing use of land (Government of Kenya, 2010).

The national government under the ministry of lands and housing and the national land commission (NLC) is responsible for land subdivision, registration and solving of land use disputes. Besides, they initiate and implement policies in furtherance of land administration. The other formal actor is the county government of Kisii which is legally mandated to prepare physical and land use plans to guide in the use and management of space in peri-urban areas of the municipality. The county is also engaged in the approval, enforcement and compliance of requests for actual physical development to planning standards and defining and gazettment of municipal growth boundary.

The other actors, formally involved in land use transformation are: farmers who owns land for agricultural use but have legal mandate to subdivide, sell or convert to urban use; developers/investors who converts land bought from farmers; professional registration boards in conjunction with the national government - ensures discipline, standards, practices and code of conduct is followed in the field of surveying, real estate, valuation and planning; utility providers, namely Gusii Water and Sewerage Company Limited (GWASCO), Kenya Power and Lighting Company (KPLC), Kenya Rural Roads Authority (KERRA) in the provision of utility services

(water, power, roads); financial institutions - provision of finances, assessing risks, and returns from investments in land to developers to facilitate acquisition, conversion and development of agricultural land; consumers who purchase or lease the already developed property in order to accommodate their activity systems; local leaders - assistant chiefs, chiefs, sub-county commissioners, among others) who are government representatives in availing information on land occupiers and solving property boundary and ownership including initiating community meetings to secure interest on land tenure and development issues. Also, the lawyers who are engaged in endorsing land transactions, as witnesses, and as advocate presentation in land use conflict and ownership.

Finally, there are land service providers (brokers) operating formally (working with registered real estate investors) or informally (individually) in providing information such as ownership, location, negotiate transaction, acquire ownership documents, determining values of land and linking land owners to potential buyers. In this research, it is assumed that farmers, investors and brokers are all driven by profit motive in the development of peri-urban land.

□□ **Theoretical foundations of land-use transformation**

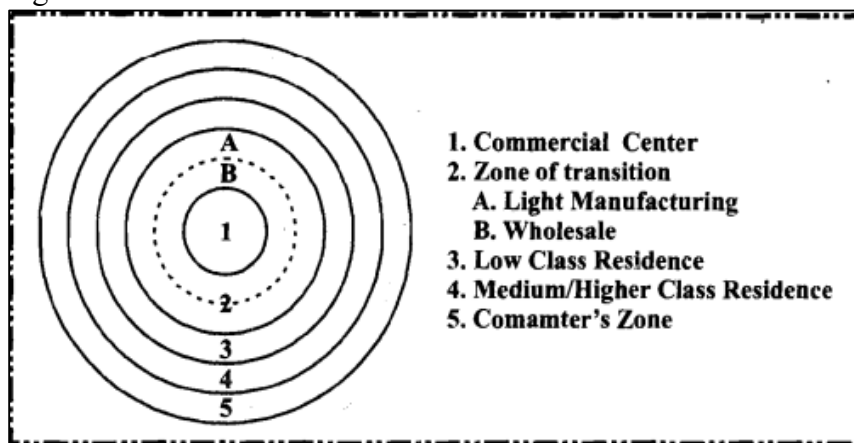
The study of urban and peri-urban land-use generally draws from different theories of land use. These theories were developed generally to explain the patterns of land use in early industrial cities of developed countries particularly in North America and Europe. According to McDonagh (1997), the distribution of land uses in urban areas is ultimately influenced by multiple and conflicting factors (social, economic and political), and that one factor cannot be adequately viewed in isolation from the other. To understand the factors and how they contribute to land-use transformation, Hitchcock and Hughes (1995) explained that theories should help make statements about particular types of actions and events/activities purposely to enable analyses of their causes, consequences, and process. Among the theories adapted by this research to explain the phenomenon of land-use transformation included concentric zone, sector, Bid-rent, and ocean wave analogue. The choice of many theories was informed by the fact that none of these theories, on their own, could adequately and accurately describe patterns of urban land-use in towns and cities. Reviewing theories was critical in understanding general process of land-use transformation and establish factors responsible for its occurrence in peri-urban areas.

□□□Concentric zone theory

The concentric zone theory by Ernest Burgess contend that cities are laid out in a series of rings that ripples from the central core, with each ring forming a zone occupied by a different form and quality of land uses (Burgess, 1925). The model consists of five major concentric zones namely: commercial centre (CBD); transition; working class; middle and upper class and commuter's zones. The rich and the middle class population tends to occupy the outlying zones. Figure 1 is a chart showing the concentric zone model.

The theory posits that a city's expansion occurs when inner zones extend their areas by invading outer zones through the process of succession. As a result, the outer zones are dominated by the activity invading them. In invasion, there is continued expansion of the inner zones into the outer

Figure 1: The concentric zone model



Source: Burges, 1925

zones, and that invasion takes place at the peripheries of the city. At the time of its application, there was a general consensus between theory and reality. However, Burges did not recognize that unusual site conditions could alter the concentric circle structure. The first creation of peri-urban area was observed in North American cities and was caused by migration of middle and upper class population running away from blight (crime, poverty, suicide, traffic snarl-up, illegitimate births, air and noise pollution, high cost of living, and violence) to bright areas. The internal structure of a city is formed during the process of distribution of residential sifting and sorting and relocation of individuals and groups by residence and occupation (Burgess, 1925; Lewis, 2007). Consequently, the distribution of social groups in the city is based on land values, and that the highest land values are at the point of greatest mobility in the city (Burgess, 1925).

Whereas this model was applicable to North America and European cities such as Chicago, a number of scholars contend that the model is still ideal in explaining the organization of land uses in modern towns and cities in other parts of the world (Splansky, 1966; Amanfu, 2017). Splansky (1966), established that the New Ibadan city of Nigeria exhibits a similar arrangement of land use functions as postulated by concentric zone model. The inner zone houses commercial and ancillary activities, diverse ethnic businesses (European, Asians and Africans; each located in ethnically identified districts), transport terminals, entertainment and cultural activity centres. Again, just like Chicago, Splansky noted a decrease in population from inner to the outer zone, with the outer zone consisting of people desirous of less congested and more modern housing. Subsequently, just as Lake Michigan hindered development of Chicago to the East, the Old Ibadan made New Ibadan to grow to the North, West and South only.

However, in the study area, a cursory observation revealed that inner municipality has not experienced inner problems just like Chicago and New Ibadan cities. Again, despite rapid development at municipal peripheries, there is still plenty of open space for further development in the inner municipality. From this observation therefore, the questions which this research sought to find answers to are: is the expansion of the municipality a depiction of the concentric zone theory? What is it that is making people to have preference for land at the municipal periphery yet there is still open space for further development? Are the people responsible for land-use transformation at the municipal periphery emanating from the inner municipality or elsewhere?

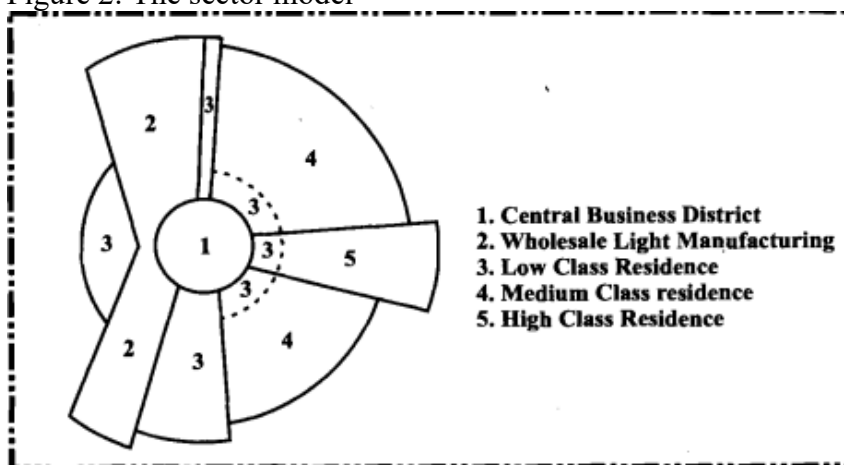
□□□Sector theory

The sector theory postulates that cities are primarily laid out in pie or wedge-shaped zones and corridors develop from the inner city to the outskirts (The Albert Team, 2020). Hoyt explained that the inner city is the centre around which a series of sectors (land use functions) grow and extend towards the periphery along major transportation corridors. McDonagh (1995), posited that the model is based on residential rent pattern and the impacts of transportation development, with high rent areas located in one or more sectors irrespective of the concentric ring. Rent then graduates outwards from the core towards the periphery. The sectors develop because of difference in accessibility from outlying portions to the core region, with corridors acting as boundaries between each sector. Hoyt observed that industrial workers lived near work places to avoid long

commutes while high class residents, avoiding negative externalities (traffic and pollution), would move to the peripheries. Figure 2 is a chart showing sector model.

In the study area, there are clear indications that the development of transportation corridors has played a major role of spreading out different land uses and activities resulting to firstly, outward movement of people and secondly rise in demand for land for residential development. These development, majority occurring along major highways is governed by market forces that creates a spatial pattern of land use and land values. Besides this, many of the peri-urban residents prefer to settle along transportation corridors for quick accessibility. Thus, giving rise to high demand for land and prices. Because of increase in land values, landowners end up releasing land to developers. Although the model is useful in understanding the dynamics of urban growth, it fails to account for the influence of the personal automobile and that most sectors contain more than one land use.

Figure 2: The sector model



Source: Nottingham and Liverpool Universities (1998)

□□□ Ocean wave analogue

According to ocean wave analog theory, peri-urban areas evolved in the peri-urban interface by activities which, like the ocean waves from the ocean, originated from the inner city of an urban area (Boyce, 1966; Thomlinson, 1969; Ayonga, 2008). The theory explains that what takes place in the rural-urban interface is brought about by turbulence in the inner city, just the same way the ocean also pushes waves and pebbles to the edge of the ocean. There are three ocean-like features associated with peri-urban areas, namely a recession wave, a procession wave and a tidal wave (Boyce, 1966).

In a recession wave situation, inner city residents begin to migrate to peri-urban areas but the process of peri-urban formation of the rural-urban interface is often unnoticed during this stage. In a procession wave zone, there is a considerable turbulence in land use. Therefore, the development of peri-urban areas as observed in the context of wave analogue theory, comes in the form of a tidal wave turning. It is argued that this is the only wave that is noticed by a casual observer in the form of urban sprawl. From this assertions, it can therefore be concluded that, the invasion of the inner city by immigrants has the effect of a tidal wave inundating first the immigrant colonies, the entry points, dislodging the thousands of immigrants who overflow into the next zone, and so on and on until the momentum of the wave has spent its force on the last urban zone (peri-urban area) (Burgess, 1925). The overflow has effect of speeding up expansion, industry, and 'junking' process in the zone of transition (ibid).

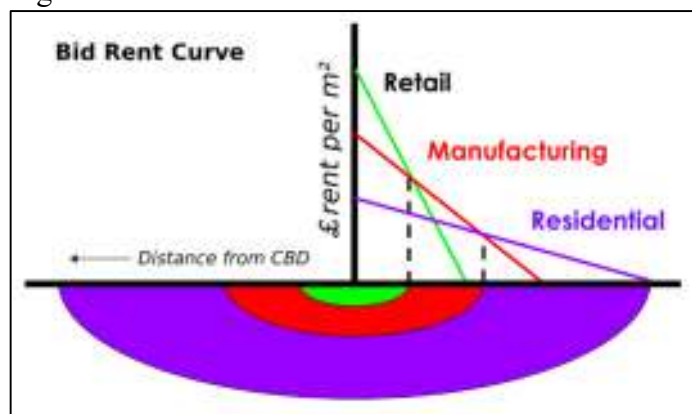
While the assertion that movement of immigrants from inner city to the periphery is responsible for transformation of arable land to urban use is true for other cities, the situation might be different in the study area. This is because, the movement of the people responsible for causing land-use transformation seems to be undefined. Therefore, the concerns of this research is one, establish the origin of the forces causing land-use transformation in the study area, and secondly, establish why people have preference for land outside the inner municipality instead of the inner municipality itself with a lot of open space for further development

□□□**Bid-rent theory**

The Bid-rent theory by Alonso account for variation and demand for urban land use. According to the theory, the value of land decreases in a curvilinear function with increasing distance from the city centre (Alonso, 1964). This is based on the assumption that locations with good accessibility are more attractive and have higher market value than peripheral locations. The accessibility defines profitability for firms and utility for household (Munshifwa and Mooya, 2014). Firms and households would then choose a location at which bid-rent is equal the rent asked by the land lord, so that the land market is in equilibrium. According to Dieleman and Wegener (2004), the bid-rent of a firm resulting from cost structure of production function is the sales price less production and transport cost plus profit divided by size of land. Thus, businesses with higher added value per square metre (m²) unit of land rent are therefore able to pay a higher price than those with less intensive land utilization.

This is an indication that when an increase in income occurs, high income earners would move to the periphery for more land (Franz, Maier, Schröck, 2006; Munshifwa and Mooya, 2014), and that income is optimally allocated between land, consumer goods, and cost of transport in relation to the Central Business District (CBD). With a decrease in transport cost, more money is allocated to land thus resulting to one, decline in population density at the CBD and an increase in the same at the periphery. Due to this, the inner city eventually expands resulting to exchange of land between the landowners and the wealthier class inner city residents in need of land at the periphery. The exchange of land, according the theory, indicates that arable land has greater economic return in urban use than original agricultural use. Figure 3 is a chart showing Bid-rent curve.

Figure 3 Bid rent curve



Source: Online source, 2020

Based on this explanation, higher economic returns from agricultural land in urban use in the study area may influence farmers to either convert portion of their land to urban use or release the land to developers for residential development. It has also been observed that, although accessibility is desirable, many of the developers with interest in investing in housing buy less of it because of preference to substitute it for more land. This may be done with the anticipation that the national and county governments, at some point in time, will provide main access to cater for accessibility needs of new residential houses. Nonetheless, apart from the main tarmacked road networks radiating from the inner municipality, other adjoining roads (either earth roads or foot paths) over time have been improved to murrum grade. The presence of access roads therefore, creates a potential for attracting investment and people to the peripheries (Nigusie, 2015).

Whereas the theory helps to identify site rents and transportation cost as an important location factors, it fails to examine how these decisions eventually lead to physical development of the city

(Munshifwa and Mooya, 2014). Again, while the theory helps to highlight importance of property values in assigning land uses and growth of cities, it ignores the process that is responsible for the provision of the built environment. The model is static - predicts the density gradient dropping monotonously away from the CBD (Czamanski et al, 2008; Veen and Otter, 2001), and city is made of uniform economic opportunities and equidistant travel distance (Veen and Otter, 2001). However, this model is useful in explaining how the variation in price of land between inner municipality and areas outside it, would influence developers to opt for peri-urban areas where they can maximize higher economic returns from investment in residential housing.

□□ **Factors of land-use transformation: what others studies have found**

Historically, the growth of cities is driven by increase in inner city population. However, in cities where there is little or no population pressure, a variety of factors are responsible for driving urban growth (European Environment Agency, 200□). The factors, rooted in the desire to realize new lifestyles in rural-urban fringe, are partly economic, partly social, and partly technological (Hall, 2002). Identifying the factors of land-use transformation requires an understanding of how people make land use decisions and how various factors interact in specific contexts to influence decision-making on land use (Lambin et al, 2003; Olson et al, 2004).

A mix of factors such as means of transportation, price of land, individual housing preferences, population shift, economic growth, application of land use planning policies, and large scale investment are regarded as responsible for peri-urbanization (Bhatta, 2010; Salem et al, 2019; Piorr et al, 2010; Appiah et al, 2014; Webster, 2002; Webster and Muller, 2004; European Environment Agency, 200□). However, because the process and factors of land-use transformation vary from place to place, each should be studied for each case on its own (Webster and Muller, 200□; Appiah et al, 2014). This, provides profound insights in sustainable peri-urban growth planning (Al Jarah et al, 2019; Samie et al, 2017; European Environment Agency, 200□). From the foregoing discussion, it seems therefore that the likely factors of land-use transformation in the study area are as outline in the proceeding discussions.

A change in the population of the inner city is likely to influence the phenomenon of land-use transformation at the periphery of the city (Bhatta, 2010). In developing countries, when a decline in the rural economy occurs, affected residents are forced to move to the inner city in need of economic opportunities to improve their living standards (Sackey, 2008; Bhatta, 2010). The

migrants first move into the inner city where they cause a rise in population (Terfa, Chen, Zhang and Niy, 2020). Bahaydar (201□), recorded that increase in inner city population also arises when there is movement from one city to the other. As the population of the inner city increases, a point is reached where the demand for housing increases leading to rise in cost of housing (Varkey and Manasi, 2019), lowers employment opportunities and poor quality of living environment (Christian, 2012; Hall, 2002; Christiansen, 2011). Because of this, inner city residents move to the periphery in need of better quality of life, better social services (that is, education, health and entertainment) and a clean environment (European Environment Agency, 200□; Christian, 2012; Al Jarah et al, 2019; Webster, 2002). This eventually causes intense pressure on rural land in the fringe; driving up the demand for land for housing, commerce and public utilities, be it in planned or unplanned areas (Lupala, 201□; Jianyi, 201□; Al-Kofahi et al, 2018).

In developed societies, the development of peri-urban areas is caused by a change in economic growth of the inner city. This is because, a rise in income may trigger middle and upper class residents to move to peripheral areas (Brueckner, 2000). The migration to the periphery is necessitated by the need for bigger and affordable land to establish own home (European Environment Agency, 200□; Piorr et al, 2010; Mugisha and Nyandwi, 201□). However, in the context of developing countries, Kombe (200□) observed that the transformation of arable land in the peripheral areas is brought by urbanisation in poverty thereby catalysing changes in land use and resultant peculiar forms of peri-urban land use patterns. Although, governments in developing countries initially strove to provide affordable housing for urban residents through formal land development including subsidised public housing provision and site and service projects (Kombe, 200□), such effort did not last due to dwindling economy and rapid rise in urban population (Kamau, 2002).

Besides, the prohibition of individuals by the governments to build low-cost housing in inner city resulted to acute shortage of housing in urban areas, rise in prices of land and rents. To overcome this, individuals devised strategies of enhancing private housing which could be feasible at the periphery of towns and cities. In the study areas, this scenario might have forced lower and middle income earners to move to the periphery in need of cheaper and affordable land to establish own home. Faced with high demand for land, the landowners, with the motive of earning a living from their land end up subdividing and releasing their land to potential buyers. Similarly, scholars have

argued that the need to develop at the periphery of the towns and cities is caused by the associated high zonal costs of development in towns and cities (European Environment Agency, 200□; Mugisha and Nyandwi, 201□; Yin and Sun, 2007; Lupala, 201□; Ayonga, 201□).

The county government of Kisii observed that farm holding sizes in the recent past has declined and range between 0.2 to 2.1 hectares (Kisii County Government, 201□; Kisii County Government, 2018). It attributed such a reduction in land holding sizes to population pressure and cultural practices of subdividing and bequeathing male family members (ibid). Similar sentiments were arrived at by Mutua (201□) who found that among the kamba community of Kenya, culture requires parents to subdivide and distribute land to children for inheritance purposes and individual private land ownership. Escalating the culture of land inheritance practice, the law of succession requires land to be granted to family children (Government of Kenya, 2012). This, in one way or another, encourages and paves the way for subdivision and conversion of agricultural land to urban use. Finally, the customary land tenure practices which confers control and decision-making powers to some family members a times excludes the interests of others family members regarding the use and management of land. For instance, in African set up, women and children do not have powers to make decision over use of land (Waiganjo and Ngugi, 2001; United States Agency for International Development (USAID), 2009).

The rural-urban fringe is a product of the interaction of policy intervention on one hand, and the action and practices of key stakeholders as observed in everyday use and appropriation of spaces on the other hand (Olson et al, 2004; Webster, 2002; Ng'ayu, 2015). Olson et al (2004), defined a policy as a means of promoting desired future conditions, with negative, as well as positive results. Actions by local authorities and development agencies can result to the process of transforming arable land to urban uses (Webster, 2002; European Environment Agency, 200□).

The phenomenon of land-use transformation may be fueled when local authorities responsible for land use planning opt to develop policies to decentralize development away from the city. This is exacerbated by lack of or weak and/or ineffective legislations and laws that shapes land use policies and building permits or unfair application of land use regulations and laws (Al Tarawneh, 201□; Al-Kofahi et al, 2018). For instance, policies which favours lower taxation benefits encourages investment in commercial and industrial production (Webster, 2002).

Similarly, authorities may formulate and implement a policy to extend the municipal boundary. This move, aimed at decentralizing development, eventually makes the city's periphery attractive for investment (Webster, 2002; Jianyi, 2016; Schultink et al, 2005). However, due to weak management (Ardeshiri and Ardeshiri, 2011) and failure to plan and enforce urban development plans for urban areas (Al Jarah et al, 2019; Al-Kofahi et al, 2018), the issue of land management at the periphery can hardly be controlled. Therefore, stakeholders and landowners have the power to make decisions which influences conversion of arable land to urban use in peri-urban areas.

Subsequently, investment in motorways and freeways may fuel change of land from agriculture to urban use along the extended roads from inner city to the peri-urban agricultural lands (European Environment Agency, 2006; Audirac, Hermyen, Smith, 1990). These agricultural roads, though intended to serve farmers and people to access their farms and homes, in turn facilitates movement of people from core city and other places to peri-urban areas (European Environment Agency, 2006; Brueckner, 2000; Narain et al, 2013). Eventually, residential houses sprout in peri-urban areas since freeways encourages use of automobiles (Audirac et al, 1990). Furthermore, Audirac et al (1990) explained that automobiles make travelling cheap, faster and convenient.

Based on this, households make a choice between residential and the price of housing and price of commuting between work place and home. When transport cost falls below a certain threshold and income reaches a certain level the rate of changing agricultural land to urban use quickens (European Environment Agency, 200□). With increased use of automobiles, land-use transformation can even be felt in the outskirts of urban areas disclosed by transportation (Lewis and Maund, 1976; Antrop, 2004). It has been noted that as the car become increasingly affordable (Christiansen, 2011), proximity of peri-urban areas is increased thereby making peri-urban areas attractive for investment (Nigusie, 2015), living, recreation, and sometimes work for former urbanites.

According to Chazan and Cotter (2001), at the periphery of city, many farmers may become reluctant to invest in agricultural production on their farms. They explained that such tendencies may develop as a result of perceived threat to agricultural productivity due to higher economic return for agricultural land in urban use. Thus, leading to impermanence syndrome (Berry, 1978). Nelson (1992) defined '*impermanence syndrome*' as action of farmers who believes that farming has no future in a particular area due to inevitability of the ongoing urbanization. Hence, as noted

by Alonso (1964), land parcels with good accessibility gains location advantage of attracting higher market value in urban use. Because of this and the inherent challenges of agricultural productivity (loss of farming as culture, inefficiency due to farm size-related costs, regulatory challenges, and neighbouring conflicts), affected farmers eventually end up releasing their land to market forces of demand and supply (Berry, 1978; Chazan and Cotter, 2001). Thus, making farming impossible for would-be new farmers because: affordable land for farming cannot be found; alternative employment opportunities often pay more and offer greater stability; and ability to earn a visible livelihood from agriculture and equity stake in relationship to their land sensibly become powerless (Chazan and Cotter, 2001).

Moreover, the phenomenon of land-use transformation may be triggered by preference for housing location (Christiansen, 2011; Piorr et al, 2010; Al Jarrah et al, 2019). The European Environment Agency (200□), explained that deterioration of inner city living conditions drives inner city residents to the peri-urban areas in need of bigger living spaces. Besides, many parents moves to the periphery in need of quality schools to secure the best education for their children (Couch and Karecha, 200□; Haregewoin, 2001; Habibi and Asadi, 2011), adequate space to play (European Environment Agency, 200□), and proximity to rural areas and nature (with healthy and clean air, sufficient sunlight) as a result of changing goals and individual lifestyles (Hall, 2002; Christiansen, 2011; Couch and Karecha, 2006).

2.5 Effects of land-use transformation in peri-urban areas

The peri-urban areas constitute the foci of dynamic processes of city transformations and the conflict zones where urban and rural functions compete for space and resources exploitation. Along with this dynamic processes of land use, the demography is also highly dynamic due to the need for alternative residential housing for urban workers at a lower cost and accessibility to new urban livelihoods. Therefore, its development has profound impact on the environment, economy, people's way of life, and urban forms (Aguilar, 2008; Nigusie, 2015; Marshall et al, 2009). The effects of land-use transformation can be broadly categorized into environmental, economic and social (Chazan and Cotter, 2001; Putta and Ravadi, 2014).

2.5.1 Effects on peri-urban environment

An increase in peri-urban population could lead to urban problems such as traffic snarl-up, congestion, pollution and crime (Christiansen, 2011; Government of Kenya, 2017). Increased driving degrades air quality by increasing pollutants (carbon dioxide) which in turn causes global warming and impairs water quality by deposition of airborne pollutants into water bodies (Schultink et al, 2005). Besides, households without sanitation facilities discharges solid and liquid waste into open spaces and rivers streams, thereby significantly compromising water quality and health conditions of peri-urban residents (Marshall et al, 2009; Ruet, et al, 2006).

As more land is urbanized, the vegetation cover reduces, more surface area become impervious resulting to decline in groundwater recharge through percolation (Al Tarawneh, 2014; Doygun, 2008; Antrop, 2004; Marshall et al, 2009). This exposes the affected area to increased flooding hazards including inundation and erosion (Bhatta, 2010; Agheyisi, 2018). The intensive peri-urban agriculture necessitating excessive use of agrochemicals which are washed into surfaces and river streams thus lowering the quality of ground and surface water (Sackey, 2008). Lupala (2015), said that as vegetation cover and ecosystem services decreases, the number of plants and animal species decreases, too over the time. Thus, uncertain and complicated pattern of land use and land cover change occur (Goswami, 2018); become undesirable for ecological as well as socio sustainability especially in developing countries due to chaotic and unplanned development of towns and cities.

Again, as the population of peri-urban areas increases, demand for land to develop arises. This necessitate transformation of arable land to residential housing which in turn leads to loss and/or decline of land holding sizes (Chazan and Cotter, 2001; Dabie, 2015; Kelly, 2006). Nigusie (2015), attributed decline of land to proximity of peri-urban areas to inner cities and relatively cheaper prices of lands. Webster and Muller (2004), opined that rapid and high magnitude of demographic, economic and manufacturing output growth, may pose a risk of continuing or accelerating environmental degradation. As a result, human well-being and public health decreases attractiveness of peri-urban areas for investment in high value activities. As this land-use change occurs, alteration to water/land-surface characteristics, which in turn, modify the surface and ground water interactions (discharge/recharge points) to the point watersheds affected shows hydrological impairment. Once the capacity to maintain hydrological and human benefits from ground water diminishes, conflict due to resources use ensues. This condition generates strong

migratory flows of people seeking for places offering better quality of life. In addition, where there is intense extraction of ground water, salt water may intrude into ground water.

Regarding the study area, there is a likelihood that environmental effects of peri-urban development is still low and not posing any challenge to peri-urban residents especially human congestion, solid and liquid waste. This is because the quantity and magnitude generated is low and the county government of Kisii is able to collect and dispose waste at designated places.

2.5.2 Effects on peri-urban economy

The area outside of the city is traditionally designated for agriculture as the main source of livelihoods and low-density housing for peri-urban residents. But, as conversion of land takes place, land for farming diminishes (Abass, Adanu, and Agyemang, 2018). This eventually forces farmers to shift to other economic activities due to changing economic structure (Lupala, 2015). Nigusie (2015), posited that proximity of peri-urban areas to inner cities coupled with relatively cheaper land prices creates a huge potential for attracting investment activities. This, in turn, attracts people from other places in need of permanent and temporary residence. As a result, vast tracts of peasant agricultural land is transformed to non-agricultural land uses. Besides, a culture of continued irregular land subdivision cripples in (Mugisha and Nyandwi, 2015).

The transformation of agricultural land, in turn, leads to a reduction and/or complete loss of agricultural land, natural land, forests, wetlands, and other natural habitats (Ng'ayu, 2015; Hasse, 2002; European Environment Agency, 200□). Besides these, the local communities who originally occupied the land often lose their rights over the property their livelihood depended on (Pratomo et al, 2020). The loss of agricultural land potentially disrupts life and livelihoods of dependents on agricultural production due to a decline in per capita food production and farm income (Nigusie, 2015; Samuel, 2006; Chazan and Cotter, 2001; Putta and Ravadi, 2014). Both Samuel (2006) and Chazan and Cotter (2001) explained that extremely small-sized farms can hardly be made productive even with improved technology. Although, food has been grown on the fringe of cities and towns, its success is hindered by inadequate planning by planners and government. This situation arises where a lot of emphasis is placed on water, housing, environmental awareness and social issues at the expense of planning for land where food is grown (Ng'ayu, 2015).

From the economic perspective, the development of peri-urban areas is at least the costliest form of development which results to increased household spending on commuting, cost of business due to inefficient transportation system, and cost of extending urban infrastructure including utilities and services (European Environment Agency, 2006; Hayward, 1998; Haregewoin, 2001). Piorr et al (2010), explained that these developments created what is called ‘capital sprawl’ and lack of concentration; thereby affecting savings which could be useful in provision of better quality amenities if building were compact. In the study area, the rapid development of peri-urban areas has outpaced the capacity of county government to provide basic physical and social amenities (Kisii County Government, 2013; Kisii County Government, 2018).

2.5.3 Effects of land-use transformation on social-cultural interaction of peri-urban residents

The development of peri-urban areas can lead to social-economic segregation and marginalization of poor peri-urban residents (Webster, 2002; European Environment Agency, 200□). This segregation is typified by middle and upper income families which can afford essential mobility and lifestyle to enable functioning effectively in peri-urban localities. Besides, their houses are big with large backyards that separate neighbours and creates a barrier to social interaction (Bhatta, 2010). However, the poor peri-urban residents who cannot afford same level of lifestyle are priced out of living in such areas and pushed into less desirable neighbourhoods (European Environment Agency, 200□).

The development of peri-urban area can lead to loss of its traditional history (Antrop, 2004). This is caused by development of built-up areas, traffic congestion, a mix of cultural diversity and heterogeneous activities (Paddison, 2001). Moreover, spreading of urbanites loosely into the countryside causes further change to traditional lifestyle and make distinction between urban and rural very diffuse (ibid). As a consequence, new residential sites are searched in more remote, yet fast and easily accessible countryside (Lucy and Philips, 1997). The loss of communities’ original values is brought by constant social interaction, breakdown of communal, kinship and familial ties which in turn affects community cohesion (Thuo, 2013). Furthermore, due to highly valued land, the peri-urban residents can be deprived of recreation space and the relative prices for dwellings, goods and services may be higher (Simon, 201□).

At local level, rise in household population, cost of accommodation and living implies reduction in expenditure on food and low-calorie intake. This makes the peri-urban poor residents

susceptible to ill-health and malnutrition, and other conditions derived from precarious living environment (infections and communicable diseases). Additionally, when residential and workplaces are widely spread, individuals spend more time getting from one place to another. In this case, over dependence on car use occurs and thus affecting their public and social health by making them sicker, fatter, more depressed, and less active physically and socially (Chazan and Cotter, 2001).

Despite the negative effects of peri-urbanization by way of land-use transformation, peri-urbanization has positive effects, too. A few scholars including Nilsson et al (2013) and (Goswami, 2018), did put forward that peri-urbanization is responsible for fulfilling peoples' housing preferences, creates attractive and competitive environments, proximity to consumers for local producers and potential for eco-friendly lifestyle, and more economical rural communities.

2.6 Coping mechanisms to effects of land-use transformation

A change in peri-urban economy from agrarian to urban due to land-use transformation may affect the livelihoods of peri-urban residents. This is because, both the original and incoming residents depend on land for survival. As the environment deteriorates, poverty creeps in due to over reliance on land which provides an opportunity for extraction of natural resources through agriculture. To overcome these consequences, affected peri-urban residents would either continue to practice subsistence farming or diversify income sources to meet livelihood needs (Wegedie, 2018).

□□□ Intensive peri-urban agriculture

As land-use transformation takes place, decline of land holding size and degradation of the natural resources also occurs. Although, these occurs in piecemeal fashion, has the effect of hindering productive agriculture. To counter this, peri-urban residents opt for intensive agriculture (Ng'ayu, 2015; Ruel, Haddad, and Garret, 1999; Mortimore and Wilson, 1965). Ruel et al (1999), observed that peri-urban residents engages in growing market-oriented fast maturing crops such as vegetables crops (tomatoes, kales, pepper, cucumber, onions, carrots, among others). Besides this, they are also engaged in poultry and dairy farming (Thuo, 2013). Tacoli (2002), attributed growing of these crops to ready markets in peri-urban areas and inner cities.

According to Thuo (2013), intensive peri-urban agriculture has the consequence of making food accessible to peri-urban poor and generate additional income for saving with the anticipation to spend it elsewhere. However, Oduro et al (2015), in their studies argued that, although agricultural intensification generates income to households, it is characterized by continuous cropping, intensive use of agro-chemicals, and lack of appropriate soil management and cropping methods. As a result, depletion of soil fertility and contamination of crops (especially vegetables), and underground and surface water takes place. Mugisha and Nyandwi, 2010, observed that a times, farmers may continue subdividing and selling their land as a way of meeting family financial needs.

2.6.2 Non-farm income generating activities

After losing existing natural-resource based livelihoods, Tacoli (2002) noted that residents engage in non-farm income generating activities as a source of livelihood. At household level, Thuo (2013) observed that multiple activities help decrease vulnerability to shocks and stresses and stabilizes incomes which may otherwise vary widely on a seasonal basis. The non-farm income generating activities include retail and wholesale business, hair dressing, shoe repair, barbering, and dressmaking, motor vehicle repair, plumbing, electric wiring and installation, and painting, food processing, saw milling, metal fabrications, construction works, selling of firewood, timber and wood products, milk, eggs, meat, chicken, hardware, charcoal, and stones, pottery, selling of locally made drinks (brews), selling of gas and fossil fuels, and sale of groceries, sweep streets and clean latrines, sex trade (Thuo, 2013; Oduro et al, 2015; Wegedie, 2018). These economic activities have become important livelihood strategies for both the indigenous and migrants.

Furthermore, Oduro et al (2013) observed that petty trading and personal services like hairdressing and dressmaking are particularly important livelihood strategies for women, who neither participate in the lucrative selling nor leasing of land business, even if they belong to a land-owning family. Again, some residents have converted portions of their houses into stores as well as kiosks and tables erected in front of houses for petty trading. In the recent development, Thompson and Olajoke (2007) observed that a number of youths are engaged in transportation especially motorcycle taxis because of provision of quick returns. However, the required initial operational capital is a constraint to prospective motorcycle operators (ibid).

The peri-urban residents do devise other modes of livelihoods which involve promoting collective action necessary in supporting various members of the peri-urban community (Thuo, 2010). These modes, as observed by Thuo (2010), include formation of self-help groups which raises funds to cater for sickness, funeral expenses, education, buying household goods, and plots. Thompson and Olajoke (2007), noted that some households usually get material and financial assistance from their children working abroad. It has also been observed that some resorts to informal means for survival namely stealing and begging from people.

Whereas, it has been noted that the primary activity is mainly dependent on agriculture, livestock and fisheries including non-farm income generating activities, other peri-urban households including immigrants also depend on income from employment both in the public and private sectors. In situation where household members are not engaged in formal activities, family and kinship ties and networks acts as the basis for providing support in form of finance, food and associated support (Thuo, 2010).

□□ Peri-urban planning options to mitigate land-use transformation

In developing countries particularly Kenya, most of the towns and cities were built during colonial period and were not designed for long-term purpose. Since that period to date, these towns have not been redesigned to respond to rapid changes in urban activities and population growth. Hence, the haphazard spilling over to peri-urban areas leading to land-use transformation and creation of complex spatial land use patterns. This has placed an uphill task on the planners and policy makers to manage unwanted growth and development since peri-urbanization is exerting pressure on remnant natural areas, important water catchments, productive agricultural land, and increasing the risk of land-use conflicts. In addition, the transformation is also affecting the livelihoods of the original landowners. Hence, the need for approaches that transcends urban containment policies and regulations to address current dynamics in peri-urban areas, which are largely unplanned. Approaches which creates a distinction between the city and the countryside in physical appearance and land use functions. In this regard, the study proposed both planning and design, and market-based concepts and incentives as the most viable options. The choice of many models is informed by the fact that each model has inherent weaknesses which possibly can be addressed by another model.

□□□Polycentric city model

The polycentric city model advocates for a city designed with a corridor, star or satellite morphology (Simon, 201□). It aims at addressing issues of containing the spatial growth of urban areas, creating room for urban biodiversity, making space for vibrant and diverse neighbourhoods and reducing travelling time by concentrating development near easily accessible locations (Westerink et al, 2012; Simon, 201□). The objective of the model is to deliver the benefits of both sprawling and compact cities, which work out as communities formed around multiple neighbourhoods. These neighbourhoods include a diversity of private activities and public services within easy proximity so that car use is reduced and public transport and walking/cycling are utilized. In return, this would increase the sense of place and reduce the likelihood of crime.

□□□The compact city model

The compact city model focus on promoting relatively high residential density patterns with mixed land uses (Arbury, 200□; Simon, 201□). It is based on an efficient public transport system that promotes walking and cycling, low energy consumption and reduced pollution. Its advocates argued that a large residential population provides an opportunity for higher quality of life and social cohesion (Simon, 201□). They also argued that a compact city is more sustainable urban settlement due to less dependency on the car, cheap in providing infrastructure, and exploitation of digital technologies (Simon, 201□; Westerink et al, 2012). However, in its original form, it focused on enhancing proximity between locations by increasing density and intensity of urban forms. However, due to challenges of implementation, this focus has been replaced with a focus on accessibility by concentrating buildings and people around accessible locations.

To eliminate land-use transformation, the model proposes for effective planning to achieve an overall more compact urban form that results to limiting city's peripheral expansion (Simon, 201□). This can only be achieved by legislating urban growth boundaries, introducing non-urban green belts and quarantining developments in certain areas. In this way, the model succeeds in creating benefits that are attractive to city residents, namely shorter commute time, reduced environmental impacts, and reduced consumption of fossil fuels and energy. However, the model is accused of encouraging crowding, lack of affordable housing, increase in crime, congestion, loss

of green space and pollution. Again, still people have preference for owning homes in their own lots (Burton, 2002; Breheny, 1997).

□□□**New ruralism model**

This is a growth management framework for conserving farmlands on the urban edge that are at a risk of encroachment due to expansion of the city (Newman and Saginor, 201□). It capitalizes on the idea embedded in smart growth which involve organizing cities around compact neighbourhoods and sustainable agriculture. Its proponents argued that the model conserve farmland in peri-urban areas by creating carefully planned, agrarian-based rural suburbs to counteract current consumerist-based urban expansion. Besides, it allows for mixed land use where rural homes are arranged closely together on relatively small lots while majority of the land is left for agriculture. Successful implementation of the model calls for formulation of agricultural zoning regulations and plans that prohibit or limit non-agricultural land uses in agricultural zones and sensitization of farmers. However, the model faces challenges emanating from leapfrogging of development. Again, farmland preservation is voluntary, thus making it difficult to protect large contiguous tracts of land (Newman and Saginor, 201□).

□□□**Zoning of peri-urban lands**

Zoning is a technique of organizing the present and future development of land by outlining a land use pattern by dividing an area into zones. The zones are seen as separate compartments, though with some interdependencies to secure the physical, economic, and social efficiency, health and well-being of urban and rural communities (Schultink et al, 200□; Government of Kenya, 2019). Zoning is important in separating incompatible land uses such as intensive agricultural and high-density development or residential and industrial (Government of Kenya, 201□).

Schultink et al (200□), did put forward that zoning can be realized in three ways namely: grouping buildings on small lots on one part; designating zonal district over one or more other zoning district; and encouraging provision of certain qualities of development in return for benefits such as fast approval of development applications. This results to classification of three criteria into cluster, overlay, and incentive zoning which are key in separating land uses and thus preserving open space, reducing land use conflicts, and encouraging developments as designated in local development plans. In Kenya, zoning is implemented using zonal plans and regulations

specifically focusing on type and density of permitted land use and buildings, height and size of buildings, and plot sizes. However, according to Ayonga (2019), zoning of land for agricultural purpose failed because post-independence land laws ignored existing informalities but encouraged future development patterns. As a result, development could precede planning and reversal of the situation could not easily take place.

The success of zoning strategy in conservation of arable land in the study area can be attained via a comprehensive physical and land use plan for the whole municipality including designation and planning rules for agriculture, nature and other interests in municipal peripheral areas. Laws should be established to regulate and govern agricultural property, land ownership, leaseholds, education, and farm size (Gunilla et al, 2011; Fertner et al, 2011). Besides, regulations must be clear to enable effective implementation and prevent unapproved development and land speculation prevalent in the Kenyan context. Besides, the zoning rules, as integrated in the policy, should define the minimum size of land to be subdivided and the manner of subdividing it.

□□□Purchase Development Rights

The Purchase Development Rights (PDR) is technique involving acquisition of development rights on a parcel of land from private landowners (Schultink et al, 2001), with ownership of development rights simply retained by the purchaser. The PDR works by compensating the farmer for the reduction in property value and ensuring that portion of land whose development rights have been acquired is permanently excluded from development but the owner can use the remaining portion unencumbered. Schultink et al (2001), explained that the success of PDR in eliminating land-use transformation in peri-urban areas must be based on master plan supported with relevant laws. Besides, master plan must provide clear goals and strategies enabling preservation of farmlands. However, in the current planning context, master plans cannot suffice since they are accused of being restrictive, ineffective in terms of process, content, implementation and monitoring and lacks stakeholder focus. Hence the need for strategic land use development plans which emphasizes inclusivity of stakeholder participation processes, and planning focusing on key strategic elements.

In the study area, PDR technique can be implemented by Kisii County Government by enacting legislations to enable purchasing of portions of lands parcels, compensating landowners, and disposing development rights to developers. By doing this, the county government will be in a

position to regulate use of space by encouraging certain developments while discouraging others in peripheral places of the municipality. This approach can attract the attention of farmers who cannot transform their lands to residential use. Although PDR has succeeded in conserving agricultural land in places such as Ann Arbor area in North America, its critics argue that it is costly and ineffective in deterring proliferation of the phenomenon of land-use transformation.

□□□ **Transfer of Development Rights/Transfer of Development Credits**

The Transfer of Development Rights (TDR) is a market-based planning technique that allows landowners to separate and trade development rights from their land to a developer or other interested party who then use the rights to increase the density of development at another designated location (Miskowiak and Stoll, 200□; Fertner et al, 201□; Harmana, Pruetz and Houston, 201□). Miskowiak and Stoll (200□), explained that in TDR, the seller of the development rights still owns the land and can continue using it, however, an easement is placed on the property to prevent further development. The TDR operates within the framework of a land use plans and regulations, that is, a landowner can decline TDR option and simply use the land as allowed by all other application regulations or can choose the TDR option. When owner accept TDR option, a perpetual easement on land in return for a marketable commodity called TDR is recorded. The number of TDRs granted is established by TDR regulations while a sale of TDRs compensates participating landowners for preserving their land.

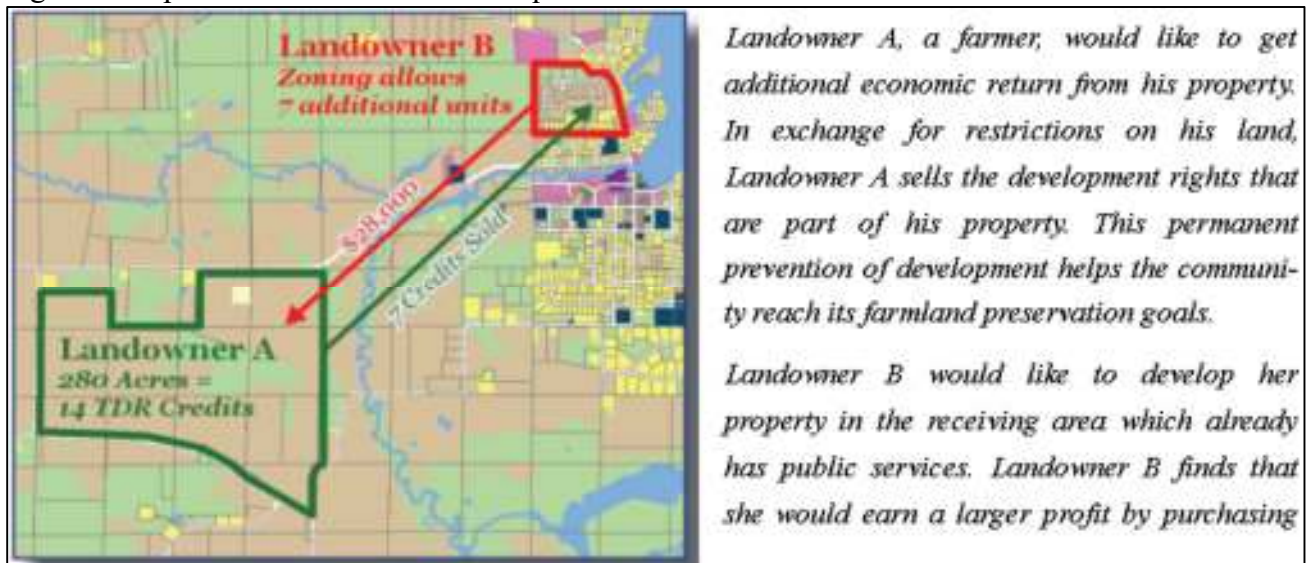
Harmana et al (201□), defined the sending sites as areas identified for preservation while receiving sites as areas TDRs are transferred to. Receiving area zone allows development up to a designated baseline density without TDR obligations. However, developers can choose to exceed baseline density to make more profit and this is applicable to those who buy TDRs, thereby preserving sending sites (ibid). TDR does not rely on tax funds but uses a portion of development proceeds to pay for preservation. The TDR is used to protect land resources at the same time providing additional income to both the landowner and the holder of the development rights (Miskowiak and Stoll, 200□). Besides this, adequate incentives must be provided to landowners before selling development rights. According to Schultink et al (200□) and Miskowiak and Stoll (200□), implementation of TDR would require a jurisdiction to fulfill four key elements, namely:

1. Identification and designation of preservation zone;

2. Identification and designation of an urban growth zone;
 - Determination of a market for development rights. In this case, the jurisdiction should ensure that long-term growth expectations exist for receiving areas to assure landowners in the sending areas that their development rights have value; and
 - Defining TDR and Transfer Ratio procedures including establishing what will be used to determine number of development credits

In the study area, TDR can be implemented jointly by Kisii County Government and national governments by enacting legislation that facilitates establishing a TDR bank from which developers can purchase development rights, training and employing well trained personnel to run and manage development right transfers either by running the TDR bank and/or negotiate transactions between landowners and developers. Besides, staff also plays a large role in educating local officials, landowners, and developers about the program. Figure □ demonstrates how TDR works to curb land-use transformation.

Figure □ Implementation of TDR technique



Source: Miskowiak and Stoll (200□)

The TDR technique is very useful in the study area since its implementation would require development of zonal plans, allow development in places with better infrastructure such as roads, schools, medical facilities, and proximity to other intensive uses while at the same time preserve those sites with low density, lack of infrastructure, or the presence of vulnerable natural feature such as wetlands or prime farmland would make intensive development inappropriate or less

desirable. Critics of TDR argues that its application is limited to agricultural land and tends to be complex and expensive, particularly when entirely supported by local funding.

□□□Appropriation of land

In developing countries, a number of scholars have argued that development of peri-urban land is responsible for the rapid change of economic structure and community from agriculture to non-agriculture (Pratomo et al, 2020). Because of this, Haringey Council (201□) argued that appropriation of land should be put in place to guide the use of land in peri-urban areas. The council defined appropriation as a statutory procedure of changing the purpose for which land is held from one statutory purpose to another provided that the land is no longer required for the purpose for which it was held immediately before the appropriation.

The occurrence of appropriation implies conversion of third party land rights into a right to the payment of compensation in order to enable a development to take place in accordance with the planning process. In supporting this argument, Pratomo et al (2020) explained that property rights should be understood as being not only the right to possess the land but also the right to appropriate it. Therefore, appropriation in the opinion of Haringey Council (201□), should result to significant improvement of the livelihoods of the local people as well as the economic, social and environmental well-being of the local area. Successful land appropriation needs to meet four conditions namely:

1. Acquire or appropriate site for planning purpose;
2. Put forth planning consent;
 - Acquire land compulsorily and compensate; and
 - Execute all works as per to purpose for which land was appropriated.

In Europe, particularly Copenhagen and Hague regions, purchasing of land through compulsory acquisition is considered a successful strategy of preventing agricultural plots considered to be transferred to urban land use from peri-urbanization (Fertner et al, 201□). This should be the path to regulate use of land in the area of study by Kisii county and national governments by setting monies from development expenditure and exchequer respectively to compensate persons who loses land through compulsorily land acquisition to advance planning, reconstruction and preservation of agricultural land. However, for appropriation to succeed in the study area, the

amount of compensation for compulsory acquisition must be equivalent to or more than what developers are offering landowners in exchange for land. In addition, solve issues of compensation by nationalizing development rights thereby allowing the state and the county to determine the type(s) of development to take place through planning (Ayonga, 2019). Finally, appropriation power must be justified by clear public interest and involve wider public consultation (Haringey Council, 2019).

□□ Case studies of urban growth management

This study made use of case studies to provide comparative insights into planning for the urban-rural fringes. Two cases studies were considered to help the role of planning in addressing peri-urban challenges of land-use transformation.

□□□ North America: Portland City

According to Garreau (1991), the development of urban areas in North America is generally characterized by a transport system exclusively dependent on cars, declining inner cities, sprawling suburbs and mushrooming of edge cities. Garreau (1991), noted that such growth took place without any meaningful spatial planning intervention under the auspices of neo-liberal deregulations of the economy and society.

Despite the weak position of spatial planning, Dieleman and Wegener (2009) noted that North America produced a number of innovative approaches which transformed the urban metropolis into a more sustainable, more compact and more mixed use urban form. One of the focal and success story of Portland city, in the larger state of Oregon of the United States of America, involved the use of urban growth boundary. This boundary defined the area inside the city within which new urban development could take place. Beyond this boundary, only agricultural structures were permitted. One notable feature of the boundary is that it had to be reviewed periodically and always included land for 20 years of development.

In 1979, the regional planning organization - Portland Metro responsible for carrying out land use and transportation planning among others was created. The Portland Metro, through the influence of environmentalist lobby organization, 'the 1000 Friends of Oregon,' coupled with the emergence of the new idea of New Urbanism Movement, developed a new type of urban development plan.

The new urban development plan, which was less car oriented as the main means of transport was favoured and became an efficient public transport. The new public transport - Transit-Oriented Development (TOD) consisted of a light-rail transport (LRT) network as the backbone of regional public transport, a dense bus network serving as feeder to the LRT stops, and concentration of jobs, services and residence at the LRT. As a result of the centres, there emerged: mixed-use centres (large new centres with high density and many work places at the main hubs of the LRT network; smaller urban TODs centres with medium density and a medium share of workplaces at intermediate LRT stops; and neighbourhood TODs centres with predominantly housing up to a distance of two miles from a LRT stop with bus feeder transport. The smart city allowed Portland's more than a quarter of the new development to take place in infill sites in already developed areas.

Out of the implementation of smart city concept, the Portland city boasts of still growing in a more compact form, use of public transport increased by 10%, reduced traffic jams than any other North America cities. Additionally, it overcame competition between cities and suburban communities for people and jobs. From the planning perspective, the implementation of smart growth model in Portland city is a testimony that under conditions of increasing competition between cities and regions caused by globalization, sustainable cities cannot be attained by voluntary co-operation only but requires an efficient regional authority based on majority rule and efficient planning.

□□□The Randstad

The Ramstad is the western part of Netherlands that houses the densely populated large cities namely, Amsterdam, Rotterdam, The Hague and Utrecht along with substantial number of small cities in the range of 10,000 - 100,000 inhabitants (Dieleman Wegener, 2001). The urban area covers a total land mass approximately 11,000km² with a population of 11inhabitants. These urban centres are located in distinctive patterns, a horseshoe form known as Randstad ('Ring City') encircling a more open agricultural area the 'Green Heart'.

The first attempt to conserve peri-urban land was in 1964when the Dutch government formulated the national spatial plan in response to a wave of suburbanization that occurred between the mid-1960s and the end of the 1970s. During this period, there was a threat that urban sprawl could engulf the Green Heart. The planning policy therefore, channeled urban growth into a number of designated growth centres (concentrated deconcentration) and prohibited growth of small rural

settlements. As a result, half a million people moved into the designated growth centres and urban sprawl was stopped (Dieleman and Wegener, 200□).

In the 1980s, spatial planning changed track and the policy of concentration deconcentration was traded for the ‘compact city’ policy. This was mainly due to concerns raised regarding decay of old urban centres, partly blamed on the development of the satellite towns. Under the ‘compact city’ policy, urban growth was guided into (re)development locations within existing cities and towards new greenfield sites directly adjacent to the built-up areas of larger cities. The implementation of the policy led to occurrence of development on the urban ring of the Randstad where it was supposed to occur under the compact city policy.

The success of spatial planning in the Ramstad is attributed to Dutch government working as a strategic planning authority in consultation with the lower tiers of government; peculiar tax system in the country where only 17 % of the revenue of municipalities comes from local taxation and 8□% channeled through the national state (drastically reduced competition between municipalities for urban growth). This gave the national government an instrument to influence local spatial planning policies. Again, The Netherlands has a very strong regulation by government of the residential development process.

2.9 Policies, development plans, and legal framework on land-use transformation

In Kenya, the allocation, use and development of any land is governed by plans, policies and laws. These play an important function of ensuring balanced and sustainable development of land due to increasing scarcity and complex competing land uses and demand (Olson et al, 2004; Government of Kenya, 2017), be it in urban or rural areas. Based on this, a decision was made to evaluate the policies and laws to establish their explanation and contribution to land-use transformation in the study area.

□□□Policies and plans

The National Spatial Plan (NSP) of 201□ sought to build on past planning efforts to provide a spatial structure that defines the use of land as a space to ensure its optimum use and sustainability (Government of Kenya, 2016). The plan recognizes that agricultural land in peri-urban areas are threatened by urban land uses and thereby affecting the livelihoods of peri-urban residents. The

National Land Use Policy (NLUP) of 2017 and National Land Policy (NLP) of 2009 strove to address issues directly relating to the use of land and its resources by incorporating activities that are likely to have an impact on use of land and resources (Government of Kenya, 2009; Government of Kenya, 2017). Just like the NSP, the NLUP and NLP guide the country towards efficient, sustainable and equitable use of land for prosperity and posterity.

Furthermore, the NSP, NLUP, and NLP notes that peri-urban agricultural lands in Kenya are under a threat of transformation to urban use. They attribute this to growth in population, improvement in transportation networks, cultural practices of land inheritance, decline of agricultural productivity, inadequate policies on land use, inadequate planning of urban areas including poor implementation and enforcement of development controls (GoK, 2009; GoK, 2017; GoK, 201□). The land inheritance practices and higher returns from agricultural land in urban use are singled out as being responsible for crippling government powers to control land use under freehold tenure thus proliferating the phenomenon of land-use transformation in peripheral areas.

Moreover, because of inadequate and poor planning of urban areas, the NSP, NLUP and NLP explains that rapid rural-urban migration has made urban areas to expand outwards inorganically and sporadically resulting to spilling over of human settlements and urban activities into peri-urban areas. As a consequence, peri-urban areas have been exposed to numerous land use conflicts, changes in land use patterns, loss of agricultural land, destruction of land resources, pollution of air, water and land resources. In the study area, a ribbon type of development along major highways is observed taking place.

To address challenges brought by land-use transformation, the NSP, NLUP and NSP have proposed intervention measures namely: delineation and formalization of edges of urban areas; adoption of smart growth policy; implementation of development plans; regulation of land subdivision and change of use of land from agriculture to urban use, practice land zoning; establish land banking; promote compact development; and harmonization of urban plans with long-term development plans to ensure synchrony between urban centres and rural areas. Although, it is evident that the plans and policies are essential to planning of urban and rural areas, they exhibit inherent weaknesses due to provision of inadequate implementation framework (Ayonga, 2019; USAID, 2009; Kitur, 2019). For instance, the USAID (2009) observed that implementation of policies is piecemeal and are interim in nature.

□□□Legal frameworks

The constitution of Kenya 2010 is a supreme law on which laws governing use of land in Kenya are anchored on. It provides various land tenure systems, with freehold tenure being the dominant land tenure in the study area (Kisii County Government, 2013; Kisii County Government, 2018; Government of Kenya, 2010).

The land act of 2012 identifies the land tenures systems which include freehold, customary and leasehold. To address processes such as subdivision of land which facilitates land-use transformation, both the Constitution of Kenya 2010 (article 68) and the Land Act of 2012 (article 159) propose for establishment of minimum and maximum land holding acreage. On the other hand, Urban Areas and Cities Act of 2019 requires planning authorities to delineate urban boundaries so as to determine the rural-urban interface.

The Physical and Land Use Planning Act of 2019 advocates for preparation of municipal plans that guide the county towards equitable and sustainable use, planning, and management of land (Government of Kenya, 2019). To address challenges brought by land-use transformation, the act requires preparation of physical development and zonal plans to help in prohibiting subdivision and conversion of arable land to urban use. According to the act, the zonal plans afford the means of solving land-use conflicts, clustering industrial, commercial, residential and social development in peri-urban areas.

Finally, the County Government Act of 2012 lists various plans to guide land use in the county. To address the peri-urban interface, the act requires counties to prepare and implement municipal, zonal, building and land use plans. It also requires delineation of the edges of municipality (Government of Kenya, 2012). As a way of overcoming the challenge of plan making and implementation, the act asserts that the preparation of county plans should be the basis for budgeting and no public funds should be appropriated outside a planning framework.

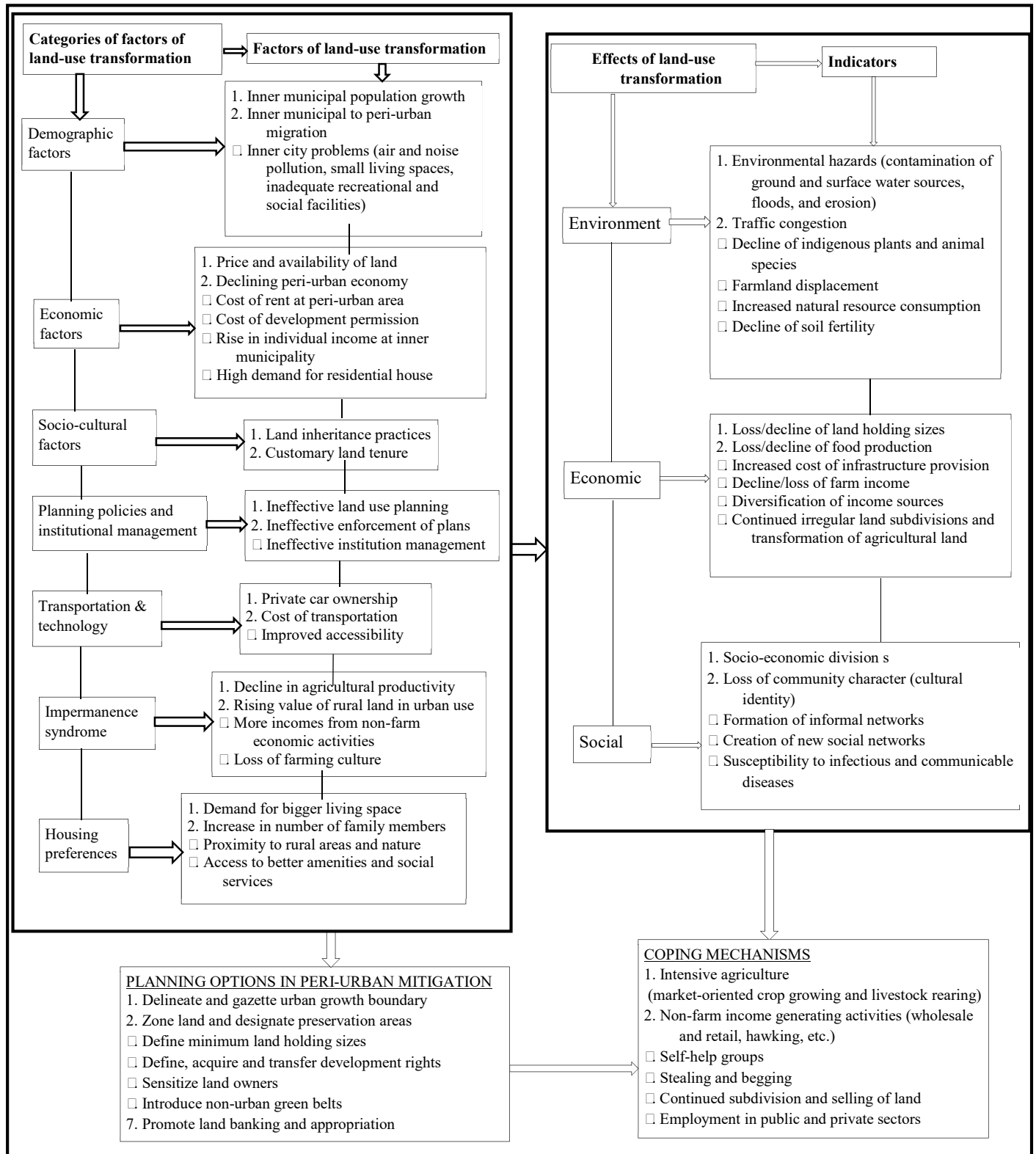
Although the Constitution of Kenya 2010 and the Land Act of 2012 requires a determination of minimum and maximum land holding size, both fails to specify the minimum size of land to be subdivided and thereby proliferating land-use transformation. They also fail to recognize the existing messes in land use but concentrate on the future development. Although the County Government Act of 2012 and Physical and Land Use Act of 2019 stipulates for the preparation of

various types of plans, they fail to specify the systematic order and duration in which the plans should be prepared and implemented. Again, the laws are running concurrently thus creating overlaps and ambiguities in decision making, waste of time and invaluable resources. In carrying out development control and delineating boundaries of urban areas, the acts do not provide procedures to be followed nor stop further development until demarcation of municipal growth boundary is done. Thus, demonstrating lack of express legal authority to take action against those who contravene the development control regulations. Because of this, there is continuation of the phenomenon of land-use transformation and permission of new developments rather than planning and revitalizing established unplanned peri-urban settlements.

□□□ **Conceptual framework**

The literature review has revealed possible factors and effects of land-use transformation in peri-urban areas. It has also examined how land-use transformation effects, not only the peri-urban environment, but also the livelihoods of peri-urban residents. The examination of concentric zone, sector, Bid-rent and wave analogue theories helped to explain the phenomenon of land-use transformation, generalization of peri-urban land use, and depiction of factors responsible for land-use transformation in the study area. However, such purely spatial models are in some way inappropriate to fully explain what peri-urban areas represent. This is due to the fact that they tend to over-simplify the character of peri-urban areas. Besides, they fail to account for the economic, social or cultural complexity of peri-urban areas nor the processes found in them. This could be attributed to failure to anticipate future changes at the time of postulating the models. Hence, the need to extend the research to establish what other studies have found in relation to the phenomenon of land-use transformation, the factors, effects and coping mechanisms. According to Chazan and Cotter (2001), the factors and effects of land-use transformation are all closely interrelated, and that some effects are responsible for land-use transformation and vice versa. From this observation therefore, the relationship of the factors, effects, coping mechanisms and peri-urban planning options was as shown in a conceptual framework represented by figure 5.

Figure 1 The Conceptual framework



Source: Author's construct, 2020

CHAPTER THREE: RESEARCH METHODOLOGY

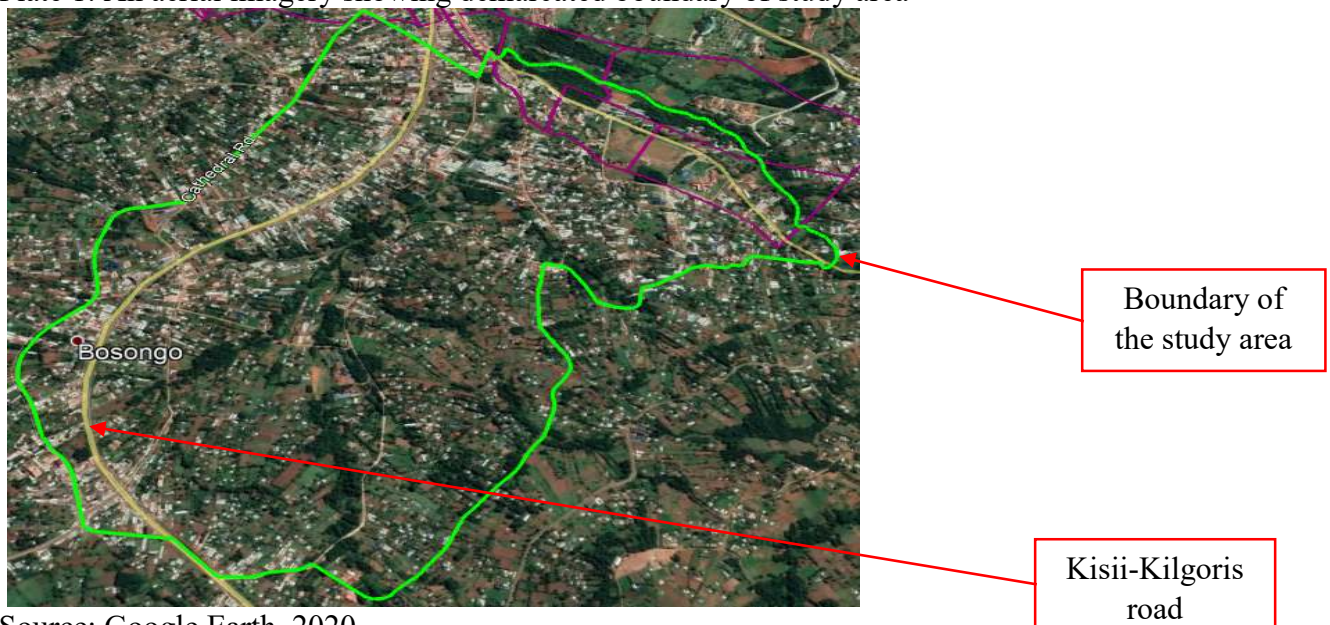
□□ Introduction

This chapter describes the types and sources of data, sampling techniques, data collection instruments, description of variables for measurement, steps followed in hypotheses testing, and data analysis and presentation techniques used in this research.

3.2 Selection and demarcation of study area for field study

This study was conducted in the peri-urban areas of Kisii municipality. The peri-urban area selected comprised of a portion of Kisii central and Bobaracho wards to the South East of the inner municipality and covered a total land mass measuring □□km². Using an aerial Google Earth imagery and transportation corridors, the boundary of the study area was demarcated followed by exporting the shape file to ArcGIS 10.7 for detailing. Since the exact end boundary of peri-urban is fluid, the demarcation was done using the density of buildings. This section of the peri-urban area was chosen because from the field observation, it is experiencing the fastest rate of transformation of agricultural land to urban development. Plate 1 is an aerial imagery showing the demarcated boundary of the study area. The field survey was conducted with the main aim of identify factors leading to land-use transformation in areas outside of Kisii municipality, resulting effects and coping mechanisms of the affected indigenous peri-urban communities.

Plate 1: An aerial imagery showing demarcated boundary of study area



Source: Google Earth, 2020

□□Literature review

A detailed literature review of a variety of reference materials was carried out to enable conceptual understanding of the phenomenon of land-use transformation; frame the research problems, research objectives and questions as well as deliver the conceptual framework (refer section 2.10 in chapter 2); isolate the independent and dependent variables; and formulate research hypotheses.

□□Research design

The conduction of this study involved the identification of the research problem, stating the research objectives to guide the study through literature review. The reviewing of literature involved use of secondary sources of data which in turn enabled conceptual understanding of the phenomenon of land-use transformation, identification of the variables for field measurement and validation, and eventually a conceptual framework. This was then followed by development of a data need matrix which defined types, sources, instruments, and methods employed in collection of primary data. It also indicated the techniques of data analysis and presentation to inform the main purpose of the study. Among the tools which were identified for data collection include household questionnaire, semi-structured interview schedules, and observation checklists. On the other hand, the research employed simple random and purposive sampling techniques.

□□Sampling procedure

□□□Target population

In research, population includes a set of people, services, elements, events, groups of things or households that are being investigated. The population is defined in terms of content, extent and time. This implies that study population is a complete list of relevant units of analysis of data. Target population includes all the individuals that are included in the study. In this study, the target population included all farmers and land buyers/developers, and county government employees (director of physical planning, county surveyor, quantity surveyor, architect, mechanical and electrical engineer, and physical planner), and chairperson of land control board (LCB) and Kisii County Municipal Board (KCMB). The latter are key informants to the study.

The key informants were selected because they were directly involved in making decisions regarding use of land in the study area. The county government officials provided information

which farmers and land buyers/developers were not willing or not in a position to provide. These included trends and variations in prices of land, rate of land subdivisions and transformation. However, the farmers and land buyers/developers (migrants) were the main target population in provision of firsthand information to inform the research question and objectives. In conclusion, during the study survey, a total of 20 farmers and 10 land buyers were sampled. In addition, four key informants were interviewed namely director of physical planning, county surveyor, chairperson to Land Control and Kisii Municipal Boards respectively. These were the accessible population at the time of the study survey and they were a representation of the target population.

3.3.3 Sampling plan

In research, it is often practically impossible to collect data from the entire units of analysis covered by the research problem or target population. As a result, sampling becomes necessary so that data can be collected from a portion/subset of the target population. Therefore, it is an essential requirement that any sample must be representative of the entire target population as possible from which it is drawn. In this case, analysis was based on the sampling units, and that the results so obtained was similar to that which could have been obtained had the entire target population been analyzed.

Therefore, to get the sample size, several demarcation of polygons following access roads, footpaths, rivers, and natural features such as property boundaries, was done to facilitate manual counting of land parcels; thus yielding a total number of 900 land parcels. Plate 2 shows the demarcation of boundary polygons to facilitate manual counting of buildings on an aerial imagery. In this research, it is assumed that all the land parcels have been transformed to urban use.

In research, determination of sample size is a function of different factors namely financial resources, the purpose of the study, characteristics of the population, among others. So, to determine the sample size, the researcher used scientific formula adapted from Israel (2012).

$$n = N / [(1 + N(e^2))]$$

Where

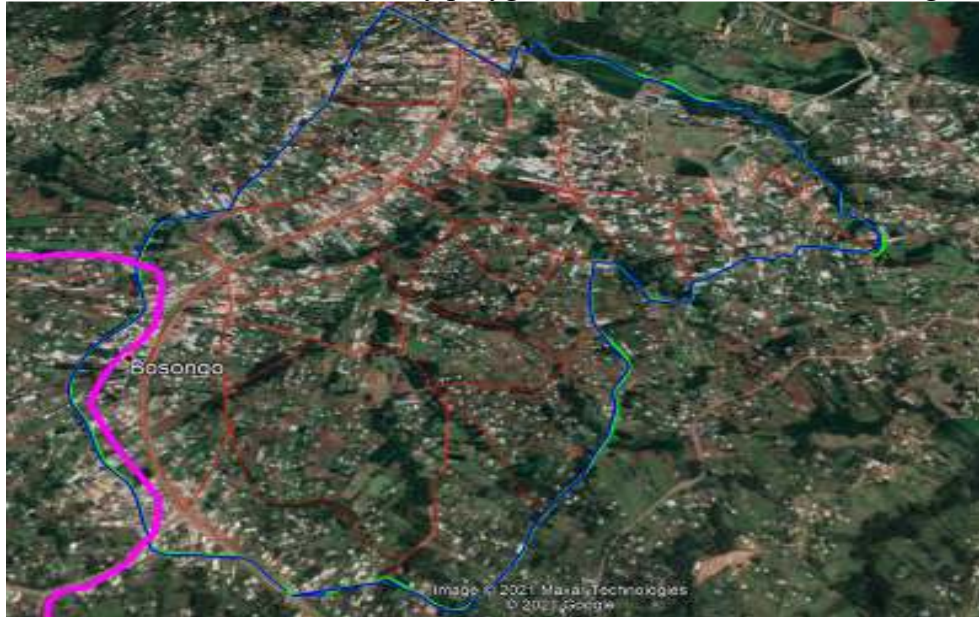
n = minimum required sample size

N= Population size

e = level of significance (that is, %)

From a population size of 900 parcels of land (representing farmers and land buyers), the sample size became 208 land parcels. Due to inadequate financial resources, constraints of time, the researcher made a decision to sample 100 individuals (that is, 50 farmers and 50 land buyers) randomly. This sample size was considered adequate to give the required representativeness of the entire population, accurate and correct result during data analysis.

Plate 2: Demarcation of boundary polygons to facilitate manual counting of land parcels



Source: Google Earth, 2020

□□□ Sampling techniques

This study employed both simple random sampling (probability) and purposive sampling (non-probability) sampling techniques in collection of data for analysis. Simple random sampling was used in administering household questionnaires because each farmer and land buyer had equal chance of being interviewed to enable generalization of the phenomenon of land-use transformation. On the other hand, purposive sampling was essential in collecting data and information from government officers with knowledge of land issues in the study area. The choice of purposive sampling was informed by the fact that the population is homogenous (consists of government employees). Again, purposive sampling was considered appropriate because of a small subset of a larger population in which members of the subset are easily identified but enumeration of all of them would be almost impossible.

□□Data collection

□□□Types and sources of data

This study made use of both primary and secondary data. The primary data was collected directly from the field (study area). The secondary data, on the other hand, was collected through literature review. The materials reviewed included books, internet materials, reference materials, empirical and evidence-based articles in scholarly, conference proceedings and papers, dissertations, theses, journals, and magazines, supplementary survey data, and use of Google Earth imagery. The imagery helped in provision of information and demarcation of peri-urban boundary. The secondary data helped justify the need to carry out the study as well as identify data gaps and needs; understand the phenomenon of land use transformation; process of peri-urbanization, previous planning efforts, geographical location, physiographic characteristics, guiding principles and legal framework. These, eventually, culminated into development of conceptual framework (section 2.10).

□□□Data need matrix

In this research, the data need matrix provided a detailed explanation of how each variable (as contained in the conceptual framework (refer section 2.10 in chapter 2)) was measured through identification of relevant data to provide the information required in answering the research questions. The data need matrix contained research objectives; types of data needed (factors and effects of land-use transformation, coping mechanisms, and planning options); methods of collecting the data; sources of data; data collection instruments; data analysis techniques; and finally data presentation techniques. It also provided a platform for a well thought-out analysis, selection of appropriate techniques of data analysis and presentation. A detailed data need matrix is as shown in appendix 1.

□□□Data collection instruments

In this study, three types of instruments were used to collect field data and information. These were, namely closed-ended household questionnaire, interviews, and observation. Using household questionnaire, the researcher provided respondents with possible answers to choose from. The closed-ended questions came in various forms namely two way questions, multiple

choice questions and rating scales. The household questionnaire was used to collect data and information regarding phenomenon of land-use transformation from farmers and land buyers/developers. These included socio-economic characteristics, factors, effects, coping mechanisms, and perception of residents regarding the phenomenon of land-use transformation including peri-urban planning options. The choice of using household questionnaire was informed by the fact that it has the potential of reaching as many respondents as possible within a short period of time, accorded respondents adequate time to respondents answer questions, offered sense of anonymity to the respondents, and minimizes biasness resulting from personal character.

The study also made use of semi-structured interviews. The interview schedules contained all items covering all the objectives of the study. The interviews schedules enabled key informants to express themselves freely on the subject matter. Semi-structured structured interviews were used because of capability to produce valid and rich information, flexibility and room for further investigation.

Lastly, observation by way of checklists was useful in collecting data and information where the other two tools could not manage to collect such as residential buildings, living houses, types of crops grown, among others. Again, it was useful where respondents were either uncooperative or unaware of the answers sought. Thereby ensuring effective data collection and avoided omission of data. Data collected using this instrument was corroborated with the findings of the study.

□□□**Data collection**

The collection of data for the study first started with administration of household questionnaire to farmers and land buyers. During the administration process, salient features of interest were also collected using observation checklist and photographing using a camera. These were physical and social infrastructure, income generating activities, and physiographic features like rivers and vegetation. Each questionnaire was assigned a unique number and type of respondent marked appropriately for easy of reference and tracing the respondent in case of omission of information and clarification of issues during data entry and analysis.

□□□Data analysis and presentation

Data analysis started with the cleaning, coding, and entering of data into a computer and performing final analysis to enable the researcher make sense of the data and obtain desired results. After all the household questionnaires were administered, the mass of raw data was systematically cleaned and organized in a manner that facilitated analysis. This was done by first making a code book in SPSS 20 series. The code book enabled accurate description of specific details of the code scheme that was followed during data entry. Analysis of data was done using both SPSS and MS excel software and presented using mean scores, percentages, tables, bar graphs, and pie charts. However, further information collected verbally during field work was presented using qualitative technique by way of descriptive narrative and photographs.

□□□Hypotheses testing results

This study made use of 8 variables (2 factors and 17 effects of land-use transformation. According to the study, the 8 variables were subjected to significance test in which mean scores were used to verify whether a variable is significant factor or effect of land-use transformation in the study area. To accept or reject a factor or effect of land-use transformation, a population mean score test was used. To do this, the respondents were required to rate the factors and effects of land-use transformation on a rating scale of 1 to 5, where 1 denoted 'Not important' and 5 denoted 'Very important.'

It was assumed that the characteristics of the sampled households were similar to that of the entire population of households being studied. Also, the population was assumed to obey the normal distribution where the four possible scores of 1- 5 in the devised numeric scale had an equal chance of occurring. Therefore, the population mean score was 2.5 on the rating scale. Any factor and effect with a mean score of more 2.5 was statistically significant factor or effect of land-use transformation.

Besides significant testing for factors and effects of land-use transformation, the study also tested two study hypotheses (refer section 1.1 in chapter 1). The testing of this hypotheses basically was to show a variation in income from residential investment and farming and cost of development in the inner municipality and areas outside it. To test the first hypothesis, income from residential housing and farm income was collected from farmers. For the second hypothesis, data (that is,

architectural, quantity survey, electrical, mechanical, physical planning and surveying fees, and registration fees) was collected from key informants. This was done mainly to support the hypothetical assumptions that income from rental housing and cost of development have a significant role in the transformation of agricultural land to urban use in the study area. A significance level, $\alpha=0.05$ was set at which the null hypotheses was either accepted or rejected.

4.4 Validity and reliability

This research aimed at establishing the factors and effects of land-use transformation and eventual coping mechanisms by the affected peri-urban communities. To do this, the researcher strove to collect correct and precise field data. In this research, piloting of household questionnaire was done to a group of five selected respondents to establish the coherence, duration and easy of collection of data. The data collected was then analyzed to establish any ambiguities in using the data collection tool. From the first piloting, the respondents indicated that it took a little bit more time to collect information because of difficulty in understanding some of the questions. Again, it was noticed that there were missing links and inconsistencies between one question to another. Hence, to overcome this challenge, research made correction to the household questionnaire and did the second piloting to the same respondents.

4.5 Ethical considerations in data collection

In research, ethics has an overriding implication for data collection, analysis and research output. Therefore, based on this observation, the research had to uphold ethics with respect to personal privacy, confidentiality and anonymity of data, informed consent, and no deceit or lying in the course of research. The respondents were informed of voluntary nature of the study that the research will not directly benefit them; rather it is purely for academic and for the benefit of the researcher. Again, to guarantee cooperation from respondents, the researcher strove to be brief, relevant and accurate in conveying the intent of the research and why data collection to avoid boredom and loss of focus. To crown it all, the researcher sought for permission from the University of Nairobi, department of Urban and Regional Planning. The permission in the form of a formal letter was presented to the respondents to instill confidence and hence provision of required data. Appendix 10 and 11 are permissions to carry research from University of Nairobi and National Commission for Science, Technology and Innovation (NACOSTI) respectively.

CHAPTER FOUR: THE STUDY AREA

4.1 Introduction

This chapter provides background information on geographical, historical and social process setting of the study area in terms of location, size, physiographic and natural conditions; demographic dynamics; physical and economic infrastructural aspects as well as the administrative and political units of the study area. The chapter also provides the status of basic urban services.

4.2 The general setting of the study area

4.2.1 Location and size

The area selected for this study was just immediately outside the boundary of the old Kisii municipality. It lies to the southern of the Kisii municipality and is engulfed within latitudes $0^{\circ}1'0''S$ and $0^{\circ}2'0''S$ and longitude $35^{\circ}01'E$ and $35^{\circ}7'1''E$ with a total land mass of 10km^2 . In terms of geographical and administrative jurisdiction, it is within Kisii County, Nyaribari Chache sub-county. Further, a portion of it to the East is in Bobaracho ward while the other portion to the West is in Kisii Central Ward. These two wards have their boundaries extending further into CBD and rural areas. The old Kisii municipality covers a total land mass of 29km^2 as per to the physical development plan of 1971.

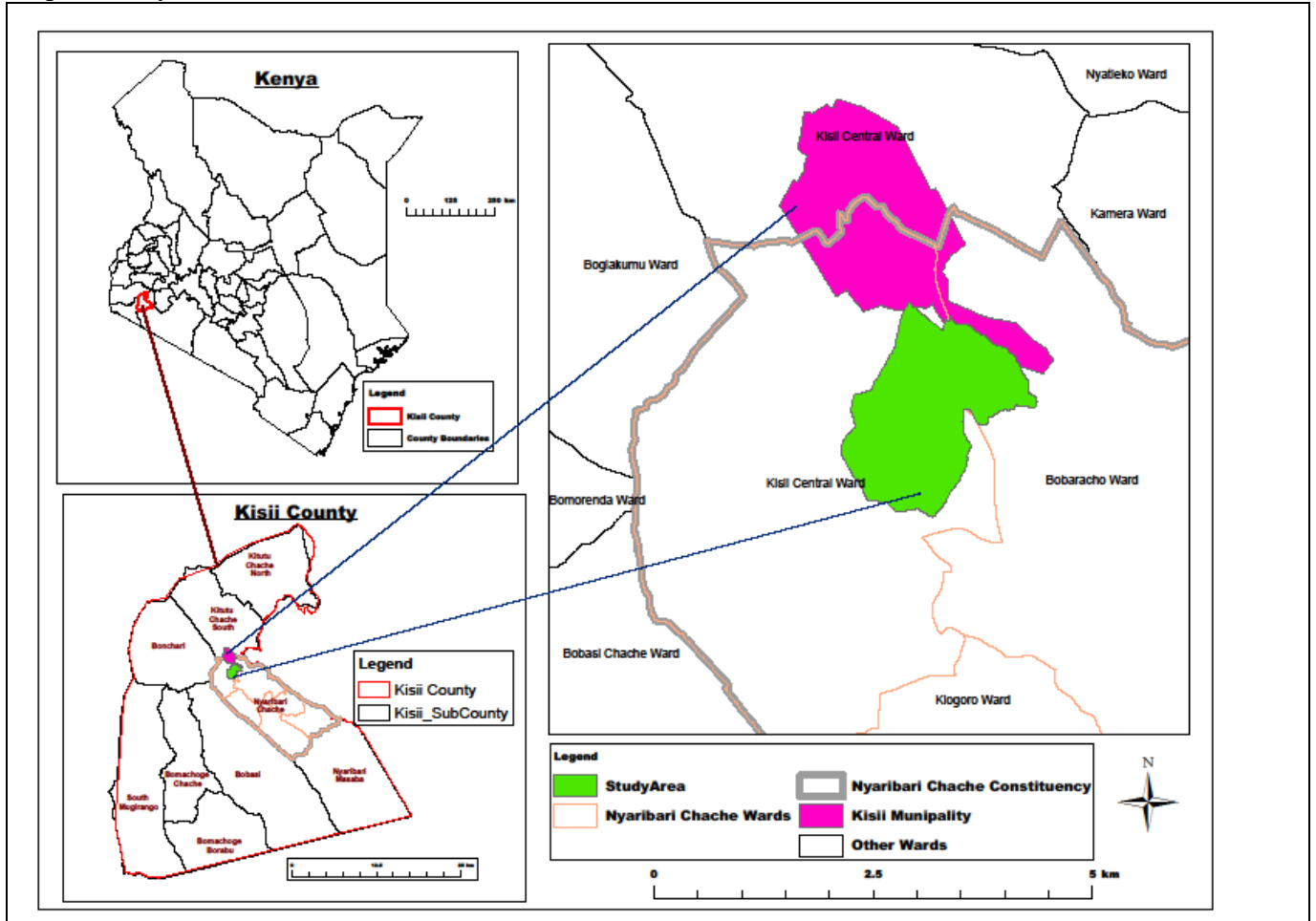
4.2.2 Historical background of the study area

The establishment of Kisii town started during the coming of the colonialists when British soldiers were forced to retreat from Lake Victoria by heavy gunfire from German soldiers' gunboats during World War I. Before the coming of the British colonialists, the town was originally known as 'Getembe' by the Gusii people. It was later renamed 'Bosongo' (to refer to the British or whites) who lived in the town during the colonial times.

In 1904, encouraged by good accessibility and plenty of ground water, the colonialists made it an administrative centre. The town grew to become the administrative headquarters of the region then known as South Kavirondo comprising of Kisii and Nyanza Districts in 1907. At that time, the town served as an administrative and commercial centre dominated by Indian traders.

In 1911, the town was raised to the status of a township with a boundary covering 8km². In 1970, it was upgraded into a town council and later a municipality after its boundary extended into rural areas covering a total land mass of 29km².

Map 1: Study area



Source: Author’s construct, 2020

In 1900, when Kenya attained self-rule, the town had a population of 1000 people. This population over time has grown to just over 80,000 people today. With the extension and upgrading of access roads from the town outwards, the town expanded mainly along the main highway into areas namely, Menyinkwa, Mwembe, Nyanchwa, Jogoo, Nyamataro, Bobaracho, and Kiabiraa and then away from main highways into rural areas.

Today, Kisii town is an economic hub hosting several businesses, financial and educational institutions, light industries, civil societies (Non-governmental Organizations (NGOs)), and many government agencies. The Kisii municipality has expanded in all direction, but much of the

extended developments first occurred along the main highways to Keroka, Nyamira, Oyugis, Kilgoris, and Migori. As time went by, and with construction of new access roads to rural areas, developments has been extending from the highways to the rural areas.

□□Demographic dynamics

Kisii municipality is predominantly inhabited by the Gusii community (also known as Kisii people). Other people from other parts of Kenya inhabiting the town include the Nubians, Arabs, Luo, Luhya, Kuria, Somali, Indians, Kikuyu, among others who make up a minority of residents (Kisii County Government, 201□). In planning and other pertinent fields, demographic and related data play a significant role in planning and development across nearly all the sectors of the economy and society at large. The importance of demographic information lies in the simple fact that development is basically the improvement of the lives of the people in society. This implies the policy and fiscal decisions must be based on factual data that addresses the needs of people by providing answers to where and how they live and how their lives are changing.

From the foregone, it is therefore imperative that factual data must function as a public good that benefits citizens in the study area, the county, the national governments, private sector and all the concerned agencies in the policy making and public planning. It is therefore important to understand the demographic factor of Kisii municipality in general and the study area in particular. However, it should be noted that as per the current administration dispensation, the study area falls within the proposed Kisii municipality covering a land mass of approximately 70km². According to the population census of the year 2009, the proposed Kisii municipality had a total population of □1,892 people (Kisii County Planning Unit, 2018) as shown in table □ Further, according the census of 2019, the municipality had a total population of 7□,098 people (KNBS, 2010).

Table 1: Population of Kisii municipality

Year	Male	Female	Total
2009	□1,□29	□0,□□□	□1,892
2019	□7,□07	□□,□91	7□,098

Source: KNBS, 2009 and 2019

□□ Climatic and physiographic features

Toman (200□), argued that that the quality of the natural environment is a significant determinant of the directions of the socio-economic and spatial development at any given moment in time. This argument was based on the fact that economic development involve extraction, processing and consumption of natural resources to satisfy human needs and wants (ibid). Therefore, the perception of nature by people and how their life as a people depend on the properties of the natural environment, a culture-determined situational context, among other factors which influences what would reasonably be viewed as a visible development strategy. It is therefore evident that the quality of the environment and its services, has a bearing, positively and negatively, on human socio-economic activities and development. Hence the need to understand the environmental setting of the study area.

□□□ Topography and drainage

Kisii municipality (by virtue of its position in highland regions) exhibits a highland equatorial climate resulting into a bimodal rainfall pattern with an average annual rainfall of 1,□00mm (Kisii County Government, 201□). Its temperature ranges from 1□°C to 27°C. In terms of relief, the area is within the highland region with altitude ranging slightly less than 1□00m and slightly more than 1700m above mean sea level (Jaetzold et al, 2009). It generally receives rain almost throughout the year due to its position in the leeward side in the Lake Victoria basin and heavily foliated Kisii highlands. The long rains are between March and June while the short rains are received from September to November with the months of January and July being relatively dry. However, due to changes in weather patterns the rain patterns are slowly changing.

Specifically, the study area is characterized by undulating terrain. From the inner municipality, the terrain rises sharply towards the Nyanchwa and Kiamabundu hills to the South in Kisii Central ward. But in Bobaracho ward to the south East, it gently falls from Menyinkwa area (upper side) towards Kisii university to the North. This explains why most of the small river tributaries feeding river Nyakomisaro passing through the inner municipality starts from hills in the south of the study area.

□□□Geology and soils

The study area is composed of upland soils developed on igneous rocks known as phaeozems and nitozols (Jaetzold et al, 2009). These soils are well drained, extremely deep with humid top soil. They have moderate to high fertility, and hence, suitable for the growth of a variety of crops. Examination of the soils in the study area indicates that the whole area is suitable for agriculture. Crops grown include almost all the cash crops (coffee, tea and pyrethrum) and food crops. However, due to the high demand for urban housing, most of the agricultural lands have been replaced with permanent houses.

□□□Agro-ecological zone

Agro-ecological zones are geographical areas exhibiting similar climatic conditions that determine their ability to support rain-fed agriculture. The agro-ecological zones are influenced by latitude, elevation, temperature, rainfall amount and distribution during the growing period (Jaetzold et al, 2009). The study area falls under the upper midland suitable for farming (Jaetzold et al, 2009).

□□□Vegetation

The study area is generally made up of exotic trees such as eucalyptus/blue gum especially in lands which have not been developed with permanent structures. A large number of these trees are located along the edges of rivers and property boundaries. However, from the field observation, it was observed that the vegetation in the area of study is greatly affected by stiff competition from development such as construction of permanent residential houses. Plate □ shows eucalyptus trees grown in the study area.

Plate □ Eucalyptus trees grown in the area of study



Eucalyptus trees

Source: Field survey, 2021

□□Economic activities and land use

Historically, agriculture is the main economic activity in the study area. This is because, almost all the land parcels are under freehold system and therefore designated for agricultural use. And has already noted, the geological and agro-ecological characteristics favours the growing of both cash and food crops. However, the field observation indicated that the expansion of the Kisii municipality into the outskirts has tremendously affected the potential of agricultural productivity. This is due to conversion of agricultural land to residential uses. Because of this, many of the land owners are compelled to convert their land to urban use due to high returns from investing in rental housing while practicing subsistence farming for household consumption.

□□□Subsistence farming

The main crops grown under subsistence system of farming include banana, maize, vegetable crops, sweet potatoes, beans, cowpeas, arrow roots, among others. The production of these crops is on small scale due to small land holding sizes. Again, these is done purposely for household consumption only. The poor production can also be attributed to poor farming practices. There is, however, a potential to improve the production to achieve food sufficiency in this area if small scale farmers can shift to use of modern technologies like greenhouse farming, hydroponics among others. However, the modern techniques are expensive to start and venture into due to high costs and skills requirement. Plate □ is an image of the subsistence farming practiced in the study area.

Plate □ Subsistence farming (banana)



Source: Field survey, 2021

□□□Cash crop farming

The main cash crops grown in the study area include coffee and tea though on a very small scale. Hence, its contribution to the financial stability of households within the study area is minimal. Other farming activities practiced in the area on small scale include livestock rearing for household consumption.

□□□Livestock production

Livestock rearing is not widespread in the study area. However, families with space are in a position keep a small number of cows, goats and poultry. All these are kept on small scale. The livestock farmers either grow nappier grass on the small land parcels or source it from far places in rural areas. the keeping of livestock is for production of milk mainly for domestic consumption only. When the animals grow old and become unproductive, are sold as a source of income to meet household basic needs. Plate □ is an image showing livestock rearing in the study area.

Plate □ Livestock rearing in the area of study



Source: Field survey, 2021

In summary, agricultural production in the study area is sharply on the decline owing to high demand for land for residential development, land fragmentation, urban development, poor farming methods, and lack of capital and technical skills to match the requirements of modern farming techniques.

□□ **Commerce, industry and employment**

Kisii municipality is a commercial hub, not only for Kisii county but also the entire South Nyanza region. It has few industries most of which are classified as light industries. These include food processing such as baking of breads and cakes, retail and wholesaling, banking services, transportation services, hotel industries, petrol stations, institutions of learning ranging from kindergartens, primary schools to colleges and universities. Besides, the municipality is a hub for transportation services serving major towns namely Kisumu, Kericho, Nakuru, Migori, Kilgoris, Nairobi including minor towns within Kisii county and neighbouring counties. These are the major sources of employment for most of the peri-urban communities of Kisii municipality especially the youth. Although the municipality has a high potential for manufacturing activities, the scale is still very low. However, with devolution of administration function and governance system, there is a likelihood that manufacturing will pick momentum with time as county government and individuals are trying to embrace new innovations in industrial sector such as banana and avocado processing.

□□ **Human settlement patterns**

A human settlement is the totality of the human community – whether city, town or village – with all the social, material, organizational, spiritual and cultural elements that sustain it (UN Habitat, 197□). The Kenya (1978) government defined human settlements as a concentration of activities and people, whether they are the smallest village or the largest metropolis. The human settlements consist of the physical elements and services. The physical elements comprise shelter (for security, privacy and protection from the elements and for singularity within a community) and infrastructure (the complex networks for the flow of people, goods, energy or information from shelter). Services are the support required by a community to fulfil its functions as a social body such as education, health, culture, welfare, recreation, nutrition, among others. Mutua (201□), explained that human settlements are essential for economic growth and development. He further noted that the concentration of activities and people provide the opportunities for achieving sufficient levels of economic and technical efficiencies regarding resource utilization in productive investment.

In the study area two types of settlements are present. At the onset when the inner municipality was expanding a linear settlement pattern occurred along the main highways (Kisii – Kilgoris road and minor road networks). As time went by and with increase in demand for land for urban use, development extended further into the areas away from the road. This created nucleated or clustered pattern of human settlement – the major human settlement pattern prevalent in the study area. However, towards the rural areas, dispersed human settlement patterns starts to emerge.

□□ **Physical infrastructure and service facilities**

Yoshino and Nakahigashi (2000), defined infrastructure as the capital stock that provides the public goods and services. It produces various effects, including those of production activities and quality of life for the households, which permeates the entire society (Yoshino and Nakahigashi, 2000; Mutua, 201□). The production activities include agriculture, industry, trade, among others. Example of physical infrastructure include electricity distribution, transportation systems, and telecommunication, water and sewerage systems, and waste disposal and management

□□□ **Transportation**

The study area is made up fairly good road network. The main highway (Kisii – Kilgoris) passing through the study area from inner municipality is tarmacked. Additionally, it covers a total distance of 2.□□km long in the study area. The rest of the roads classified as rural access are all marram and earth surfaces. Road transport is the only mode of transport available in this place.

□□□ **Energy**

The study area is well connected with electricity grid. From the field survey, electricity is the main source of energy for lighting in most of the households, with a few homesteads using solar energy or both. The slow uptake of solar energy especially for middle income and poor families in peri-urban areas could be attributed to high installation and acquisition of solar equipment.

□□□ **Water supply**

In any given society, water is at the core of sustainable development. It is critical for socio-economic development, healthy ecosystems and for human survival itself. It is also a finite and irreplaceable resource fundamental to human well-being. The field study revealed that although

there is well established network of water pipes by Gusii Water and Sewerage Company (GWASCO), the supply is very minimal. A number of respondents indicated that it can take several months before getting piped water. Owing to this challenges, many families have dug shallow wells as their main source of water for domestic use. Other sources of water include rain water harvested and stored in tanks and rivers. However, people are shying away from using river water due to contamination by wayward residents. Plate 1 shows protected springs in the study area.

Plate 1 Protected springs



Source: Field survey, 2021

1.1.1 Waste collection and management

The waste collection and management is the responsibility of Kisii County Government. However, provision of sewerage services lies with GWASCO. The field survey revealed that residents are instructed to dump solid waste at designated points where it is collected and transported to dumpsite. Homesteads to the northern of the study area are connected to the existing sewerage system while those without are using pit latrines or septic tanks.

1.1.2 Postal and telecommunication services

The old communication facilities are no longer applicable in the study area. This is attributed to changes and advancement in technology. Hence residents are using mobile telecommunication services provided by subscribers namely Safaricom, Airtel, Orange, YU, and Telkom. The residents also use radio and televisions for receiving information from across the country and beyond. The installation of fibre optic cables in Kisii Town and its environs has enabled businesses and households mainly in the study area to be connected to the rest of the world through fast internet.

□□ **Social infrastructure and services**

In social sphere, social infrastructural services promote the social well-being of the people. Social services include: education, health, recreation, emergency services, governance and public administration, cultural centres and community facilities. Provision of these services is aimed at promoting social change, protect vulnerable groups and development in society as anchored by Sustainable Development Goals, Kenya Constitution 2010, Vision 20□0, National Spatial Plan, pertinent laws and regulating policies.

□□□ **Health services**

In the study area, there is one public dispensary called Nyaura a many clinics owned privately. However, many of the peri-urban residents do access bigger hospital within the inner municipality at walking distance. Some of these hospitals include Kisii Teaching and Referral Hospital (KTRH), Oasis, Galaxy, RAM, Hema, Kiogoro dispensary, Nyanchwa, and Getembe.

□□□ **Educational facilities**

In the study area, there are three public secondary schools namely Nyaura and Gusii Highlights. The former is a public day school while the latter is privately managed. There are two public primary school namely Gekomu and Nyaura primary. There rest of the primary schools are owned privately. Nevertheless, children from the study area do access schools in the inner municipality namely Kisii campus primary, Nyamage primary, Rehema Acdemy, Elimu Academy, Set Green Hill, among many others.

CHAPTER FIVE: RESEARCH FINDINGS AND DISCUSSIONS

5.1 Introduction

This chapter provides a detailed findings of the study with respect to the factors and effects of land-use transformation, coping mechanisms by peri-urban residents, and perception of residents regarding peri-urban planning options to mitigate challenges brought by land-use transformation.

5.2 Factors of land-use transformation

This study sought to address the first research question which was;

‘What are the factors of land-use transformation in the peri-urban areas of Kisii Municipality?’

In order to find answers to this research question, a literature review was conducted by examining the theories explaining the process of land-use transformation (refer section 2.1 in chapter two). These were, namely concentric zone, sector, Bid-rent and wave analog. Besides the theories, the research reviewed further literature to establish what other studies have found as the possible factors of land-use transformation in peri-urban areas (refer to section 2.1 in chapter two). The review was critical in understanding and establishing factors responsible for the occurrence of the phenomenon of land-use transformation in peri-urban areas. Emanating from these, the researcher conceptualized 2.1 as ‘what would be’ the possible factors of land-use transformation as shown in table 2.

Table 2: List of factors

Number	Name of factor
1	Inner municipal population growth
2	Inner municipality to peri-urban migration
3	Inner municipal problems
4	Price of land
5	Decline in peri-urban economy
6	Cost of rent at peri-urban area
7	Cost of development permission
8	Rise in individual income in inner municipality
9	High demand for residential housing
10	Customary land tenure
11	Land inheritance practices
12	Ineffective land-use planning

Number	Name of factor
1□	Ineffective enforcement of plans
1□	Ineffective institution management
1□	Private car ownership
1□	Cost of transport
17	Improved accessibility
18	Decline of agricultural productivity
19	Rising value of rural agricultural land in urban use
20	More incomes from non-farm income activities
21	Loss of farming culture
22	Demand for bigger living space
2□	Increase in number of family members
2□	Proximity to rural areas and nature
2□	Access to better amenities and social services

Source: Author's construct, 2021

Each of these factor was subjected to further inquiry by identifying its source of data, methods of data collection, analysis and presentation. This was as shown in the detailed data need matrix in appendix 1. Once all these had been done, a structured closed-ended questionnaire was prepared. This enabled collection of data and information for validation of the factors of land-use transformation. Other data and information which was picked included age of respondents, category of respondents, area lived before, methods and year of land acquisition, income generating activities, income from rental and farm investment.

Furthermore, the respondents were required to identify and rate factors according to their level of influence on land-use transformation on a scale of 1 to □ where 1 denoted 'not important' while □ 'very important.' Besides the household questionnaire, the researcher used observation checklists and interview schedules to collect data from field and key informants respectively.

Finally, the researcher proceeded to calculate the response rate. This was necessary in determining the accuracy of the research inquiry. In research inquiry, a good response rate improves the representativeness of results to the target population. Table □ is the outcome of the response rate according to the field survey.

According to Mugenda and Mugenda (200□), a response rate of at least □0% is considered satisfactory. From table □, the study achieved an overall survey response rate of 72% from the

possible accessible population. Thus, meeting Mugenda and Mugenda (2003) requirements in making conclusive judgement about the phenomenon of land-use transformation.

Table 1: Survey response rate

S/No.	Respondents	Expected number of schedules/interview(s)	Responses	Response rate (%)
1	Farmers	10	20	100
2	Land buyers/developers	10	7	70
3	Land Control Board	1	1	100
4	County Physical Planner	1	1	100
5	Land Surveyor	1	1	100
6	Architect	1	1	100
7	Quantity surveyor	1	1	100
8	Electrical Engineer	1	1	100
9	Mechanical Engineer	1	1	100
	Total	46	46	100

Source: Field survey, 2021

3.3.3 Age of farmers

According to the field survey, it was found that 17% of the farmers were aged between 20 to 30 years; 20.8% aged between 31 to 40 years; 27.9% aged between 41 to 50 years; 12.9% aged between 51 to 60 years; 8.9% between 61 to 70 years while 3.9% were aged over 80 years. From these findings, it was evident that farmers aged over 40 years were adequately mature to explain the contribution of land subdivision to the process of land-use transformation in the study area. However, the study noted that majority of farmers owning land in the area of study are aged between 31 to 40 years; and that most of the original land owners had died and the current agricultural land owners acquired their land through inheritance. Oluoch-Kosura (2003), opined that the age of a farmer may explain the exposure to farming practices, level of exposure to new technologies in farming and thereby the use of land. Similarly, as agricultural landowner become older, there is a likelihood of subdividing land to fulfill the socio-cultural practices such as land inheritance.

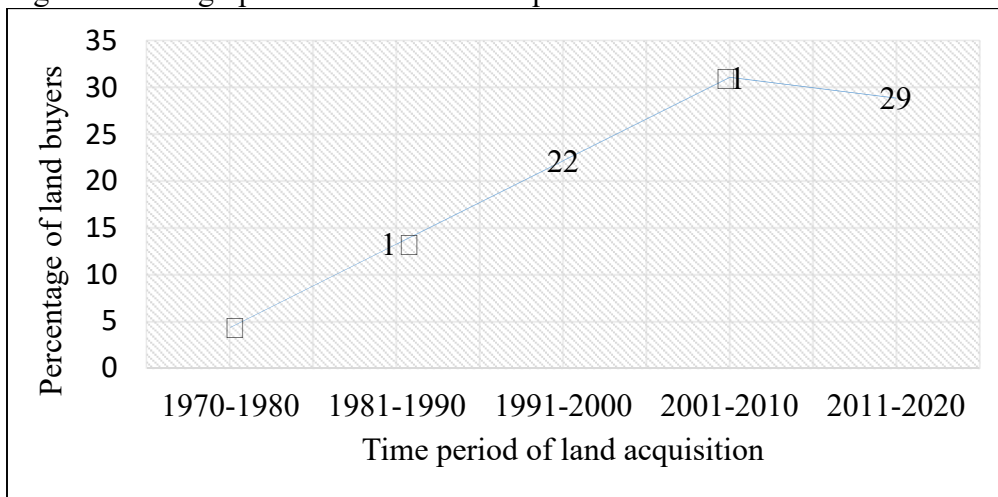
3.3.4 Trends in land acquisition and land-use transformation

The knowledge regarding the trend in land acquisition is very important in making informed decision regarding the development of peri-urban areas. The field survey indicated that 3% of land

buyers acquired land between the year 1970 and 1980; 1% between the year 1981 and 1990; 22% between the year 1991 and 2000; while 31% and 29% between the years 2001 and 2010 and 2011 and 2020 respectively. Figure 4 is a line graph showing the trend in acquisition and transformation of agricultural land to urban use. In addition to this, appendix 7, 8 and 9 shows how transformation of agricultural land to urban use has been happening over the years.

From figure 4, it is clear that the pattern and trend of agricultural land-use transformation to urban use has been increasing over the years. Land acquisition reached its peak between the year 2001 and 2010 and dropped by 2% between the year 2010 and 2020. This was attributed to a further rapid rise in demand and price of land, and persistent effort by local administrators to discourage farmers to cease subdividing and selling their land. Again, with dwindling economy, the new market rates for a plot of land did put a new ceiling beyond the affordability of interested land buyers.

Figure 4 Line graph of trends in land acquisition



Source: Field survey, 2021

Further inquiry from the Kisii county government physical planning and survey officers indicated that currently a plot closer to main access road costs between 2.5 to 4 million while away from the road the cost ranges between 1.5 to 2 million Kenya shillings. However, land buyers who bought land between the year 1970 up to late 1990s indicated that land was relatively cheap and affordable. In the subsequent periods, the price of land escalated due to high demand for land for residential development. The findings from county government officers, according to this study, was

consistent with postulations of sector and Bid-rent theories that lands located along good accessibility are more attractive and have higher market value (Alonso, 1964; McDonagh, 1995).

Regarding the process of land-use transformation, the field survey revealed that 8% of the farmers subdivided and sold portions of their land parcels while 12% subdivided, sold and developed residential houses. These two categories of farmers explained that such motive was necessitated by the need to meet their family basic obligations, pay school fees, offset medical fees and use part of the earnings to develop rental houses. Besides this, 21% of the farmers were found to have not subdivided but extended agricultural use to include residential use while 29% indicated that they neither subdivided, developed nor extended the use of their lands. From these findings, the study concluded that the development of peri-urban areas is a joint and collaborative effort of both the farmers and the land buyers of physically converting open spaces as previously. It also reaffirms that land tenure and inheritance practices are a precursor to land subdivision and subsequent conversion to other uses as was observed by Olson et al (2001), Kisii County Government (2011, 2018).

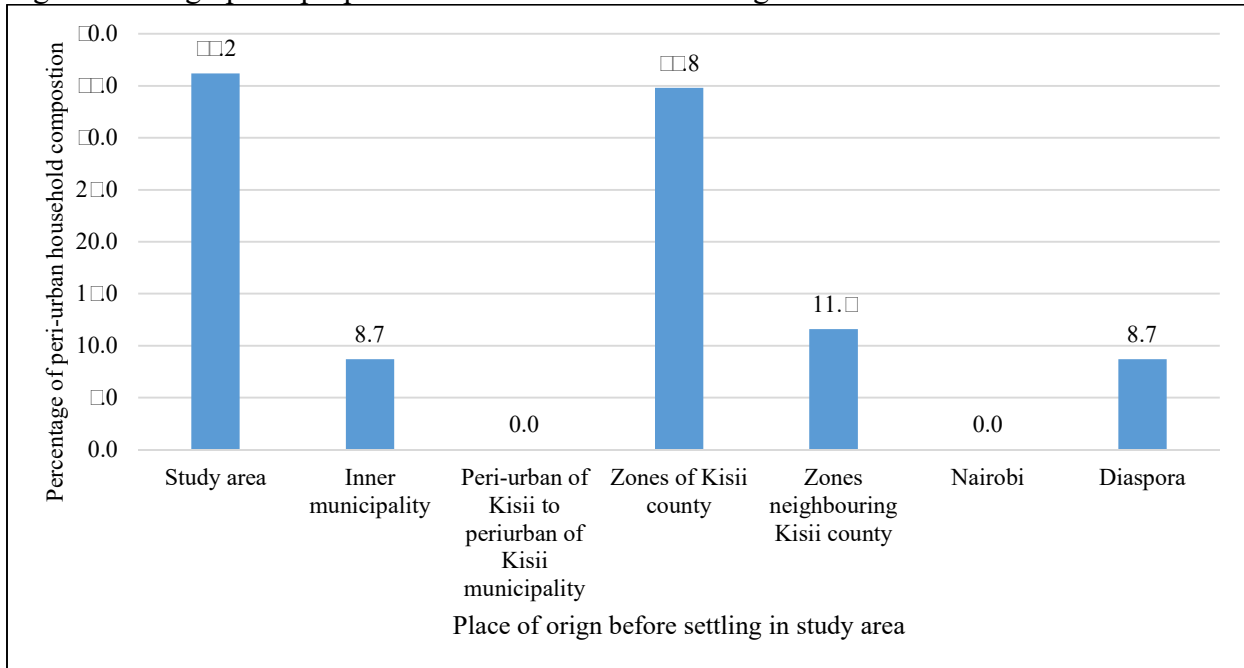
4.4.4 Zones migrated from

The knowledge regarding migration of people to areas outside the core of Kisii municipality is very vital in explaining its development. According to the field study, 8.7% of land buyers came from the inner municipal zone; 11.8% from other zones of Kisii county; 11.1% from zone neighbouring Kisii county; 8.7% from diaspora (areas outside Kenya) while 52% are the indigenous farmers as represented by figure 7. From this, the study concluded that 41% of the land buyers responsible for land-use transformation migrated to the study area from rural areas and other towns. Further, the study established that land buyers who bought land from 1980s to 2000s indicated that they did so because they were working in vicinity of the municipality. Hence, the need to own a home. Although, Nairobi and other peri-urban zones of Kisii municipality registered zero percentage migrants, this does not imply that there was none at all had the whole population of land buyers been sampled.

These findings therefore, departs from the conventional knowledge that the development of peri-urban areas is caused by migrants from inner city to the periphery as observed in cities in developed nations, especially North America and Europe. Instead, in developing countries, development of

peri-urban areas is facilitated by failure of the state to police peri-urban boundaries (Ayonga, 2019; Sadiki and Ramutsindela, 2002).

Figure 7: Bar graph of proportion of farmers and zones migrated from



Source: Field Survey, 2021

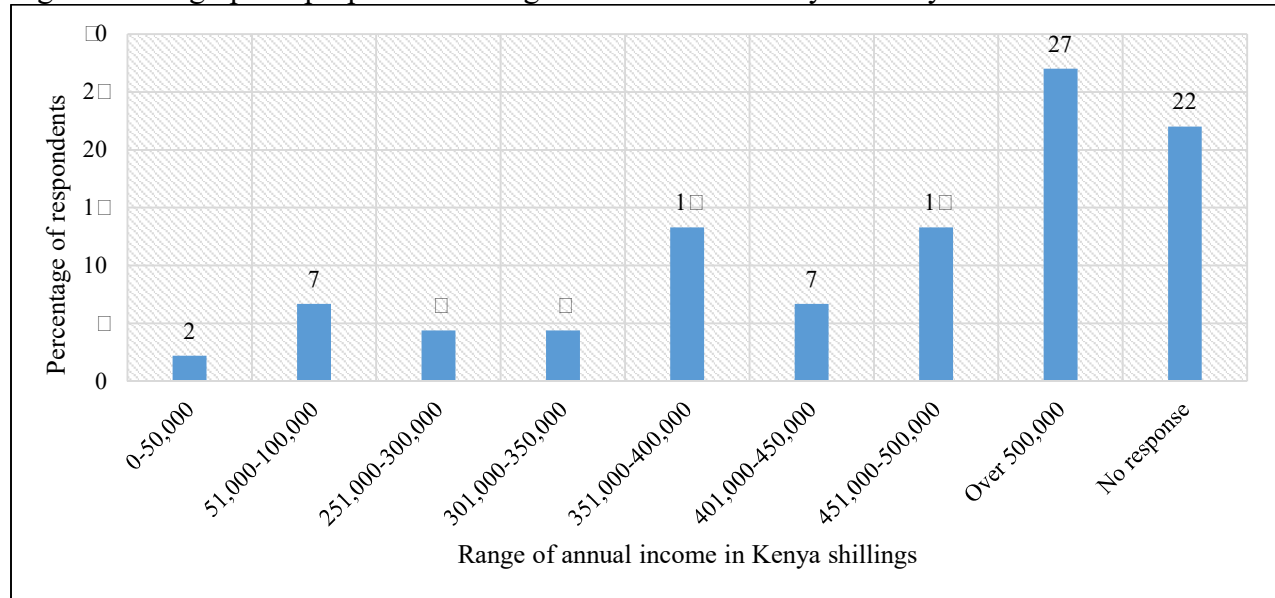
3.3.3 Economic activities

The study established that before the process of peri-urbanization took place, all the farmers were engaged in farming activities as the main source of income. As for land buyers, on the other hand, 9% of them stated that they were engaged in formal employment, 18% stated that they were engaged in business activities; 9% were engaged in farming activities; while 9% did not specify their income generating activities.

Further inquiry revealed that 2% of land buyers earned between 0 to 10,000 shillings; 7% of land buyers earned between 11,000 to 100,000 shillings; 9% of land buyers earned between 211,000 to 100,000, another 9% earned between 101,000 to 100,000 shillings respectively; 19% land buyers earned between 111,000 to 100,000 shillings; 7% earned between 101,000 to 100,000 shillings; while 27% earned over 100,000 shillings annually. Figure 8 is a bar graph showing proportion of farmers and their respective range of annual income.

From the analysis of annual income, the study concluded that land buyers were in a financial position to purchase land directly from savings or use income as a collateral to secure loans from financial institution to purchase land in the area of study.

Figure 8: Bar graph of proportion of range of income earned by land buyers

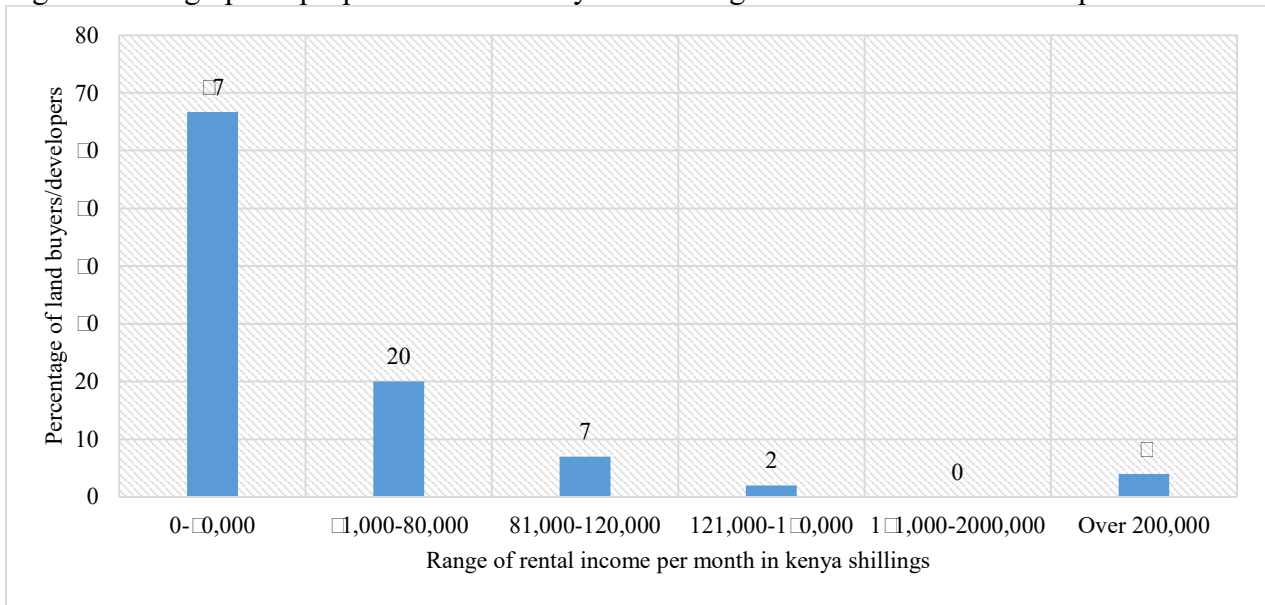


Source: Field survey, 2021

Income from rental investment

Although, the development of residential houses by farmers and land buyers is to provide accommodation to tenants, the main reason behind it is to get maximum economic returns from it. The field survey noted that both land buyers and farmers made livelihood out of residential investment. Among the land buyers interviewed, 7% of them earns between 0 to 10,000 shillings; 20% earns between 11,000 to 80,000 shillings; 7% earns between 81,000 to 120,000 shillings, 2% earns between 121,000 to 100,000 shillings; while 9% of land buyers earn over 200,00 Kenya shillings per month from rental housing. Figure 9 is a graph of percentage of land buyers and ranges in rental income earned per month.

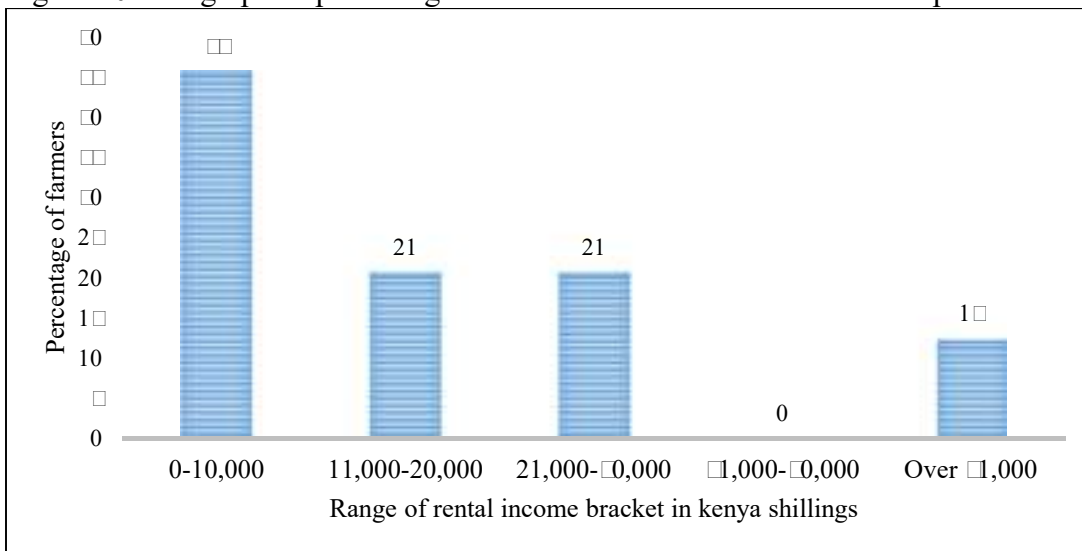
Figure 9: Bar graph of proportion of land buyers and range of rental income earned per month



Source: Field survey, 2021

Similarly, the field survey found that 67% of farmers with investment in rental housing earns between 0 to 10,000 shillings; 21% earns between 11,000 to 20,000 shillings; 21% of earns between 21,000 to 30,000 shillings while 4% earns over 30,000 shillings per month. Figure 10 is a bar graph showing percentage of farmers and their respective ranges of rental income earnings per month.

Figure 10: Bar graph of percentage of farmers and rental income earned per month



Source: Field survey, 2021

This finding was found consistent with the respondents who explained that rental income is more reliable than farm income hence land-use transformation. Secondly, land buyers' rental income in comparison to farmers is much higher. Therefore, land buyers, possibly because of their financial position, are in a position to maximize economic returns from rental investment than farmers. Because of this realization, many farmers are now in land-use transformation spree with the main purpose of investing in rental housing. For example, plate 7 shows one of the farmers who had converted his land from agriculture to residential use in the area of study. And these, as was revealed by field study, is a common practice among farmers in the study area.

Plate 7: Conversion of agricultural land to urban use by farmers



Farmer's living house

Farmer's rental houses

Source: Field survey,2021

Rating of the factors of land-use transformation

From the preceding analysis, it is imperative to note that the phenomenon of land-use transformation is on the rise and is likely to exacerbate and spill over farther into the rural areas. Thus, reducing the land holding sizes and subsequently affecting the livelihood of the people. As Webster and Muller (2000) noted that the factors of land-use transformation vary from one locality to another, respondents were asked to identify and rate the factors on a scale of 1 to 5, whereby 1 denoted 'not important' and 5 denoted 'very important.'

To arrive at the exact factors explaining occurrence of land-use transformation in the study area, the population mean score (mid-point of 1 to 5, was arrived at by adding 1,2,3,4,5 and dividing the summation by 5). This was done with the intention of getting the decision-making point, and this

was found to be 2. According to this research, any factor with a mean score of more than 2. was regarded as significant in influencing land-use transformation and vice versa. The resulting mean score of each factor using SPSS was as shown in table

Table Mean scores of the factors of land-use transformation

S/No.	Factor	Number of respondents	Mean score (\bar{x})
1	Inner municipal population growth	22	1.8
2	Inner municipal to peri-urban migration	2	1.8
	Inner municipal problems	28	1.
	Price of land		
	Decline in peri-urban economy	2	2.09
	Cost of rent at peri-urban area	2	12
7	Cost of development permission	8	2.1
8	Rise in individual income in inner municipality	1	1.
9	High demand for residential housing		
10	Customary land tenure		0
11	Land inheritance practices	7	
12	Ineffective land use planning		2.9
1	Ineffective enforcement of plans		2.1
1	Ineffective institution management	2	2.8
1	Private car ownership	0	1.0
1	Cost of transport	9	1.9
17	Improved accessibility	7	2
18	Declining agricultural productivity	2	2.
19	Rising value of peri-urban land in urban use	8	21
20	More incomes from non-farm economic activities		2.
21	Loss of farming culture	21	1.8
22	Demand for bigger living space		2.70
2	Increase in number of family members	22	1.77
2	Proximity to rural areas and nature		1.
2	Access to better amenities and social services		2.0

Source: Field survey, 2021

From table 4, out of the 20 factors of land-use transformation, 10 were measured to have a mean score of more than 2.0 and therefore statistically significant in influencing transformation of agricultural land to urban use. A detailed analysis of the significant factors with their mean scores was as shown in appendix 2.

4.4.4 Discussion of factors of land-use transformation

From table 4, the study established that '*land inheritance practices*' was ranked first as significant factor of land-use transformation by respondent with a mean score of 4.0. Among the Kisii community of Kenya, inheritance is believed to be the sure way of ensuring family survival in which male children are bequeathed land by their parents. All these is done with the intention of fulfilling the rules and norms governing community allocation, use, access, and transfer of land from one generation to another. This finding was supported by all the farmers interviewed that they got their land from their parents as an inheritance while the land buyers/developers got their land through purchase after subdivision. Further inquiry from the chair of Land Control Board (LCB) and government officers in charge of land matters hinted that, inheritance notwithstanding, a number of indigenous peri-urban families are still reeling in poverty. A factor which influences the selling of land as a means of livelihood.

Another important factor of land-use transformation is the '*price of peri-urban land*' which was ranked second most significant factor with a mean score of 3.8. In the outskirts of inner municipality, the study established that the prices of lands are subject to market forces of demand and supply. This finding supported earlier finding by Mugisha and Nyandwi (2010) and European Environment Agency (2000) that lower price of lands at the periphery led to expansion of Kigali city and European cities respectively. Again, extremely low price of agricultural land acquisition enabled realization of greater profits and hence contributing to sprawling of most of the cities. In Kenya, Thuo (2010) noted that price of land facilitated subdivision and subsequent conversion of agricultural land in the fringes of Nairobi city and Kiambu county. This study therefore, concludes that price of agricultural land in peri-urban area of Kisii municipality is a significant motivating factor making farmers to continue subdividing and converting the original use of land to urban use.

Subsequently, *'high demand for residential housing'* was ranked third significant factor of land-use transformation with a mean score of 3.33. The rise in demand for residential housing is largely as a result of Kisii university and middle level colleges with many students in need of accommodation feasible in the study area. The field study established that the intensity of residential building is high around the university and decreases away from it. This argument was supported by land buyers and farmers who explained that the elevation of the former campus of Egerton to full-fledged Kisii university led to mass movement of students from all over the country in need of accommodation in the vicinity of the learning institution.

Improved accessibility was ranked fourth significant factor of land-use transformation by the respondents with a mean score of 3.2. It was observed that along the main access roads such as Kisii-Kilgoris, the intensity of building was very high and decreases away from it. This, as already highlighted implies that plots of land along the access roads have locational advantage and therefore, have higher economic returns. Again, this has the implication of lowering the value of agricultural activities and raising the value of land for urban use. Hence, farmers would easily get influenced by high market value for their land. This finding agree with findings of previous studies by European Environment Agency (2004) who noted that new transport links and nodes are the prime motors of urban sprawl that has outpaced growth of residential areas.

The *'rising value of agricultural land in in urban use'* was ranked fifth significant factor of land-use transformation with a mean score of 3.21. The rise in demand for residential housing was key in affecting the value of agricultural land due to reliable economic returns as compared to agriculture. When examined in this sense therefore, there is a likelihood that the higher monetary offers to farmers by land buyers could be an influencer in raising the value of land in urban use. Previous studies by Chazan and Cotter (2001), Berry (1978) and Nelson (1992) explained that as urbanization takes place, farmers are likely to become reluctant to invest in agriculture due to rise importance and value of agricultural land in urban use. This, in the long run, has noted by Mugisha and Nyandwi (2014) and Ayonga (2008) will have negative implication on the use of peri-urban land due to development without a prior physical land use plans and provision of basic infrastructure (that is, develop into new urban informal settlements).

Another important factor of land-use transformation is the *'cost of rent in peri-urban areas'* which was ranked sixth significant factor of land-use transformation with a mean score of 3.12. Previous

studies by Olajuyigbe (201□), noted that low housing rents and establishment of college of education at Ekiador community in peri-urban zone of Benin city of Nigeria led to transformation of Ekiador to peri-urban settlement. This study attributed institution of learning as an influential factor in the transformation of agricultural land to urban use.

Closely tied to land inheritance practice, is the '*customary land tenure*' which was ranked seventh significant factor of land-use transformation with a mean score of □0□

'*Ineffective land use planning*' was ranked eighth significant factor of land-use transformation with mean scores of 2.9□ while '*institution management was ranked* ninth significant factor of land-use transformation with mean scores of 2.8□ In Kenya, the law requires that plans to be prepared so as to guide use of land by ensuring effective and optimum utilization of limited space. However, the study established that, in the study area, all the implemented developments have taken place contrary to the legal requirement.

Further inquiry with the county government officials indicated that processing of development applications for residential development are being approved on regular basis despite absence of a physical development plan. Besides, the officers cited inadequate technical and skilled manpower, inadequate mobility and underfunding of planning function as a serious challenge which has not be given due consideration. And this, according to them, was thwarting any efforts to cause order in the use and management of peri-urban lands. This finding therefore, concur with previous study findings by Sithole et al (201□) that failure by the government to plan and regulate development led to land-use changes at Ezulwini peri-urban area in Swaziland.

The '*demand for bigger space*' in peri-urban area was rated tenth significant factor of land-use transformation by respondents with a mean score of 2.70. The field study noted that land buyers who had bought land between the year 1970s to 1990s were keen on land sizes that could accord them adequate space for living house, outdoor recreation, and a kitchen yard. However, in the subsequent years, as noted by land buyers, such requirement was not given a serious priority due to the need to maximize higher returns on rental investment. Although, conventional knowledge holds that the demand for bigger space in peri-urban area was necessitated by influence of inner city turbulence, the findings of this research is of the contrary. This is because, as outlined in section □2.□, the peri-urban inhabitants did not emanate from the inner municipality. However, this study finding concurs with arguments of previous research studies that most families have a

preference for plot of land with bigger space to accommodate large families in peri-urban areas as compared to inner municipality (European Environmental Agency, 200□; Piorr et al, 2010; Al Jarah et al, 2019; Couch and Karecha, 200□; and Christiansen, 2011).

Having discussed significant factors of land-use transformation, it is also important to mention the factors which, according to the respondents, were statistically insignificant in influencing land-use transformation in the study area. Although, these factors did not score a mean score of more than 2.□, their influence in causing land-use transformation in the area of study should not be overlooked. These factors were, namely inner municipal population growth; inner municipal to peri-urban migration; inner municipal problems; decline in peri-urban economy; cost of development; rise in individual income in the inner municipality; ineffective enforcement of plans; private car ownership; cost of transport; decline of agricultural productivity; more income from non-farm activities; loss of farming culture; and increase in number of family members. The cost of development was rated as insignificant factor of land-use transformation because, perhaps, many respondents were not aware of the cost of land and development in the inner municipality and areas outside it.

□□□Hypothesis testing

The first hypothesis was stated as follow;

Null hypothesis

H₀₁: There is a significant difference between rental and farm income; a factor which leads to land-use transformation in favour of urban use in the area of study.

Alternative hypothesis

H_{a1}: There is no significant difference between rental and farm income in the area of study, a factor which leads to land-use transformation in favour of urban use.

In order test and accept or reject the null hypothesis, the researcher collected rental and farm income from farmers. Table 5 shows rental and farm income for one of the farmers over the years.

Table 1 Rental and farm income

Year	Rental income (KShs)	Farm income (KShs)
2010	0,000.00	0,000.00
2011	0,000.00	7,000.00
2012	0,000.00	0
2013	120,000.00	0,000.00
2014	120,000.00	0.00
2015	100,000.00	0,000.00
2016	100,000.00	0,000.00
2017	100,000.00	0,000.00
2018	190,000.00	10,000.00
2019	190,000.00	10,000.00
2020	190,000.00	10,000.00

Source: Field survey, 2021

The resulting t-test for the pair sample of farm and rental income is as follows;

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Income	Equal variances assumed	2.992	0.000	1.18	20	0.000	12090.909	19179.091	808.191	1098.27
	Equal variances not assumed			1.18	10.097	0.000	12090.909	19179.091	802.170	1079.18

Conclusion:

From the t-test result table, the p value for F-test is less than 0.05 in this case, the bottom row of the second table where the variance of the mean is not assumed to be equal is used. Under the t-test section, p value is equal to 0.000. Because p value is less than 0.05 the null hypothesis was accepted while the alternative hypothesis was rejected. This therefore implied that the means of rental and farm income are statistically different. Hence, the study concluded that there is a significant difference between incomes from rental housing and farming.

From the field observation, analysis of rental income (section 2.1) and the hypothesis testing, there is adequate evidence that there is variation in rental and farm income sources. Further, the

analysis of factors indicated that there is a preference for rental investment as compared to farming. Because of the variation in income, rental income was considered more reliable and consistent in supply. Thus, farmers will continue subdividing and converting the use of land from agriculture to urban use. Similarly, this is likely to influence other farmers to either extend the use of their lands to have residential houses or subdivide, sell and use the returns to develop the remaining portions of their lands with residential houses. Plate 8 contain two images, one showing agricultural land fully transformed to residential use while the other shows agricultural land recently undergoing transformation to residential use.

Plate 8: Land parcels transformed and undergoing transformation



(a) Already transformed

(b) undergoing transformation

Source: filed survey, 2021

The second hypothesis was stated as follow;

Null hypothesis

H₀₂: There is no significant difference in the cost of development between the core municipality and outside it; a factor which favours investment in peri-urban areas.

Alternative hypothesis

H_{a2}: There is a significant difference in the cost of development between the core municipality and outside it; a factor which favours investment in peri-urban areas.

Similar to the first hypothesis, the researcher collected data from various key informants as shown in table 6. For the purpose of testing the hypothesis for this research, a hypothetical low residential housing of plinth area 203.9m² and consisting of 4 units; with each unit consisting of a sitting room, bedroom, kitchen and washroom was used. The total cost of constructing the house was

determined to be KShs 7,363,818.00. This cost was used to determine the various costs of development as shown in table 6. Lastly, the house occupies a plot of land measuring 100ft by 50ft.

According to the Architects and Quantity Surveyors Act (cap 525), the total cost of professional fees is supposed to be 6% of the total cost of project (Government of Kenya, 2010). The 6% is broken into architect's fees (2%), quantity surveyors (1.5%), mechanical technician's fees (0.5%), and electrical technician's fees (0.5%). However, in this research, only the professional cost agreed between the professionals and developer were considered, and these were similar. Further, details of all the costs involved in title registration and processing for approval permission are as indicated in table 6. A floor plan of such house is as shown in appendix 5.

In this research, it was assumed that the cost of development includes all the statutory payments which start at the time of processing for acquisition of formal ownership to the land parcel and ends at the point of securing approval from the Kisii county government to commence implementation of housing project. This argument is informed by the fact that anyone intending to cause any material change to his/her property must prove that he/she owns the land.

Table 6: Ownership and development processing fees

No.	Items	Leasehold land	Freehold land
1	Part development plan	97,000.00	0
2	Surveying fees	120,000.00	0
3	Registration of lease document	70,000.00	0
4	Subdivision process	0.00	29,100.00
5	Transfer process	0.00	10,000.00
6	Architect's fees	0,000.00	0,000.00
7	Quantity surveyor's fees	10,000.00	10,000.00
8	County development application fees	29,000.00	29,000.00
9	Mechanical fees	10,000.00	10,000.00
10	Electrical fees	10,000.00	10,000.00
11	Planner's fees	0,000.00	0,000.00
12	Stamp duty (2% of land value) i.e. KShs 1,000,000.00	0.00	0,000.00

Source: County Government of Kisii and UhuruKeno Construction Company Limited

The resulting t-test computation for the mean and p values is as per computation in the table.

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Cost of development permission	Equal variances assumed	1.111	0.000	1.219	22	0.228	181.007	127.020	-107.001	290.700
	Equal variances not assumed			1.219	1.000	0.200	181.007	127.020	-119.112	292.000

From the t-test result table, the p value for F-test is 0.000 which is less than 0.05. In this case, the bottom row of the second table where the variance of the means is not assumed to be equal is used. Under the t-test section, p value is equal to 0.200. Because p value is more than 0.05 the null hypothesis was rejected as the alternative hypothesis was accepted. This therefore implied that the means of the cost of development between leasehold and freehold properties were found to be statistically different. Hence, the study concluded that there is a significant variation in the cost of development in the inner municipality and area outside it.

Therefore, developers desirous of making higher returns will opt for the areas outside core municipality as was the case in the fringes of Nairobi city (Ayonga, 2010). Mugisha and Nyandwi (2010), also established that lower cost of development led to peri-urbanization of Kigali city in Rwanda. It was also revealed by the Kisii county government physical planning and surveying officers that the cost of buying land in the inner municipality is much higher than in the periphery. Hence, this could also explain, as already indicated, that the lower cost and availability of land at the periphery is a motivation factor in the transformation of land from agriculture to urban use.

2.2 Effects of land-use transformation on livelihoods of peri-urban communities

This study sought to address the second research question which was;

‘How does land-use transformation affect the livelihoods of peri-urban residents?’

To find answers to this research question, a literature review was conducted to establish what previous studies have established as the effects of land-use transformation in peri-urban areas. Emanating from these, the research conceptualized and recorded 17 as ‘what would be’ the possible effects of land-use transformation (as illustrated in section 2.9 and table 7).

Table 7: List of possible effects of land-use transformation

Number	Name of effect
1	Environmental hazards
2	Traffic congestion
<input type="checkbox"/>	Decline of indigenous plants and animal species
<input type="checkbox"/>	Farmland displacement
<input type="checkbox"/>	Increased consumption of natural resources
<input type="checkbox"/>	Decline of soil fertility
7	Decline of land holding sizes
8	Loss/decline of food production
9	Increased cost of infrastructure provision
10	Decline/loss of farm income
11	Diversification of income sources
12	Continued irregular subdivision and transformation of arable land
1 <input type="checkbox"/>	Socio-economic divisions
1 <input type="checkbox"/>	Loss of community character
1 <input type="checkbox"/>	Formation of informal networks
1 <input type="checkbox"/>	Formation of new social networks
17	Susceptibility to infections and communicable diseases

Source: Author's construct, 2021

Each of these effect (independent variable) was then subjected to further inquiry by identifying its source of data, methods of collection, analysis and presentation. This was as shown in the detailed data need matrix in appendix 1. Once all these had been done, a structured closed-ended household questionnaire was prepared which enabled collection of data and information for validation of the variables. Furthermore, the respondents were required to identify and rate effects on a scale of 1 to \square where 1 denoted 'not important' while \square 'very important.' The researcher also collected more data using field observation checklists and camera so as to answer the research question.

To arrive at the exact effect, a similar mathematical treatment for the factors was also applied where population mean score (mid-point of 1 to \square , was arrived at by adding 1,2, \square , \square and dividing the summation by \square). The determination of the population mean was done with the intention of getting the decision-making point, and this was found to be 2. \square According to this research, any effect with a mean score of more than 2. \square was regarded as significant in impacting the peri-urban environment, economy and social behaviours of peri-urban residents. Table 8 shows the resulting

mean score of each effect using SPSS was as shown in table 8 while appendix □ provides detailed determination of mean scores.

Table 8: Mean score of effects of land-use transformation

No.	Name of effect	Number of respondents	Mean score (\bar{x})
1	Environmental hazards	□0	2.90
2	Traffic congestion	12	1.92
□	Decline of indigenous plant and animal species	□9	□1□9
□	Farmland displacement	□9	2.7□
□	Increased consumption of natural resources	□□	2.□□
□	Decline of soil fertility	17	1.29
7	Decline/loss of land holding sizes	□9	□□□
8	Decline in food production	□9	□□9
9	Increased cost of infrastructure provision	1□	1.□□
10	Decline/loss of farm income	□9	□07
11	Diversification of income sources	□2	2.□2
12	Irregular subdivision and transformation of agricultural land	□1	□2□
1□	Socio-economic division	□8	2.7□
1□	Loss of community character	□2	1.8□
1□	Formation of informal networks	□1	2.□9
1□	Creation of new social networks	□7	□00
17	Susceptibility to infections and communicable diseases	20	2.0□

Source: Field survey, 2021

□□□ Discussion of significant effects of land use transformation

The respondents rated *decline/loss of land sizes*, *loss of food production* and *loss of farm income* first, second and fifth with mean scores of □□□, □□9 and □07 respectively as significant effects resulting from conversion of land from agricultural to urban use. The areas outside of the municipality are mainly designated for agriculture and low residential housing for rural communities. However, the study established that frequent subdivision and selling of land to land buyers has significantly led to reduction of land holding sizes. This, in turn has led to loss/decline of food production and farm proceeds. These findings concur with previous studies by Mandere et al (2010) that pressure from peri-urban expansion due to immigration to peri-urban areas of Nyahururu town decreased household land sizes due to sale of part of the land to new developers

for residential and business use or both residence and agriculture, and inheritance purposes. The findings also support findings of early studies by Ng'ayu (2015), Hasse (2002) and European Environmental Agency (2006) that transformation of agricultural land results to reduction and/or complete loss of agricultural land. Plate 9 is a clear indication that the three effects are as a result of erecting permanent structures on a land designated for agricultural use.

Plate 9: Permanent structures erected on agricultural land



Source: Filed survey, 2021

The *continued irregular subdivision and transformation of agricultural land* was ranked third a significant effects of land-use transformation with a mean score of 2. The study established that the development of area of study has created a dynamic land market, where farmers have developed a tendency of continuously subdividing and selling their lands. The study also established that some of the farmers had subdivided and sold all their land and relocated to further rural areas while others have migrated to small towns to do business for survival.

The *decline of plant and animal species* was ranked fourth with a mean score of 1 as significant effect of land-use transformation in the study area. The respondents opined that animals namely hare and rabbits (genus *Lepus*), hyenas (*carcopithecus mitis* species), snakes (suborder *Serpentes* species), birds (*animalia* species), wild dogs, anteaters (suborder *Vermilingua* species), and black monkeys (*Colobus angolensis* species). This finding is consistent with previous studies by Lupala (2010) that peri-urbanization on Pugu and Kazimzumbwi forest reserves led to loss of plant and animal species. Similar to Pugu and Kazimzumbwi, this study attributed loss of plant and animal species to loss of vegetation cover and ecosystem services.

The *formation of new social networks* and *socio-economic division* were ranked sixth and ninth as significant effects of land-use transformation with mean scores of 0 and 2.7 respectively. The

European Environmental Agency (200□), observed that the expansion of inner cities generated greater segregation of residential development according to income. Thus, exacerbating social and economic divisions among peri-urban communities. In the study area, such social and economic divisions were found to manifest through income, material possession, type of living houses, employment and mobility. The field study revealed that, in the midst of middle class residents with permanent buildings, some of the peri-urban farmers are still living in dilapidated mud walled houses without water and electricity connection. Plate 10 shows some of the farmers living in dilapidated house. Besides this, all the farmers interviewed indicated that they have never had opportunities to work in full time employment while □ land buyers (□8.9%) stated that they got income through formal employment.

Plate 10: Dilapidated mud walled houses



Source: Field survey, 2021

From a cursory observation and inquiry, it was clear that children of the migrants are engaged in education, employment, business or combination of both elsewhere. Finally, because of socio-economic division, a formation of new social networks among peri-urban communities ensued. This is, according to the respondents, is exacerbated by the incoming of many students and people desirous of doing business activities in the areas outside the core municipality.

The *environmental hazard* was ranked seventh significant effect of land use transformation with a mean score of 2.90. The development of the area of study is basically taking place on land designated for agricultural use. Therefore, residential use is basically competing for the same land. As already indicated, the development has resulted to loss/decline of agricultural land and this has major impacts on biodiversity with the loss of valuable biotopes for many animals, and particularly birds. The respondents indicated that reduction of natural vegetation has made the area of study

experience uncontrolled rainfall surface runoffs. Additionally, due to increased number of peri-urban population, the area is also experiencing occasional dumping of solid and liquid waste to rivers especially from families without pipe linkages to sewer networks. This finding was consistent with the findings by county government of Kisii (201□ and 2018) that population pressure has had negative consequences on the environment especially degradation of soil, water, forest cover and the ecosystem in general.

Displacement of farms was ranked eighth significant effect of land use transformation with a mean score of 2.77. The study noted that introduction of urban uses in a land designated for agricultural led to displacement of agricultural farms. This was attributed to subdivision and erection of permanent residential houses on the same land.

Having discussed significant effects of land use transformation, the study also established, what the respondents ranked as insignificant effects of land-use transformation. These included traffic congestion; increased consumption of natural resources; decline of soil fertility; increased cost of infrastructure provision; diversification of income sources; loss of community character; formation of informal networks; and susceptibility to infections and communicable diseases.

The ranking of increased cost of providing infrastructure as insignificant factor of land-use transformation is contrary to previous study findings by Chazan and Cotter (200□) and European Environment Agency (200□) that development of peri-urban areas leads to increased provision of infrastructure. The study concluded that, perhaps according to the respondents, provision of infrastructure is the responsibility of the county and national governments, hence indirect participation. This, according to Brueckner and Fansler (1983) and Brueckner and Kim (2003), explains the unending peri-urbanization of outskirts of Kisii municipality. Eventually, worsening environmental, economic and socio-economic consequences in the study area.

□□ **Coping mechanisms to overcome effects of land use transformation**

This study sought to address the second research question which was;

‘How do peri-urban residents cope with undesirable consequences of land-use transformation?’

To find answers to this research question, a literature review was conducted to establish what studies have found as possible coping mechanisms to undesirable consequences of land-use

transformation in peri-urban areas. During field validation, the respondents were asked to provide details of various livelihood strategies put in place for their survival. In this study, much emphasis was placed on the farmers who bears the blunt of the phenomenon of land-use transformation. Besides the household questionnaire, the study made use of field observation to gather more information and data to find answers to the research question.

□□□Agriculture

Historically, the interviewing of farmers revealed that the study area is known for the production of both food and cash crops. However, with the penetration of urban activities particularly residential development, many of the farmers found themselves subdividing and selling land to new comers. As a result, the sizes of land held by families drastically reduced day by day leading to poverty.

Notwithstanding this, the outcome of the interview revealed that all the farmers interviewed practiced subsistence farming though on a very small land sizes. The farmers stated that the main reason for practicing subsistence farming was purely for household consumption and to cushion them against unnecessary expenditure of buying food from the market. The types of food crops grown include vegetables (specifically kales), maize, and banana. The field study revealed that □7% of farmers grows maize, 8□% grows kales, 2□% grow bananas and a paltry 12.□% grows sugarcane as shown in table 9. In addition, it was found that subsistence farming in the form of mixed crop farming system is practiced in the area outside the core municipality.

Table 9: Types of food crops and percentage of growers

Types of food crop	Number of farmers	Percentage
Maize	1□	□□□
Beans	10	□1.7
Kales	20	8□□
Banana	10	□1.7
Sugarcane	□	12.□

Source: Field survey, 2021

Plate 11, 12 and 1□ are images showing the types of food crops grown in areas outside core municipality.

Plate 11: Banana farming



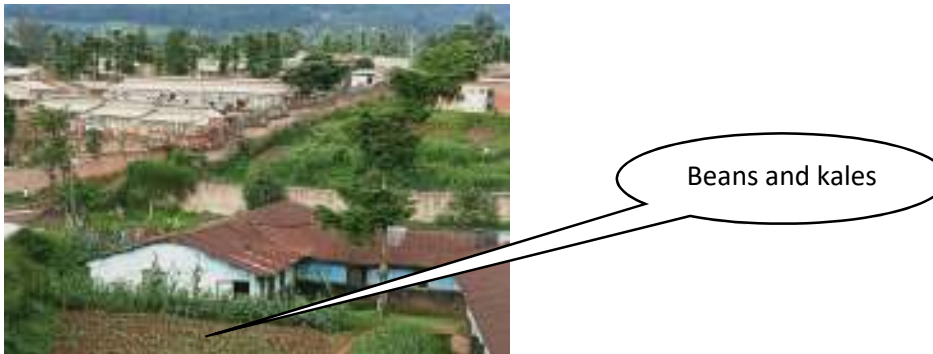
Source: Field survey, 2021

Plate 12: Maize farming



Source: Field survey, 2021

Plate 13: Beans and kales



Source: Field survey, 2021

Besides subsistence farming, indigenous peri-urban households also practice poultry and livestock keeping, though on small scale. Just like subsistence farming, farmers interviewed stated that rearing of cows and chicken is practiced for household consumption purpose. However, where the production exceeded the family consumption needs, the excess production of milk is sold to the neighbourhoods and hotels within peri-urban area. Plate 13 shows livestock farming in the area outside the core municipality.

Plate 1 □ Livestock (cow) rearing



(a) Open field grazing

(b) Simple zero grazing unit

Source: Field survey, 2021

On the other hand, the outcome of the interview and field observation indicated that new comers with bigger sizes of land practiced both subsistence and livestock farming. In comparison to farmers, through field observation, it was noted that farms owned by land buyers were more organized in terms of use of space. The study attributed this to adequate skills and capital to practice productive agriculture. Because of this, farmers could not produce adequate farm produces for marketing purpose.

Additionally, farmers with land bordering river Nyakomisaro and along the access roads practiced growing of trees as a source of income, firewood and timber and poles for building purpose. However, the farmers noted that the trees take a long period of time to mature. Hence not an immediate and reliable source of income. Plate 1 □ is an image showing tree growing in the area of study.

These findings contradict the finding by Mandere et al (2010) who noted that in the peri-urban areas of Nyahururu town, agriculture was one of the predominant economic activity, though waning gradually as non-farm income activities gains popularity. Again, as noted by Mandere et al (2010), land holding sizes in peri-urban Nyahururu town is much larger than in the area of study.

□□□ Non-farm/non-agricultural income generating activities

As noted already, subdivision and conversion of land has drastically reduced sizes of farmlands. Hence, household have devised alternative options for generating income from remaining portions

of their land parcels. The field study established that peri-urban inhabitants without land were actively engaged in non-farm income activities to meet family basic needs. The income activities included business, non-farm wage and farm wage labour on the nearby agricultural farms especially those owned by land buyers living in the study area.

Plate 1 □ Tree farming



Source: Field survey, 2021

Others peri-urban inhabitants who could not afford to start business also found themselves engaged in menial jobs of washing clothes for middle income neighbours, work as food attendants in food making kiosks, and babysitting. The respondents noted that most of these menial works were done by women. Further, the field study revealed that many of the land buyers are living in the same compound with tenants. This is an indication of an afterthought to make money from rental housing due to a rise in demand for residential houses. Plate 1 □ show some of small scale business activities engaged by peri-urban poor families.

Plate 1 □ Roadside racks for selling food stuffs



Racks for selling food stuffs and other goods

Source: field survey, 2021

Due to lack of adequate capital, the study noted that peri-urban poor households were not able to diversify income activities. Again, the study noted that the non-farm income activities were poorly

paying. Thus, could not help the poor to ameliorate their poor economic status. As compared to land buyers/developers, the farmers noted that their children have never secured formal employment due to inadequate education. Hence some ended up engaging in motorbike riding business in Kisii town while others left to far towns to seek for non-farm income jobs.

Again, these finding disagree with previous studies by Mandere et al (2010) that non-farm economic activities, besides agriculture, were a major source of income to households in Nyahururu peri-urban area. The findings also contravene study findings by Thuo (201□) and Ng'ayu (201□) that non-farm income activities played a major role in provision of livelihood to peri-urban residents in the fringes of Nairobi and Kiambu town respectively.

Because of the severity of household economic hardship, the farmers noted that most of them devised the option of subdividing, selling and using the return to develop their own residential houses. Where the farmers felt that they could not manage to build rental houses on their own, they entered into agreement with the land buyers to develop in exchange for land. According to the field survey, 71% of the farmers agreed that they changed the use of the land from agricultural by introducing non-agricultural uses or extending the agricultural use to include new urban-based use. In this situation therefore, farmers embraced both agricultural and new urban use (residential) on their farms.

The farmers noted that the motive behind the introduction of urban use is to compensate for declining/loss of agricultural land. They also indicated that rental income is reliable as compared to farm income where one has to wait until harvesting period. Among the non-agricultural uses introduced include residential and commercial use. Plates 17, 18 and 19 are images showing residential and agricultural use, residential and commercial uses, and residential use in areas outside the municipality. From field study, the study concluded that residential development is the dominant land use in the study area, and therefore the main source of income to farmers.

Whereas, in other places it has been noted that peri-urban residents tend to seek for alternative source of income through employment, either in the public or private sector, the respondents noted that none of their family children have managed to secure employment in the said sectors. However, the land buyers noted that many of the farmers in the peri-urban areas did not bother to sponsor their children to higher levels of education. In situation where farmers who had sold land

and failed to invest, such farmers ended up migrating to farther rural areas to buy alternative and bigger land for farming.

Plate 17: Residential and agriculture use on the same land parcel



Source: Field survey, 2021

Plate 18: Residential and commercial use



(a) Residential use



(b) Commercial use

Source: Field survey, 2021

Plate 19: Residential use



Source: Field survey, 2021

□□ Planning options to mitigate consequences of land-use transformation

This study sought to address the fourth research question which was;

‘What planning options exist to mitigate the challenges of land-use transformation in peri-urban areas’?

Although the study had delved into possible peri-urban planning interventions to address the undesirable consequences of land-use transformation outside the core municipality, there was need make an inquiry from the Kisii Municipal Board (KMB) to establish the extent to which planning of the municipality is mitigating the consequence of the land-use transformation. A further inquiry was also made with respondents to seek for the views of the residents regarding planning of peri-urban area. This was necessary to gauge the level of awareness regarding the phenomenon of land-use transformation and appreciate the role of peri-urban planning. To do this, the respondents were asked to share thoughts and perceptions on possible planning options as enshrined in the household questionnaire. The county government officers, on the other hand, were also asked to highlight on the status of planning of the municipality and areas outside it to address the consequences of land-use transformation.

□□□ Perception of respondents

According to the field study, 7□8%, 88%, 87% and 89% of the respondents were of the view that delineation and gazetment of urban boundary, zoning and designation of preservation zones, determination of minimum land holding sizes, and sensitization of peri-urban inhabitants are the best options to development of peri-urban area. However, the respondents noted that sensitization is key in making the residents aware of the challenges brought by land-use transformation.

□□□ Findings from Kisii county government (Kisii Municipal Board)

According to chairperson of Kisii County Government, the only portion of the municipality which is planned is the former Kisii municipality covering a total land mass of 29km². The chairperson indicated that this portion of the municipality was planned in 1971 and since then no any planning had been done to capture changes which had taken place. This portion of the municipality is as shown in plate 20.

Plate 20: Physical Development Plan of the old Kisii Municipality



Source: Kisii County Government, 2021

Regarding the awarding of the new municipal status in the year 2019 (after implementation of devolution in 2010), the chairperson of the KMB indicated that the old municipal boundary had been extended to cover a land mass of 72km². This boundary is engulfed between latitude 0°08.7'S and 0°08.0'S and longitude 35°08.8'E and 35°09'8.2'E respectively. And it includes Suneka market to the West, Nyakoe market to the North, Kiogoro market centre to the south and Bobaracho market centres to the East. However, the new boundary has not been formally demarcated nor gazetted. An indication that no steps had been taken to mitigate the undesirable impacts of land-use transformation. Further, no suitable peri-urban planning options had been floated to mitigate the phenomenon.

CHAPTER SIX: SUMMARY, CONCLUSION AND RECOMMENDATIONS

□□Introduction

The main purpose of the study was to establish the factors of land-use transformation and how it affects the livelihoods of peri-urban residents. The peri-urban areas of Kisii municipality was chosen for the study. The study began with literature review which led to conceptual understanding and identification of independent variables for field measurement and validation. The collection of data was done using instruments, namely household questionnaire, interview and observation. Household questionnaire was used to collect data and information from farmers and land buyers while semi-structured interview schedules from key informants. Simple random and purposive sampling techniques were used to aid collection of data and information. The analysis of data involved editing, coding, inputting and validation upon which actual analysis was carried out using SPSS and MS Excel software. In analyzing quantitative data, quantitative techniques were used while for qualitative data, qualitative technique was employed. Quantitative methods used both descriptive and inferential statistics. The analyzed data was presented using mean scores and percentages.

□□Summary of the main findings

□□□Factors of land-use transformation

The study identified land inheritance practices, price of land, high demand for residential housing, improved accessibility, rising value of agricultural land in urban use, cost of rent at peri-urban area, customary land tenure, ineffective land use planning, ineffective institution management, and demand for bigger living space as the significant factors of land-use transformation in the study area. Land inheritance practices was ranked first while bigger living space was ranked tenth significant factors of land-use transformation in the study area.

The study, through hypotheses testing, established that there is a significant difference between rental and farm income; a factor which leads to land-use transformation in favour of urban use in the area of study. Additionally, the study established that there is a significant difference in the cost of development between the core municipality and outside it; a factor which favours investment in peri-urban areas. Finally, contrary to concentric zone, sector and wave analogue

theories that inner municipality is responsible for development of peri-urban areas, the study established that the development of the area of study is largely caused by immigrants from other places and not from inner municipality.

□□□ **Effects of land use transformation in the study area**

The study identified decline/loss of land holding sizes, decline of food production, irregular subdivision and transformation of agricultural land, decline of plant and animal species, decline/loss of farm income, formation of new social networks, environmental hazards (water and air pollution), displacement of farms, and socio-economic division as the significant effects of land-use transformation in the study area. Decline/loss of land holding sizes was found leading effect of land-use transformation while socio-economic division was ranked ninth significant effect of land-use transformation in the study area.

□□□ **Coping mechanisms**

Investment in rental housing is the main source of income for both farmers and land buyers/developers in the study area. On the other hand, peri-urban communities lacking land for farming and/or residential development do engage in non-farm income activities such as small scale retail business as a source of livelihood. Those without land end up migrating to rural areas to seek for land for farming while others to small towns to do business for survival.

□□ **Conclusion**

The study established that the phenomenon of land-use transformation has been rising steadily over the years. Land inheritance practices, price of land, high demand for residential housing, improved accessibility and rising value of agricultural land in urban use are the most significant factors of land-use transformation in the study area. Decline/loss of land holding sizes, decline of food production, irregular subdivision and transformation of agricultural land, decline of plant and animal species, and decline/loss of farm income are the most significant effects resulting from transformation of agricultural land to urban use. The subdivision and subsequent transformation of agricultural land to urban use has led to decline/loss of land holding sizes. And hence, loss of traditional farm income and changes in livelihoods of peri-urban residents. To cope with undesirable effects of land-use transformation, peri-urban residents have diversified their sources

of income with residential income being the main source of livelihood. However, residents practice subsistence farming for household food supply and consumption only. Peri-urban residents without access to land do practice business as a source of livelihood while others migrate to farther rural areas to acquire alternative land for farming.

□□ **Recommendations**

The study has shown that the existing core municipal plan is obsolete and limited in terms of geographical coverage to guide and guard development in the area outside it. Hence there is not any valid spatial framework to control development of peri-urban areas. Because of this, the study recommended as follows;

- 1) The county government in collaboration with the national government and other lead agencies in land matters should carry out preparation of physical and land use plan of the inner municipality and areas outside. This is key in facilitating demarcation and gazetment of municipal growth boundary.
 - 2) Using the physical and land use plan, the Kisii county government should carry out zoning and classifying peri-urban areas into defined land uses, namely residential, agriculture, physical and social amenities, education and recreation spaces.
-) The Kisii county government should come up with policies and legislations to facilitate acquisition and transfer of development rights. This is useful in limiting developments in particular areas while promoting in other places within the peripheral areas.
 -) The Kisii county government should promote land appropriation and banking for provision of affordable housing and promotion of agriculture. This helps to lower both the price of agricultural land and investment in rental housing.
 -) The Kisii county government should adopt new ruralism model and introduce no-urban green belts. This helps to deter development of urban areas into farther rural areas. Thereby promoting and conserving farmlands on the urban edge at risk of urban encroachment.
 -) The Kisii county government should promote urban containment policies such as compact and polycentric city models. This is useful in promoting relatively high density development within the inner city while at the same time attracting people from the peri-urban back to inner municipality. Thus, lessening pressure on agricultural land due to high demand for land for residential development.

□□ Areas for further research

- 1) A scientific study on the minimum allowable and economically viable land holding sizes should be done in peri-urban areas of inner municipality and Kenya in general.
- 2) A scientific study should be done to establish possible economic ways of providing affordable housing by the national and county governments in the inner municipality and remedy the effects of land-use transformation in peri-urban areas of the inner municipality.
-) As opposed to conventional knowledge regarding growth of urban areas, a scientific study should be carried out to establish a theoretical framework to help explain growth of urban areas in developing societies.

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Appendix 1: Data need matrix

Research objective	Data need		Methods of data collection	Sources of data	Data collection instruments	Data analysis technique	Presentation techniques
	Categories of land-use transformation	Factor					
1. Determine factors of land use transformation	Demographic factors	1. Inner municipality population growth	1. Interview 2. Literature review	1. Farmers 2. Land buyers <input type="checkbox"/> Existing records	1. Household questionnaire 2. Key Informant Guide (KIG)	Mean score	Report
		2. Inner municipality to peri-urban migration	1. Interview 2. Literature review	1. Farmers 2. Land buyers <input type="checkbox"/> Existing records	1. Household questionnaire 2. KIG	1. Mean score 2. Percentage	Report
		<input type="checkbox"/> Inner municipal problems (air and water pollution, congestion, inadequate living spaces, inadequate recreational and social facilities)	1. Literature review 2. Interview	1. Farmers 2. Land buyers <input type="checkbox"/> Existing records	Household questionnaire	Mean score	Report
	Economic factors	1. Price of land	Interview	1. Farmers 2. Land buyers <input type="checkbox"/> Existing records	1. Household questionnaire 2. KIG	Mean score	Report
		2. Declining peri-urban economy	1. Interview 2. Literature review	1. Farmers 2. Land owners <input type="checkbox"/>	1. Household questionnaire 2. KIG	Mean score	Report
		<input type="checkbox"/> Cost of rent at peri-urban area	Interview	1. Farmers 2. Land buyers	1. Household questionnaire 2. KIG	Mean score	Report
		<input type="checkbox"/> Cost of development	1. Interview 2. Literature review	1. Farmers 2. Land buyers	1. Household questionnaire 2. KIG	1. Mean score 2. t-test	Report

Research objective	Data need		Methods of data collection	Sources of data	Data collection instruments	Data analysis technique	Presentation techniques
				<input type="checkbox"/> County physical planning office <input type="checkbox"/> Land development consultants			
		<input type="checkbox"/> Rise in individual income at inner municipality	1. Interview 2. Literature review	1. Land buyers	Household questionnaire	Mean score	Report
		<input type="checkbox"/> High demand for residential housing	1. Interview 2. Literature review	1. Farmers 2. Land buyers	Household questionnaire	Mean score	Report
	Socio-cultural factors	1. Customary land tenure	1. Interview 2. Literature review	1. Farmers 2. Land owners <input type="checkbox"/> Land Control Board	1. Household questionnaire 2. KIG	Mean score	Report
		2. Land inheritance practices	1. Interview 2. Literature review	1. Farmers 2. Land buyers	1. Household questionnaire 2. KIG	Mean score	Report
	Planning policies and institution management	1. Ineffective land use planning	1. Literature review 2. Interview	1. Farmers 2. Land buyers <input type="checkbox"/> Kisii county government Physical planning office	1. Household questionnaire 2. KIG	Mean score	Report
		2. Ineffective enforcement of plans	1. Literature review 2. Interview	1. Farmers 2. Land buyers <input type="checkbox"/> Kisii county government Physical planning office	1. Household questionnaire 2. KIG	Mean score	Report

Research objective	Data need	Methods of data collection	Sources of data	Data collection instruments	Data analysis technique	Presentation techniques
	<input type="checkbox"/> Ineffective institution management	1. Literature review 2. Interview	1. Farmers 2. Land buyers <input type="checkbox"/> Kisii county government Physical planning office	1. Household questionnaire 2. KIG	Mean score	Report
	Transportation and technology	1. Private car ownership	1. Interview 2. Literature review	1. Farmers 2. Land buyers	Household questionnaire	Mean score Report
	2. Cost of transportation	1. Interview 2. Literature review	1. Farmers 2. Land buyers	Household questionnaire	Mean score	Report
	<input type="checkbox"/> Improved accessibility	1. Interview 2. Literature review <input type="checkbox"/> Field observation <input type="checkbox"/> Photography	1. Farmers 2. Land buyers	1. Household questionnaire 2. Camera	1. Mean score 2. Photographic image analysis	Report
	Impermanence syndrome	1. Decline in agricultural productivity	1. Interview 2. Literature review	1. Farmers 2. Land buyers <input type="checkbox"/> Kisii county physical planning and agriculture office	1. Household questionnaire 2. KIG	1. Mean score 2. t-test Report
	2. Rising values of agricultural land in urban use	1. Interview 2. Literature review	1. Farmer 2. Land buyers <input type="checkbox"/> Kisii county physical planning office	1. Household questionnaire 2. KIG	Mean score	Report
	<input type="checkbox"/> More incomes from non-farm economic activities	1. Interview 2. Literature review	1. Farmer 2. Land buyer	1. Household questionnaire 2. KIG	Mean score	Report
	<input type="checkbox"/> Loss of farming culture	1. Interview 2. Literature review	1. Farmer 2. Land buyer	1. Household questionnaire 2. KIG	Mean score	Report

Research objective	Data need	Methods of data collection	Sources of data	Data collection instruments	Data analysis technique	Presentation techniques
	Housing preferences	1. Demand for bigger living space	1. Interview 2. Literature review	1. Farmers 2. Land buyers	Household questionnaire	Mean score Report
		2. Increase in number of family members	1. Interview 2. Literature review	1. Farmers 2. Land buyers	Household questionnaire	Mean score Report
		<input type="checkbox"/> Proximity to rural areas and nature	1. Interview 2. Literature review	Land buyers	Household questionnaire	Mean score Report
		<input type="checkbox"/> Access to better amenities and social services	1. Interview 2. Literature review	Land buyers	Household questionnaire	Mean score Report
2. Determine effects of land use transformation on livelihoods of peri-urban communities in the study area	Environmental effects	1. Environmental hazards (air, soil and water pollution, floods and erosion)	1. Interview 2. Environmental reports <input type="checkbox"/> Photography	1. Farmers 2. Farmers <input type="checkbox"/> Field observation	1. Household questionnaire 2. Checklist <input type="checkbox"/> Camera <input type="checkbox"/> Key Informant Guide	Mean score Photographic analysis Report
		2. Traffic congestion	1. Interview 2. Literature review <input type="checkbox"/> Field observation	1. Farmers 2. Land buyers	Household questionnaire	Mean score Report
		<input type="checkbox"/> Decline of indigenous plant and animal species	1. Interview 2. Literature review	1. Farmers 2. Land buyers	Household questionnaire	Mean score Report
		<input type="checkbox"/> Farmland displacement	1. Interview 2. Literature review <input type="checkbox"/> Field observation	1. Farmers 2. Land buyers	Household questionnaire Camera	Mean score Report
		<input type="checkbox"/> Increased consumption of natural resource	1. Interview 2. Literature review	1. Farmers 2. Land buyers	Household questionnaire	Mean score Report
		<input type="checkbox"/> Decline of soil fertility	1. Interview 2. Site observation	1. Farmers 2. Land buyers	Household questionnaire	1. Mean score 2. Photographic analysis Report

Research objective	Data need	Methods of data collection	Sources of data	Data collection instruments	Data analysis technique	Presentation techniques	
	Economic effects	1. Decline/loss of land holding sizes	Interview Literature review Field measurement	1. Farmers 2. Land buyers	1. Household questionnaire 2. Tape measure	1. Mean score 2. Bar graph <input type="checkbox"/>	Report
		2. Decline of food production	Interview	Land owner (farmers)	Household questionnaire	Quantitative analysis	
		<input type="checkbox"/> Increased cost of infrastructural provision	1. Interview 2. Literature review	1. Farmers 2. Land buyers <input type="checkbox"/> Kisii County Government	1. Household questionnaire 2. Key Informant Guide	Mean score	Report
		<input type="checkbox"/> Decline/loss of farm income	Interview	Land owner (farmer)	Household questionnaire	Mean score	Report
		<input type="checkbox"/> Diversification of income sources	1. Interview 2. Literature review <input type="checkbox"/> Field observation	1. Farmers 2. Land buyers <input type="checkbox"/> Kisii county planning office	1. Household questionnaire 2. KIG	1. Mean score 2. Photographic analysis	Report
		<input type="checkbox"/> Irregular subdivision and transformation of agricultural land	1. Interview 2. Literature review <input type="checkbox"/> Field observation	1. Farmers 2. Land buyers <input type="checkbox"/> Kisii county physical planning office	1. Household questionnaire 2. KIG <input type="checkbox"/> Camera	1. Mean score 2. Photographic analysis	Report
	Social effects	1. Socio-economic divisions	1. Interview 2. Literature review	1. Farmers 2. Land buyers	Household questionnaire	Mean score	Report
		2. Loss of community character	1. Interview 2. Literature review	1. Farmers 2. Land buyers	Household questionnaire	Mean score	Report
		<input type="checkbox"/> Formation of informal social networks	1. Interview 2. Literature review	1. Farmers 2. Land buyers	Household questionnaire	Mean score	Report

Research objective	Data need	Methods of data collection	Sources of data	Data collection instruments	Data analysis technique	Presentation techniques	
	<input type="checkbox"/> Formation of new social networks	1. Interview 2. Literature review	1. Farmers 2. Land buyers	Household questionnaire	Mean score	Report	
	<input type="checkbox"/> Susceptibility to infectious and communicable diseases	1. Interview 2. Literature review	1. Farmers 2. Land buyers	Household questionnaire	Mean score	Report	
<input type="checkbox"/> Determine coping mechanisms put in place by peri-urban inhabitants to overcome effects of land use transformation in the study area	Coping techniques	Activities					
	1. Intensive peri-urban agriculture	Market-oriented food crops and animal products)	1. Interview 2. Review of reports <input type="checkbox"/> Photography	1. Farmers 2. Land buyers	1. Household questionnaire 2. Field observation <input type="checkbox"/> Camera	Qualitative analysis	Report
	2. Non-farm income generating activities	a) Retail business b) Wholesale business c) Hair dressing a) Shoe repair b) Timber and wood products c) Barbering d) Hawking e) Dressmaking f) Motor vehicle repair g) Plumbing h) Hawking i) Metal fabrication j) Motorbike riding k) Transportation l) Others	1. Interview 2. Review of reports <input type="checkbox"/> Field observation <input type="checkbox"/> Photography	1. Farmers 2. Land buyers	1. Household questionnaire 2. Camera	Qualitative analysis	Report
	<input type="checkbox"/> Self-help groups	-	1. Interview 2. Review reports	1. Farmers 2. Land buyers	Household questionnaire	Qualitative analysis	Report
	<input type="checkbox"/> Employment in private	-	1. Interview	1. Farmers 2. Land buyers	Household questionnaire	Qualitative analysis	Report

Research objective	Data need		Methods of data collection	Sources of data	Data collection instruments	Data analysis technique	Presentation techniques
	and public sectors		2. Literature review				
<input type="checkbox"/> To propose planning options to mitigate effects of land use transformation in the study area	Planning options						
	1. Delineate and gazette urban growth boundary	1. Peri-urban development policies 2. Planning options <input type="checkbox"/>	1. Interview 2. Review planning policies <input type="checkbox"/> Interview guides	1. Farmers 2. Land buyers <input type="checkbox"/> Kisii County Government	1. Household questionnaire 2. Key Informant Guide	Qualitative analysis	Report
	2. Zone land and designate preservation areas	1. Peri-urban development policies 2. Planning options	1. Interview 2. Review planning policies <input type="checkbox"/> Review reports	1. Farmers 2. Land buyers <input type="checkbox"/> Kisii county government <input type="checkbox"/> County Land Control Board	1. Household questionnaire 2. Key informant Guide	Descriptive analysis	Report
	<input type="checkbox"/> Define minimum land holding sizes	1. Peri-urban development policies and laws 2. Planning options	1. Interview 2. Review planning policies and laws 3. Review land and agricultural reports	1. Farmers 2. Land buyers	1. Household questionnaire 2. Key Informant Guide	Qualitative analysis	Report
	<input type="checkbox"/> Define, acquire and transfer development rights	1. Peri-urban development laws and policies 2. Planning options	1. Interview 2. Review planning and development policies, laws and reports	1. Farmers 2. Land buyers <input type="checkbox"/> Kisii county physical planning office	1. Household questionnaire 2. Key Informant Guide	Qualitative analysis	Report

Research objective	Data need		Methods of data collection	Sources of data	Data collection instruments	Data analysis technique	Presentation techniques
				<input type="checkbox"/> Land surveying office			
	<input type="checkbox"/> Sensitize land owners	1. Peri-urban development laws and policies 2. Planning options	Interview	Kisii county government Land owners	1. Household questionnaire 2. Key Informant Guide	Qualitative analysis	Report
	<input type="checkbox"/> Introduce non-urban green belts	1. Peri-urban development laws and policies 2. Planning options	1. Interview 2. Review planning and development policies, laws and reports	1. Farmers 2. Land buyers <input type="checkbox"/> Kisii county physical planning office 4. Land surveying office	1. Household questionnaire 2. Key Informant Guide	Qualitative analysis	Report
	<input type="checkbox"/> Promote land banking and land appropriation	1. Peri-urban development policies 2. Planning options <input type="checkbox"/>	1. Interview 2. Review planning and development policies	1. Farmers 2. Land buyers <input type="checkbox"/> Kisii county government	1. Household questionnaire 2. Key Informant Guide	Qualitative analysis	Report

Source: Author's construct, 2021

Appendix 2: Detailed determination of mean scores of factors of land-use transformation

Name of factor	Factor (indicator)	Rating	Percentage response (%)	Mean score (\bar{x})
Economic factors	Price of land	Not important	0	□□1
		Less important	1.□	
		Important	□0.7	
		Very important	□9.1	
		Total valid	□□□	
	Cost of rent at peri-urban area	Not important	1.□	□12
		Less important	2.9	
		Important	□□□	
		Very important	1□□	
		Total valid	□□□	
	High demand for residential housing	Not important	0	□□□
		Less important	1.□	
		Important	□□□	
		Very important	□□8	
		Total valid	□□□	
Socio-cultural	Customary land tenure	Not important	0	□0□
		Less important	□8	
		Important	□□2	
		Very important	10.1	
		Total valid	□□□	
	Land inheritance practices	Not important	0	□□□
		Less important	2.9	
		Important	□9.1	
		Very important	□0.□	
		Total valid	□□□	
Planning policies and	Ineffective land use planning	Not important	0	
		Less important	8.7	

Name of factor	Factor (indicator)	Rating	Percentage response (%)	Mean score (\bar{x})	
institution management		Important	11.7	2.9	
		Very important	2.9		
		Total valid	14.6		
	Ineffective institution management	Not important	0	2.8	
		Less important	20.1		
		Important	11.1		
		Very important	8.7		
		Total valid	14.6		
	Transportation and technology	Improved accessibility	Not important	0	2.2
			Less important	1.1	
Important			10.9		
Very important			20.1		
Total valid			14.6		
Impermanence syndrome	Rising value of rural land in urban use	Not important	0	2.1	
		Less important	1.1		
		Important	11.8		
		Very important	18.8		
		Total valid	14.6		
Housing preferences	Demand for bigger living space	Not important	11.1	2.70	
		Less important	10.1		
		Important	17.8		
		Very important	0		
		Total valid	14.6		

Source: Field survey, 2021

Appendix 1 Detailed determination of mean scores of effects of land use transformation

Type of effect	Factor (indicator)	Rating	Percentage response (%)	Mean score (\bar{x})
Environmental effects	Environmental hazards (air and water pollution)	Not important	2.9	2.90
		Less important	1□□	
		Important	2□1	
		Very important	1□□	
		Total valid	□□.□	
	Decline of plant and animal species	Not important	0	□1□9
		Less important	7.2	
		Important	□9.2	
		Very important	2□2	
		Total valid	□□□.□□	
	Displacement of farms	Not important	8.7	2.77
		Less important	1□□	
		Important	□9.□	
		Very important	7.2	
		Total valid	□□□.□□	
Economic effects	Decline/loss of land holding size	Not important	0	□□□
		Less important	0	
		Important	□□.8	
		Very important	□□.2	
		Total valid	□□□.□□	
	Decline in food production	Not important	0	□□9
		Less important	0	
		Important	□0.7	
		Very important	□9.□	
		Total valid	□□□.□□	
	Decline/loss of farm income	Not important	1.□	
		Less important	□8	

Type of effect	Factor (indicator)	Rating	Percentage response (%)	Mean score (\bar{x})	
		Important	7□8	□07	
		Very important	1□9		
		Total	□□□□		
	Irregular subdivision and transformation of agricultural land	Not important	1.□	□2□	
		Less important	7.2		
		Important	□7.7		
		Very important	27.□		
		Total valid	□□□		
	Social effects	Socio-economic division	Not important	1□	2.7□
			Less important	7.2	
Important			□9.□		
Very important			8.7		
Total valid			□□□		
Formation of new social networks		Not important	1.□	□0	
		Less important	1□		
		Important	□□7		
		Very important	1□9		
		Total valid	□□□		

Source: Field survey, 2021

Appendix □ Household questionnaire



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

Preamble:

This household questionnaire is in aid of a research thesis conducted by Douglas M. Makori, a master’s candidate (in Planning) in the Department of Urban and Regional Planning, School of Built Environment, University of Nairobi. The research is on *‘land-use transformations and changes in peri-urban livelihoods in Kisii Municipality, Kenya.’* The researcher is using a case study of peri-urban areas of Kisii Municipality.

Declaration:

The information generated through this household questionnaire will be held professionally and will be used for research purpose only.

Section I: Survey instrument identification and tracking

Q□ Name of interviewer.....

Q□ Instrument Id No.

Q□ Date of Interview.....

Q□ Ward name

Section II. Information on respondent

Q/No.	Questions	Responses (Please mark appropriately)	Remarks
Q□	Name of respondent (optional)		
Q□	Age (Years)		
Q□	Gender	1. Male 2. Female	
Q□	Category of respondent	1. Farmer 2. Land buyer/developer	

Section III: Factors of land-use transformations

Q/No.	Questions	Responses (Please mark appropriately)	Remarks
Q□	Which area did you live in before settling in this place?	Zones: <ol style="list-style-type: none"> 1. In the study area 2. Inner municipality <input type="checkbox"/> From peri-urban of Kisii municipality to peri-urban areas of Kisii municipality <input type="checkbox"/> Other zones of Kisii county <ol style="list-style-type: none"> i) Ogembo ii) Keumbu iii) Keroka iv) Nyamarambe v) Suneka vi) Nyamache vii) Others (specify) <input type="checkbox"/> Zones neighbouring Kisii county <ol style="list-style-type: none"> i) Nyamira ii) Kisumu iii) Kericho iv) Migori v) Homa Bay vi) Kilgoris vii) Narok viii) Eldoret <input type="checkbox"/> Nairobi city county 7. Others (specify) 	
Q□□	<p>(a) Which of these factors would influence buying and transformation of agricultural land to urban uses in this area?</p> <p>(You may tick more than one factor under each category of factors)</p>	<p><u>Economic factors</u></p> <ol style="list-style-type: none"> 1. Price and availability of land 2. Declining rural agrarian economy <input type="checkbox"/> High demand for residential housing <input type="checkbox"/> Need to earn a living from residential housing <input type="checkbox"/> Reduced rental fees <input type="checkbox"/> Cost of development permission 7. Rise in individual income in inner municipality 8. Any other (specify) <p><u>Planning policies and institution management</u></p> <ol style="list-style-type: none"> 1. Ineffective land use planning 2. Ineffective enforcement of plans <input type="checkbox"/> Ineffective institution management <input type="checkbox"/> Any other (specify) <p><u>Social –cultural factors</u></p>	

Q/No.	Questions	Responses (Please mark appropriately)	Remarks
		1. Customary land tenure 2. Land inheritance practices <input type="checkbox"/> Ineffective peri-urban land administration and management <input type="checkbox"/> Any other (specify) <u>Transportation and technology</u> 1. Improved accessibility 2. Private car ownership <input type="checkbox"/> Cost of transportation <input type="checkbox"/> Movement of people to peri-urban areas in need of land <u>Impermanence syndrome</u> 1. Decline of agricultural productivity 2. Rising values of rural land in urban use <input type="checkbox"/> More income from non-farm activities <input type="checkbox"/> Loss of farming culture <input type="checkbox"/> Any other (specify) <u>Demographic factors</u> 1. Inner municipality population growth 2. Inner municipality to peri-urban migration <input type="checkbox"/> Inner municipal problems (air, water and environmental pollution, small living spaces, poor quality of schools, crime etc.) <input type="checkbox"/> Any other (specify) <u>Housing preference</u> 1. Need to own a house 2. Demand for bigger living space <input type="checkbox"/> Increase in number of family members <input type="checkbox"/> Proximity to rural areas and nature <input type="checkbox"/> Access to better amenities and social services <input type="checkbox"/> Any other (specify)	

Q□□	Questions	Factors of land use transformations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Q□□	From Q□□(a), rank the factors according to their influence on transformation of agricultural land to urban use in this area.	1	Price and availability of land				
		<input type="checkbox"/>	Declining peri-urban economy				
		<input type="checkbox"/>	High demand for residential housing				
		<input type="checkbox"/>	Reduced rental fees at peri-urban areas				
		7	Cost of development permission				
		8	Rise in individual municipal income				
		9	Ineffective land use planning				
		10	Customary land tenure				

Key <input type="checkbox"/> =Not important <input type="checkbox"/> =Less important <input type="checkbox"/> =Important <input type="checkbox"/> =Very important	11	Land inheritance practices				
	12	Ineffective enforcement of plans				
	<input type="checkbox"/>	Ineffective institution management				
	<input type="checkbox"/>	Cost of transportation				
	<input type="checkbox"/>	Improved accessibility				
	<input type="checkbox"/>	Private car ownership				
	17	Declining agricultural productivity				
	18	Rising value of rural land in urban use				
	19	More income from non-farm activities				
	20	Loss of farming culture				
	21	Inner municipality population growth				
	22	Inner municipality to peri-urban migration				
	<input type="checkbox"/>	Inner municipality problems				
	<input type="checkbox"/>	Demand for bigger living space				
	<input type="checkbox"/>	Increase in number of family members				
	27	Proximity to rural areas and nature				
	28	Access to better amenities and social services				

Section IV: Land acquisition and use

Q/No.	Questions	Responses (Please mark appropriately)	Remarks
Q <input type="checkbox"/>	a) How did you acquire land in this place?	1. Land subdivision 2. Inheritance <input type="checkbox"/> Purchased <input type="checkbox"/> Gift from friend/relative <input type="checkbox"/> Allocation by government <input type="checkbox"/> Others (specify)	
	b) Which year did you acquire land?		
	c) What is the size of land you acquired? acres	
	d) Did you subdivide your land?	1. Yes 2. No	
	e) If yes, how did you use the resultant plots of land?	1. Sold 2. Developed <input type="checkbox"/> Sold and developed <input type="checkbox"/> Any other	
	f) If you sold your plots of land, how did you	1. Paying school fees 2. Paying medical fees <input type="checkbox"/> Build own living house	

Q/No.	Questions	Responses (Please mark appropriately)	Remarks
	spend the money received?	<input type="checkbox"/> Bought food <input type="checkbox"/> Bought clothes <input type="checkbox"/> Leisure 7. Bought a family/business car 8. Any other (specify)	
	g) If you developed your land, how long did you take to acquire development approval?	1. One day 2. One week <input type="checkbox"/> Two weeks <input type="checkbox"/> Three weeks <input type="checkbox"/> One month <input type="checkbox"/> Over a month	
	h) If you sought for development approval, how much did you pay in Kenya shillings?	1. Public Health 2. Physical planning..... <input type="checkbox"/> Survey..... <input type="checkbox"/> Urban Engineering <input type="checkbox"/> NEMA..... <input type="checkbox"/> Any other (specify).....	
Q <input type="checkbox"/>	What are your income generating activities?		
	Farmer/Land buyer/developer	1. Farming 2. Business <input type="checkbox"/> Formal employment <input type="checkbox"/> Rental housing <input type="checkbox"/> Off-farm economic activities <input type="checkbox"/> Others (specify)	
Q <input type="checkbox"/>	i) If employed, how much is your average income per year?	1. KShs 0 – <input type="checkbox"/> 0,000.00 2. KShs <input type="checkbox"/> 1,000.000 – 100,000.00 <input type="checkbox"/> KShs 101,000.00 – 1 <input type="checkbox"/> 0,000.00 <input type="checkbox"/> KShs 1 <input type="checkbox"/> 1,000.00 - 200,000.00 <input type="checkbox"/> KShs 201,000.00 – 2 <input type="checkbox"/> 0,000.00 <input type="checkbox"/> KShs 2 <input type="checkbox"/> 1,000.00 – <input type="checkbox"/> 00,000.00 7. KShs <input type="checkbox"/> 01,000.00 – <input type="checkbox"/> 10,000.00 8. KShs <input type="checkbox"/> 11,000.00 – <input type="checkbox"/> 00,000.00 9. KShs <input type="checkbox"/> 01,000.00 – <input type="checkbox"/> 10,000.00 10. KShs <input type="checkbox"/> 11,000.00 – <input type="checkbox"/> 00,000.00 11. Over KShs <input type="checkbox"/> 00,000.00	
	ii) If own rental housing, what is the size of land occupied by the houses?	Area of land occupied by rental housing Aream ²	
	iii) How many units?	Number.....	

Q/No.	Questions	Responses (Please mark appropriately)	Remarks
	iv) What is the monthly rental income per unit?	KShs.....	

Section V: Income from farming and rental houses (non-farm income)

Q□□	a) Do you earn income from farming and rental houses?	1. Agree 2. Disagree			
	b) If you agree, what is your average earnings from farming and residential housing for 0.0□Ha piece of land as per the years provided?	Year	Farm income (KShs)	Rental income (KShs)	Remarks
		201□			
		201□			
		201□			
		2017			
		2018			
		2019			
		2020			

Q/No.	Questions	Responses (Please mark appropriately)	Remarks
Q□□	a) What is your most preferred mode of transport to CBD?	1. Public transport 2. Private car <input type="checkbox"/> Motor cycle (boda boda) <input type="checkbox"/> Any other (specify)	
	b) What is your transportation expenditure per month?	KShs	

Section VII: Effects of land-use transformations

Q/No.	Questions	Responses (Please mark appropriately)	Remarks
Q□□	Which of these effects have been brought by transformation of agricultural land to urban use in this place? (You may tick more than one factor under each effect)	<u>Environmental effects</u> 1. Environmental hazards (air, soil and water pollution, floods and erosion) 2. Decline of plant and animal species <input type="checkbox"/> Farmland displacement <input type="checkbox"/> Increased consumption of natural resource <input type="checkbox"/> Decline of soil fertility <input type="checkbox"/> Any other (specify)	

		<u>Economic effects</u> <ol style="list-style-type: none"> 1. Decline of land holding sizes/loss of agricultural land 2. Decline in food production <ul style="list-style-type: none"> <input type="checkbox"/> Increased cost of infrastructure provision <input type="checkbox"/> Decline/loss of farm income <input type="checkbox"/> Diversification of economic activities <input type="checkbox"/> Irregular subdivisions <u>Social effects</u> <ol style="list-style-type: none"> 1. Social-economic division 2. Loss of community character <ul style="list-style-type: none"> <input type="checkbox"/> Formation of informal networks <input type="checkbox"/> Creation of new social networks <input type="checkbox"/> Susceptibility to infections and communicable diseases <input type="checkbox"/> Any other (specify) 	
--	--	--	--

Q <input type="checkbox"/>	Questions	Factor	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<p>From Q18, rank the effects of land use transformations in this place.</p> <p>Rank the effects on a scale 1, 2, <input type="checkbox"/>, and <input type="checkbox"/> (tick where applicable)</p> <p>Key</p> <p><input type="checkbox"/> = Not important <input type="checkbox"/> = Less important <input type="checkbox"/> = Important <input type="checkbox"/> = very important</p>		1	Environmental hazards (contamination of ground and surface water, floods, erosion, etc.)				
		2	Traffic congestion				
		<input type="checkbox"/>	Decline of plant and animal species				
		<input type="checkbox"/>	Farmlands displacement				
		<input type="checkbox"/>	Increased consumption of natural resources				
		<input type="checkbox"/>	Decline of soil fertility				
		7	Decline/loss of land holding sizes				
		8	Decline of food production				
		9	Increased cost of infrastructure provision				
		10	Diversification of income sources				
		11	Irregular subdivision and transformations of land				
		12	Socio-economic division				
		1 <input type="checkbox"/>	Loss of community character				
		1 <input type="checkbox"/>	Formation of informal networks				
		1 <input type="checkbox"/>	Creation of new social networks				
1 <input type="checkbox"/>	Susceptibility to infections and communicable diseases						

Section VIII: Coping mechanisms

Q/No.	Question	Response (tick appropriately)	Remarks
Q <input type="checkbox"/>	a) Has your household ever experienced food	<ol style="list-style-type: none"> 1. Yes 2. No 	

Q/No.	Question	Response (tick appropriately)	Remarks
	shortage over the years?		
	b) If yes, how did your household cover the food gap?	1. Agriculture <ul style="list-style-type: none"> i) Food crops ii) Cash crops iii) Livestock rearing/keeping 2. Borrowing from neighbours, relatives, friends etc. <ul style="list-style-type: none"> <input type="checkbox"/> Doing menial jobs <input type="checkbox"/> Sale of family assets <input type="checkbox"/> Sale of family livestock <input type="checkbox"/> Received food aid 7. Donation from church organizations 8. Non-farm and off-farm income <ul style="list-style-type: none"> i) Business ii) Hair dressing iii) Shoe repair iv) Selling timber and wood products v) Barbering vi) Hawking vii) Plumbing viii) Motorbike riding transportation ix) Any other 9. Any other (specify)	
	c) Which crops do you grow on your farm?	1. Maize 2. Beans <ul style="list-style-type: none"> <input type="checkbox"/> Kales <input type="checkbox"/> Banana <input type="checkbox"/> Others (specify) 	

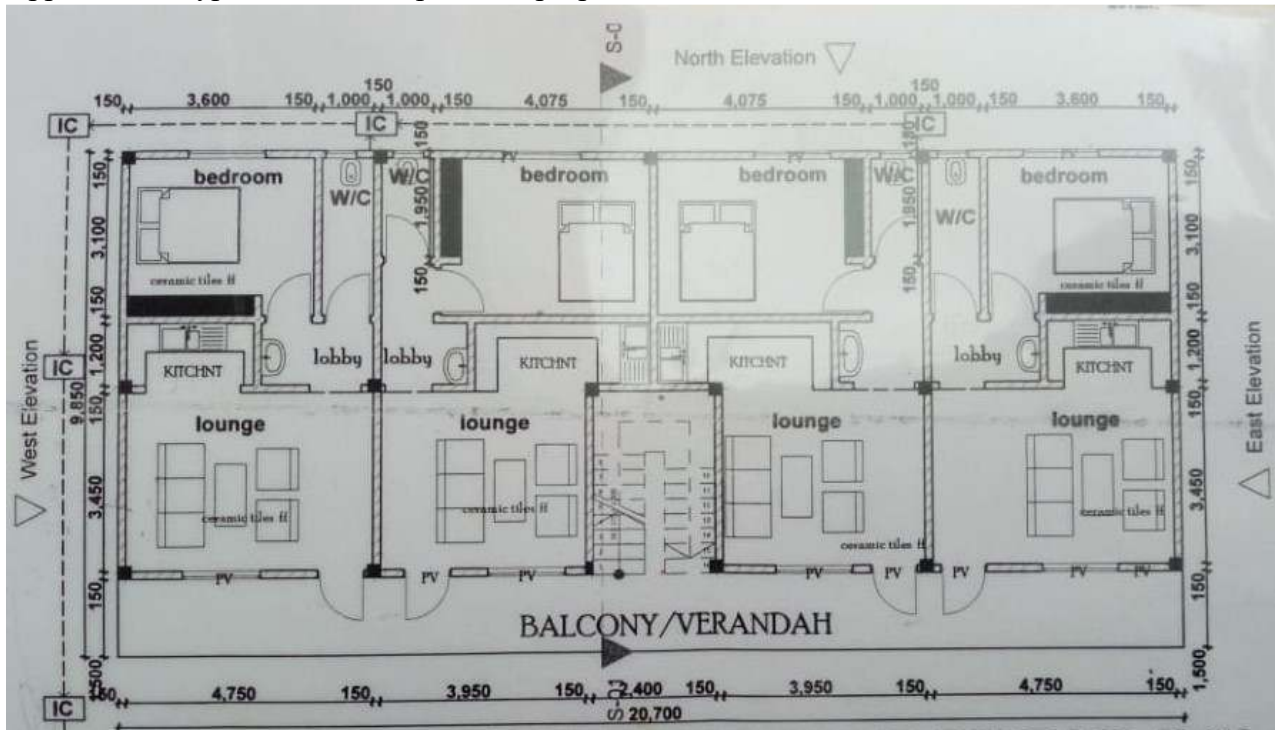
Section IX: Mitigation options for peri-urban land-use transformations

Q/No.	Questions	Responses (Please mark appropriately)	Remarks
Q□□	In your opinion, what options may enable mitigation of peri-urban land-use transformation in peri-urban area of Kisii municipality?	1. Delineate and gazette urban growth boundary 2. Zone and designate preservation areas <ul style="list-style-type: none"> <input type="checkbox"/> Determine minimum and maximum land holding sizes <input type="checkbox"/> Define, acquire and transfer development rights 	

Q/No.	Questions	Responses (Please mark appropriately)	Remarks
		<input type="checkbox"/> Sensitize land owners <input type="checkbox"/> Introduce non-urban green belts 7. Any other (specify)	

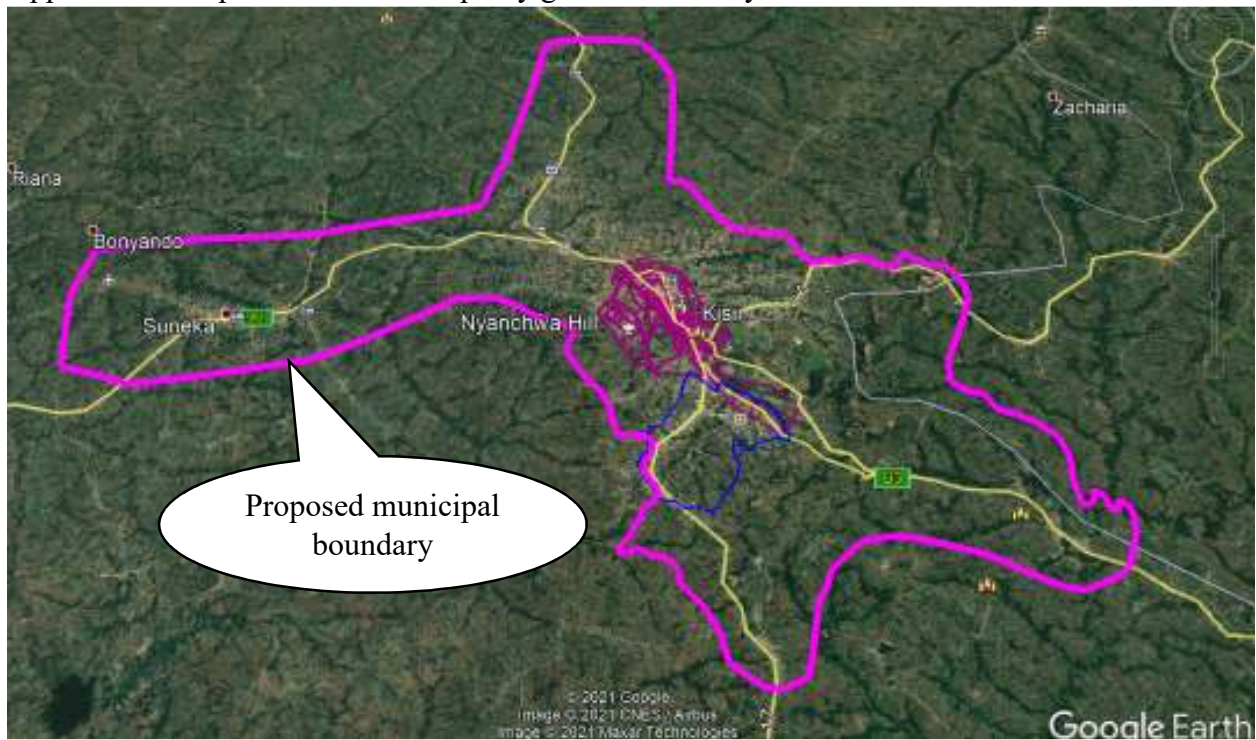
Thank you for your time

Appendix □ Hypothetical floor plan of a proposed residential house



Source: UhuruKeno construction company limited

Appendix □ Proposed Kisii municipality growth boundary



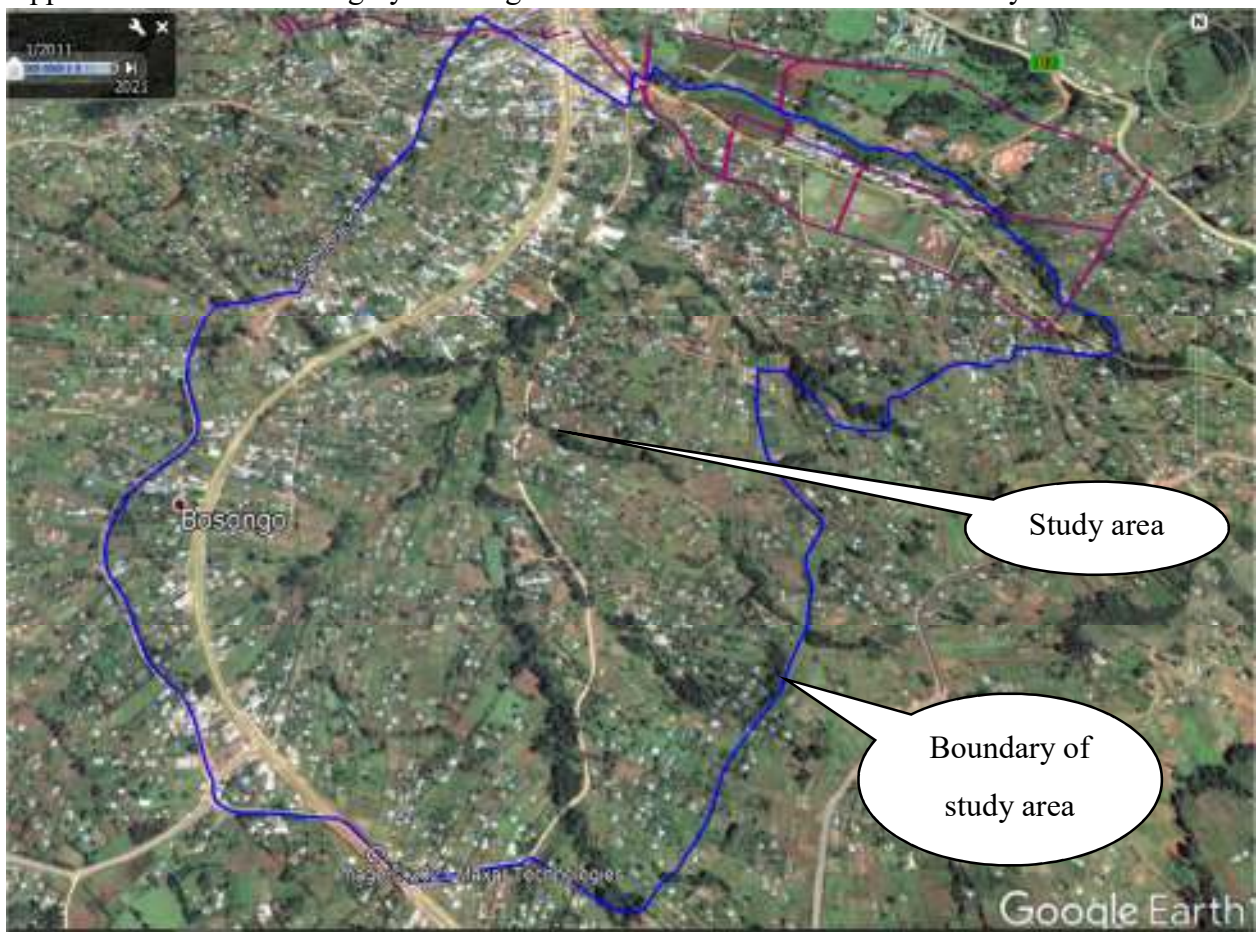
Source: Google Earth Image, 2021

Appendix 7: An aerial imagery showing extent of land-use transformation in the year 2020



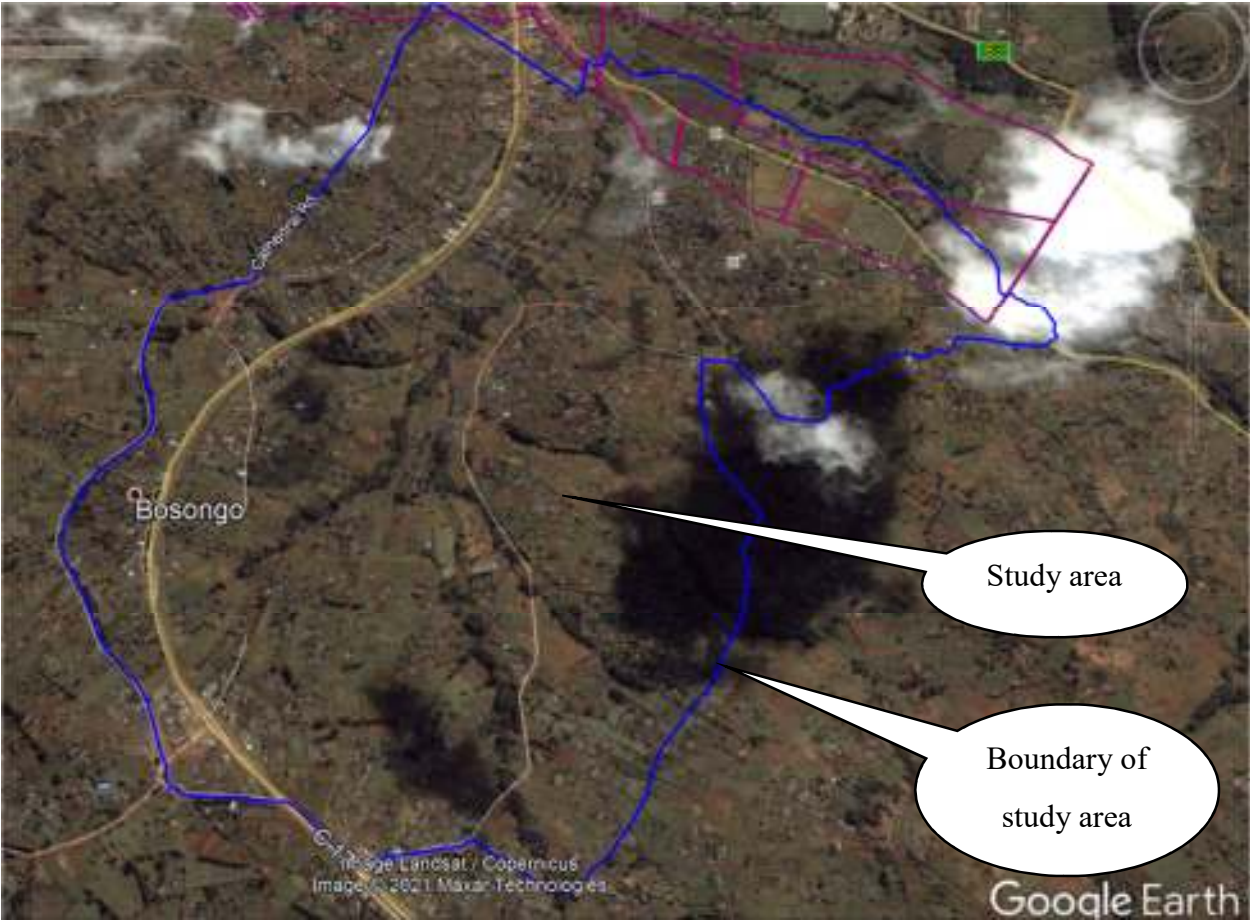
Source: Google Earth, 2020

Appendix 8: An aerial imagery showing extent land-use transformation in the year 2011



Source: Google Earth, 2010

Appendix 9: An aerial imagery showing extent of land use in the year 2002



Source: Google Earth, 2002

Appendix 10: Permission to carry out field work



University of Nairobi
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e-mail: durp@uonbi.ac.ke
Tel. 020 4913526

October 19, 2020

TO WHOM IT MAY CONCERN

RE: MAKORI M. DOUGLAS – B63/12734/2018

This is to confirm that the above named is a Master of Arts (Planning) student in the Department of Urban & Regional Planning, University of Nairobi.

As part of the continuous assessment culture in the Masters of Arts in Planning Programme our students are encouraged to acquire some experience through training in the field of Urban and Regional.

We wish to request you to allow him/her collect data from your institutions/households for his/her Masters Project title ***“Land Use Transformations in Peri-urban areas of Kisii Municipality and their Effects on Food Security”***.


Any assistance accorded to him/her will be highly appreciated.


PROF. KARANJA MWANGI, MKIP FKIP
CHAIRMAN
DEPARTMENT OF URBAN & REGIONAL PLANNING



Source: University of Nairobi, 2020


Appendix 11: Research permission from NACOSTI

 **REPUBLIC OF KENYA**

 **NATIONAL COMMISSION FOR
SCIENCE, TECHNOLOGY & INNOVATION**

Ref No: **836288** Date of Issue: **21/June/2021**


RESEARCH LICENSE




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