THE EFFECT OF EXPANSION OF KIMILILI TOWN ON PERI URBAN LAND USE FROM 1990 TO 2020

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DECLARATION

I hereby declare that this research thesis is my original work and has never been presented elsewhere for any award or degree.

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CERTIFICATION

The undersigned certify that they have read and hereby recommend for acceptance of Masinde Muliro university of Science and Technology a thesis entitled, **"The Effect of Expansion of Kimilili Town on Peri urban Land Use."**

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DEDICATION

This research work is dedicated to the Almighty God for his grace and guidance. I humbly dedicate this work with all my love to my dear wife and children, my dear parents and siblings for their unconditional love, care and support.

ABSTRACT

Urbanization has caused unprecedented land use changes around urban settlements leading to enormous social-economic impacts on peri urban residents. Currently, 55% of the world's population lives in urban areas, a figure that is predicted to reach 60 percent by the year 2030. If existing urbanization trend persist, urban dwellers will hit 68 percent by 2050. In order to satisfy the rising metropolitan population, urban areas have expanded spatially beyond legal limits into their hinterlands. This has resulted in conversion of arable land to residential and commercial use leading to decline in agriculture as a source of livelihood for peri urban residents. The overall objective of the study was to establish the effect of expansion of Kimilili town on peri urban land use from 1990 to 2020; the specific objectives were to; determine the trend of urban expansion of Kimilili town from 1990 to 2020; establish the extent to which expansion of Kimilili town has affected peri urban land use and identify strategies for sustainable development of Kimilili town. Urban population increase and proximity to the town centre typified urban expansion while increase in size of built up area and change in peri urban land use activities characterized peri urban land use. The study adopted a descriptive research design. Both quantitative and qualitative data was collected from both primary and secondary data sources. Data was collected using questionnaires, key informant interviews, document analysis, and observation and focus group discussions from a sample of 384 respondents randomly selected from the target population. Data was analyzed using Pearson product moment correlation and simple regression analysis techniques and presented in tables, figures, pie charts and graphs. The study found significant changes in land use in the study area from 1990 to 2020. This indicated rapid expansion of Kimilili town from the past 30 years. The study further established statistically significant relationship between population growth and expansion in built up area and distance from the town centre and peri urban land use activities. The study concluded that the growth and development of Kimilili town has resulted in expansion of built-up area into arable land leading to decline in agriculture as a source of livelihood among peri urban residents. The findings of this study will be useful in addressing challenges arising from uncontrolled urban growth and development. The study recommends adoption of compact building system where buildings are closely spaced and vertical development to check horizontal development. The study further recommends development of policies and planning interventions to guide growth and development in fast growing small and medium towns in Kenya. To achieve this however, public participation and advocacy should be enhanced so as to encourage residents in the peri urban areas to embrace physical planning and allow for enforcement of development control approaches in the peri urban areas to avert risk of food insecurity.

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ABBREVIATIONS AND ACRONYMS

CBD	Central Business District
UNDP	United Nations Development Programme
UNICEF	United Nations International Children's Emergency Fund
UNDESA	United Nations Department of Economic and Social Affairs
UN	United Nations
SDG	Sustainable Development Goals
USA	United States of America
USGS	United States Geological Survey.
ISUDP	Integrated Strategic Urban Development Plan
UNFPA	United Nations Fund for Population Activities

DEFINITION OF OPERATIONAL TERMS

In the context of this thesis, the following terms shall be defined as follows:

Urbanization: Population shifts from the countryside to the city are influenced by a wide range of factors, including economics, society, demography, the environment, politics, geography, and geographical expansion.

Peri-urban: Interface between rural and urban activities

Population: Number of people that live together in the same place.

Land use: An activity to which land is put such as grazing, crop farming, urban building, logging, mining and so forth. In this case, Kimilili town and its surroundings.

Land use planning: A system for coordinating the distribution of resources and the scheduling of human activities across both urban and rural areas.

Urban sprawl: It refers to urban extension to agricultural land, induced by high density and urban displacement in rural areas.

Zoning: This applies to the manner in which governments regulate the growth of urban areas and the types of land use and standards in designated area over a specified period.

Urban agglomeration: A group of urban centres.

Development control is the enforcement of legislation and standards for construction and land subdivision within defined areas/zones.

Urban development is improving of urban attributes such as infrastructure and environment in general.

Urban management means the collection of resources, processes, tasks and functions that enable the efficient running of the city or metropolitan environment.

Urban expansion is the rise in density and urban space in a city, arising from people moving to urban, suburban and rural areas and natural population growth. The shared ground between sustainable development and urban sprawl is urban growth.

Institutional structures are the systems that shape the decisions that policymakers and government bodies can make.

A town for the purpose of this review, "town" is characterized as a place with a minimum of ten thousand people, in accordance with the Urban and Cities Act, 2017. According to the 2019 Kenyan census, Kimilili town has a population of 17,939, making it fit this criterion.

CHAPTER ONE: INTRODUCTION

1.1 Background to the study

Urbanization is a significant global phenomenon influencing economic, social and physical change around the globe (United Nations, 2018). Currently the majority of people in the globe reside in towns, a trend that is reliably predicted to continue over the next few decades. A report by UNDESA (2018) on World Urbanization Prospects shows that population of the globe has risen from 3.3 billion in 1965 to 7.7 billion in 2019, 8.5 billion people are anticipated to exist by 2030, and 9.7 billion by 2050. Currently, 55% of the world's population lives in urban areas, a figure that is predicted to reach 60 percent by the year 2030. If existing urbanization trend persist, urban dwellers will hit 68 percent by 2050 (UN DESA, 2018).

Africa is predominantly rural; nonetheless, it is indisputably one of the most rapidly urbanizing regions in the Global South. During the 1950s, the proportion of the continent's population residing in urban areas was estimated to be merely 14%. Nevertheless, the urban population had a notable surge, reaching 43% in 2018, with projections indicating a further growth to 50% by 2030 and a substantial climb to 59% by 2050. According to Pott (2012), there is a projected increase in urban populations in many African countries, which is expected to surpass the rate of migration. An essential aspect of the urbanization process in Africa is that, unlike Asia and Europe, much of the urban development happens without a substantial industrial expansion (Muhammed et al., 2015). Eastern Africa urban population grew from 11.2 million to 77.2 million between 1970 and 2010, while the urban ratio increased between 10% and 24% throughout the same time frame (UN-Habitat, 2010). The majority of Africa, including Kenya, is characterized by increasing

urbanization and development, and Kenya is no exception. The country's urban population is predicted to grow rapidly in the years to come. Less than 10% of the lived in urban areas in 1963, which in 2018 increased to 27%. By 2030, the projected this figure to rise to 33.4%. and 58 per cent by 2050, considering the latest global trends in population (Araya and Cabral, 2010). Kimilili town is no exception. The town's population rose by 2.9% from 5483 people in 1989, 7734 people in 1999, 13,929 in 2009 and 17,939 in 2019 respectively and in that order (KNBS, 2019).

The phenomenon of urban development, as illustrated by the increase in population, has resulted in significant alterations in land use patterns surrounding metropolitan areas. These changes have had profound socio-economic consequences for those residing in peri-urban regions (Seto et al., 2011). To address the growing urban population, a consequence that cannot be avoided is the expansion of urban districts beyond their legally defined boundaries into surrounding hinterlands. As a result, the conversion of agricultural land for residential and commercial use has resulted in a decrease in agriculture as a means of sustenance for individuals living in peri-urban areas (Abbas and Afua, 2013; Amoateng et al., 2013). According to Angel et al. (2013), there is a notable disparity in the growth rates between metropolitan areas and urban populations, with metropolitan areas expanding at an average rate that is twice as fast as urban populations on a global scale.

Unplanned or insufficiently regulated urban expansion, coupled with unsustainable development and consumption practices, results in rapid proliferation, pollution, and degradation of the environment within certain urban areas. Hence, it is anticipated that there would be a significant surge in alterations to land utilization in the vicinity of global urban regions in the forthcoming years, owing to the mounting demands placed on land

resources by urban expansion (UNDESA, 2018). Given the current state of urban development, which has surpassed the capacity of many local governments, the planning and management of urban transformations emerges as a critical issue in the 21st century. This is particularly significant considering that the majority of global population growth in the next thirty years is projected to take place in medium- and small-sized cities in the developing regions (Zeng, 2016).

The expansion of towns has a significant impact on the peri-urban zone, which is characterized by its transitional nature. This area experiences the most pronounced effects of urban growth and development. The peri-urban area encompasses a wide range of land uses, resulting in a diverse composition of various groups, such as indigenous populations, farmers, migrants, recreational users, industrial users, natural resource users, developers, and investors (Thuo, 2010). According to Lasisi et al. (2017), the concept of an urban peri-region encompasses a geographical area characterized by the dynamic and complex interplay between urban and rural land use patterns. According to Amoateng et al. (2013), these regions frequently exhibit unregulated physical expansion trends, leading to the progressive conversion of valuable agricultural land on the periphery into residential and commercial properties.

Whilst research on land use change concentrated primarily on rural and natural areas, less focus was placed on urban land use yet current urbanization and emerging land disputes exist in peri urban areas of cities and towns of the world (Seto et al. 2012). The major concern of this research therefore was to find out how the expansion of Kimilili town has

impacted the peri urban land use in the surrounding area. The pertinent issues analyzed included the land use change trends from 1990 to 2020, the impact that urban expansion has had on the activities that take place on peri-urban land. Furthermore, the study suggested strategies to ensure sustainable urban development in Kimilili town. The choice of the period 1990 to 2020 was informed by the fact that Kimilili was gazzeted as an urban centre in 1990.

1.2 Statement of the problem

Urbanization is a significant factor influencing global economic, social, and spatial reorganization. The growth of urban populations leads to an increased need for consumer goods and services, and the close proximity to urban settlements generates a readily accessible market for agricultural products from peri-urban areas. Notwithstanding this benefit, the swift expansion and progress of Kimilili town beyond the officially recognized urban-rural boundary has resulted in the transformation of fertile land into residential and commercial areas. However, it is important to note that agriculture, which serves as a means of sustenance for peri-urban inhabitants, is experiencing a continuous decline. Given the observed reduction in agricultural productivity, it became imperative to identify the most effective policy and planning approach to mitigate the expansion of Kimilili town onto fertile territory and mitigate the risks associated with food insecurity. If prompt action is not taken, the agricultural sector, which serves as a means of sustenance for indigenous peri-urban inhabitants, will persistently decline.

1.3 Objectives of the study

The overall objective of this study was to establish the effect of expansion of Kimilili town on peri urban land use from 1990 to 2020.

The specific objectives were:

1. To establish the trend of urban expansion in Kimilili town from 1990 to 2020 using GIS

2. To establish the extent to which expansion of Kimilili town has influenced peri urban land use

3. To identify strategies for sustainable development of Kimilili town.

1.4. Research Questions

The study was guided by the following research questions;

1. How has Kimilili town expanded between 1990 and 2020?

2. To what extent has expansion of Kimilili town affected peri urban land use?

3. Which strategies should be adopted to ensure sustainable development of Kimilili town?

1.5. Research hypotheses

The following hypotheses were formulated to test the relationship between population increase and space expansion; and increase in distance from CBD and change in land use activities in the peri – urban area.

1. "H_0" There is no relationship between population growth and expansion of built-up areas in Kimilili town.

   "H_1" There is a relationship between population growth and expansion of built-up areas in Kimilili town.

2. "H_0" There is no relationship between distance from Kimilili town and peri urban land use activities.

"H_1" There is a relationship between distance from Kimilili town and peri urban land use activities.

1.6. Justification of the study

The study set out to determine the effect of growth and development of Kimilili town on peri urban land use. Previous study has examined and analyzed the phenomenon of urban expansion and land usage, with a particular emphasis on large metropolitan centers such as Nairobi, Kisumu, and Nakuru. Limited research has been undertaken to ascertain the effects of the growth and development of small and medium-sized urban centers, such as Kimilili town, on land use patterns in peri-urban areas. This study focused on Kimilili town, which is considered one of the small and medium-sized metropolitan centers in the country.

Kimilili town's unusual urbanization can be attributed to various factors, including rapid urbanization, high rates of natural population increase, international migration, and the categorization of urban areas (UN-Habitat, 2010; GOK, 2018). Nevertheless, it is worth noting that in numerous metropolitan regions, the rate at which urban sprawl occurs exceeds the rate of urban population expansion (Seto et al., 2010). Unregulated urban expansion poses a significant obstacle to the field of urban planning and management, as it exerts a considerable influence on the utilization of peri-urban areas. This influence is frequently manifested in the form of urban sprawl, which subsequently engenders conflicts pertaining to land use and land rights. Moreover, it gives rise to tenure insecurity and

disrupts the social and economic fabric of communities, particularly in regions where land is already fragmented, such as border areas.

The available literature on urban sprawl has focused more on major cities such as Nairobi, Kisumu and Nakuru. No study to determine the impact of urban growth and expansion on peri urban land use in small and medium towns such as Kimilili has been conducted so far This research will shed light on the causes of and solutions to urban sprawl in Kimilili, as well as other rapidly expanding cities in Kenya, and suggest ways to use land more efficiently. The national government, the county government of Bungoma, and other agencies would do well to have a deeper familiarity with sprawl and these tactics since it would help them come up with workable solutions to the problems caused by medium sized towns' rapid expansion.

The findings of this study may help to guide fundamental changes in urban planning and management that could slow down unchecked urban sprawl. Reforms and laws regarding land ownership and use, as well as housing and environmentally responsible land management, were among the issues covered. This research aimed to fill in the blanks between official plans and actual implementation of housing and urbanization initiatives in Kenya, as outlined in the National Land Policy (2009), the Urban Areas and Cities Act (2011), the National Spatial Plan (2015), the Urban Development Policy (2016), and the National Land Use Policy (2017).

1.7. Scope of the study

The scope of the research was limited to determining how Kimilili town expansion has changed peri-urban land usage. Particular attention was paid to residents of Kibingei and Kimilili wards in Kimilili municipal area for this study. Five sub locations, one in Kibingei ward and four in Kimilili ward within the township area constituted the study area.

The study covered a 30 –year period of Kimilili growth and development between 1990 and 2020. The rationale for choosing a 30-year study period was informed by the fact that Kimilili town was elevated into an urban centre in 1990. It was imperative therefore to establish how the town has expanded within this period and the impact it has had on peri urban land use pattern. It focused on determining the trend of urban expansion in Kimilili town, establishing the extent to which expansion of Kimilili town has influenced peri urban land use as well as identifying strategies for sustainable development of Kimilili town.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter discusses the literature on status of urban growth and development globally with specific reference to Kimilili town and its environs. It focuses on determining the scope of Kimilili town's growth and development from 1990 to 2020 using GIS, determining the extent to which expansion of the town has affected peri urban land use. In addition, the existing gaps in knowledge are highlighted. At the end of the chapter, the study has laid out the theoretical underpinnings of the research.

2.2 Global urban growth and development

Urban growth concerns the increase in population and urban space in a city, arising from people moving to urban areas, and natural population growth. In response to interrelated patterns of, etc., there has been a steady increase in the percentage of the population living in urban regions has been increasing steadily in response to interrelated economic, social, demographic, environmental, political and geographical patterns (UNDESA, 2018). In a study on Cities and Economic development in Europe and North America, Bairoch (1988) revealed that urban growth was influenced by industrialization and strong economic growth. Cities offered a wide range of educational and employment opportunities in industries and urban services. This attracted large populations from rural areas (Grubler and Fisk, 2013). People are attracted to urban centres by employment opportunities, better social services such as education, health and entertainment and push factors like unattractive cultural and traditions in the rural areas etc.

However, Farrel (2017) in his examination of urban transition in developing countries challenged this long-standing notion of associating urban growth with economic

development. While citing new trends in in sub-Saharan Africa, in his article "The Rapid Urban Growth Triad" the author argued that Sub-Saharan Africa saw continued urbanization between 1970 and 2000 despite a general regional economic downturn at that time (Satterthwaite, 2010). This lends credence to the notion that urbanization is better understood as a demographic rather than an economic process (Dyson, 2011). The studies by (Grubler and Fisk, 2013) corroborate the findings by Hope (2012). In his research, the author states that rapid urban growth in Kenya may be directly attributed to the country's rapid economic growth.

Whilst urban development in all countries is a common event, determinants, trends and results are not inherently consistent. With urban growth in developed countries fundamentally achieved by the turn of the 21st century, urbanization is currently entirely restricted to developing nations (Farrel, 2017). Urban growth results to rapid land use changes in the peri urban areas leading to transformation of agricultural land into residential and commercial use (Mubea,2014). A new approach to urban planning that takes into account the interconnected nature of towns is necessary for effectively tracking and reducing negative impacts from urbanization (Mundia,2010).

Mapping urban expansion and development with land use shifts on the city's periphery is a task made easier with the help of satellite imagery and GIS technology (Ibid). Remote sensing allows for the collection of huge, spatially consistent datasets. The study of peri urban land use changes is necessary in addressing issues regarding land management in urban areas and in developing more sustainable strategies for urban development (Mubea,2014).

2.2.1 Global urban population trends, distribution and patterns

The population of the world has grown to 7.7 billion by 2019, from 3.3 billion by 1965 to 8.5 billion inhabitants by 2030 and 9.7 billion by 2050 (UNPFA, 2019). Global trends of increased human population indirectly point to an urbanizing world trend. Metropolitan areas have more inhabitants than those found in rural settings globally, 55% of the world's population now resides in urban regions as at 2018. As at 1950, only 30% of the world's population lived in urban areas and is estimated to reach 60% by 2030 and rise to 68% by 2050 (UN-Habitat, 2012). Figure 2.1 summarizes the trends in urban and rural populations around the world from 1950 to 2050.
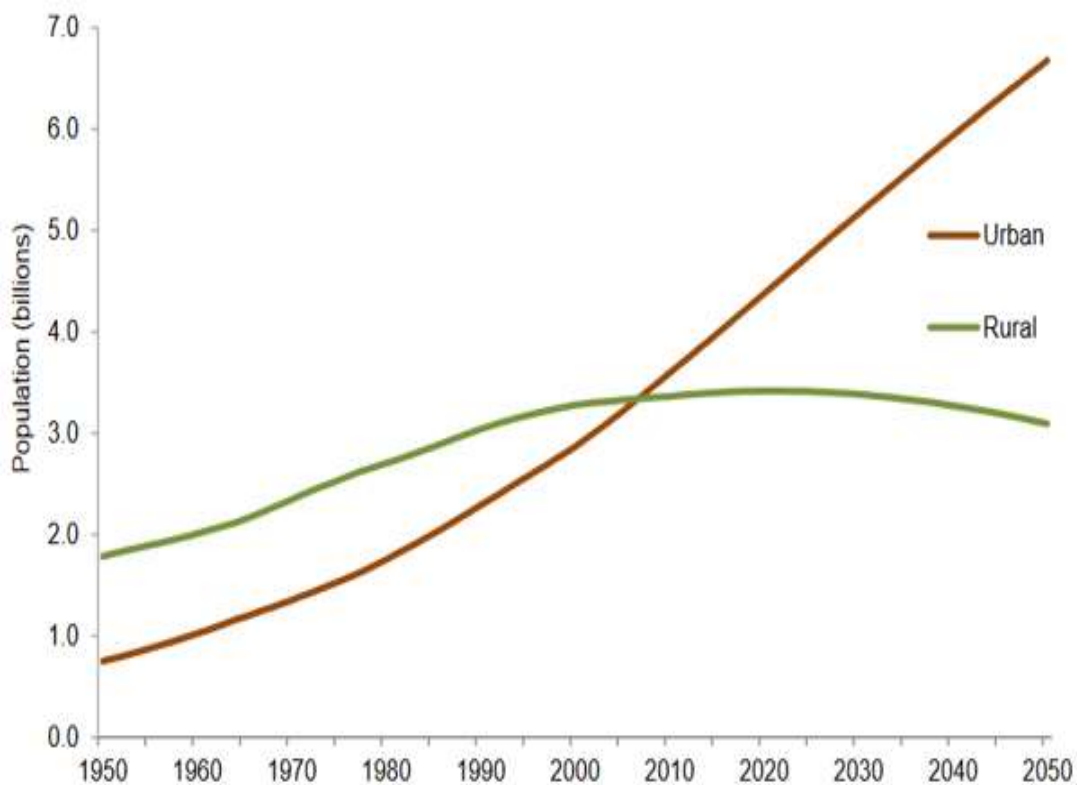
Figure 2.1: Trends in urban and rural population across the globe, from 1950 to 2050 (2018). World Urbanization Prospects: The 2018 Revision

The global urbanization rate masks major urbanization variations between geographical areas. At present, North America, Latin America and the Caribbean regions are home to over 80% of the population, compared to 74% in Europe and 68% in Oceania, 50% in Asia and 43% in Africa. Africa's share of population is projected to grow to 50% in 2030 and 59% by 2050 (UN, 2018). The overall projection will be much higher than this given that, some African nations, like Gabon, have already reached this point. In fact, 87% of Gabon's population now lives in metropolitan areas.

Trends in urban population growth in developed and developing nations tends to vary. In the US, the birth rate has decreased in favor of migration as the main driver of urban population growth. Since World War 2 immigration in the United States has been on the rise and accounts for a large portion of the total metropolitan development caused by population growth. However, natural population growth as a driver of urban growth is considered more dominant as compared with migration in developing countries, particularly in Sub-Saharan Africa (Pott, 2012; Fox, 2014; Jedwab et al., 2015). In certain countries in Sub Saharan Africa, reclassification of urban centres can also play a major part in urban growth and development (Awumbila, 2014).

2.2.2 Population trends in Africa

The sub-regions of Africa urbanize at varying levels. While East Africa is the least urbanized area in Sub-Saharan Africa, its urbanization currently is most rapid as compared to South Africa. Eastern African urban the populace surged from 11.2 million to 77.2 million between 1970 and 2010, with the urban ratio expanding from 10 to 24 percent over that time (Hope, 2012). Medium-sized metropolitan areas with populations below one million are now the fastest expanding cities in the world – a trend which is close to the

urbanization of Africa. According to (UNFPA, 2019), substantial growth is expected in small and medium-sized cities in Africa by 2030. Potts (2012) for instance noted that urbanization in Malawi is rising more rapidly than national population growth in the capital city of Lilongwe and 24 others, while 16 urban centers are expanding faster in Mozambique than Maputo and some of the other municipalities.

Kenya, like most of Africa, is marked by rapid development and urban expansion. Kenya's population in 1969 reached 10.9 million inhabitants, up to 38.6 million in 2009 and 47.6 million in 2019, an annual increase of 2.3 per cent per year. It is estimated that Kenya's population will exceed 60 million people by 2030 and 77 million by 2050 (Hope, 2012). In 2018, an estimated 27 percent of the total population in Kenya was urban. This is projected to hit 33% by 2030 and 50% by 2050 (Figure2.2).
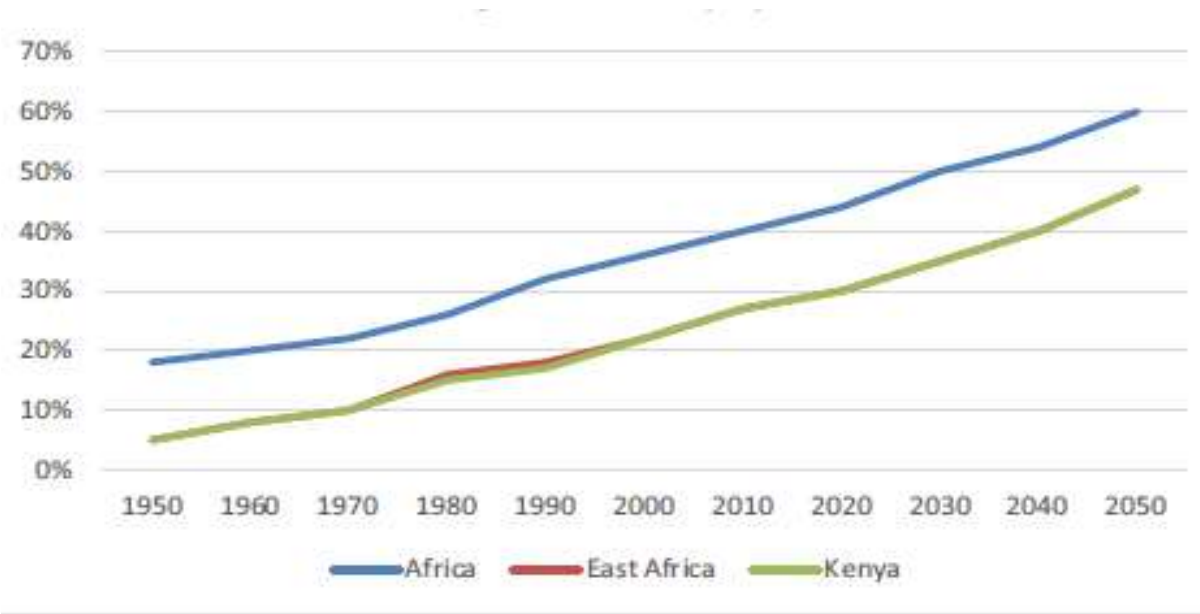
Figure 2.2: Urban and rural population Trend of Africa, 1950-2050.
(2018).

Rapid urbanization in Kenya is a direct result of the shifting urban-rural balance in the country. This shift is associated with growing economies and shifting patterns of labour demand and supply, since cities have become the primary settings for both (Hope, 2012).

Kimilili is currently experiencing rapid urbanization as one of Kenya's small and medium-sized urban centres. According to the 1989 population census, Kimilili town recorded a population of 5483 people. The town's population reached 7734 people in 1999, 13,929 people in 2009 and 16,833 inhabitants in 2019 with a projected growth to 22,578 inhabitants by 2030 (Researcher 2020). Thus, cities and towns in Kenya stay at the heart of both public and private enterprise and are, therefore, a good settlement for the public (*op.cit).*

2.3 The impact of expansion of Kimilili town on peri urban land use activities

One of the main effects of geographic growth of urban areas globally is the transformation of primary agricultural land in the urban fringes to residential use (Cobbinah and Amoako, 2012; Mandere et al., 2010; Thuo, 2010). Increased encroachment of population into peri urban areas has resulted to a decline in both farmable land and soil quality due to the widespread use of once-productive farmland for other purposes (Mandere et al., 2010; Thuo.,2010; Abbas and Afua,2013).

2.3.1 Effect of population growth on peri urban land use

Previous studies (Kiio and Achola,2017; Hegazy and Galoop,2015; Qom et al.,2017) suggested that the growth of built-up regions, which may be linked to an increase in population, is the primary driver of a shift in the types of land uses that occur in the outskirts of towns. The growth of cities is driven by high birth rate internal migration from

the countryside and external migration from outside the country. This puts pressure on the available urban land to accommodate the urban population's growth. Oyugi (2017) argues that rapid population growth causes the rising need for homes, businesses, and factories, and institutional facilities. It also catalyzes land subdivision for purposes of inheritance. This in turn causes rapid land use changes, including urban sprawl and the proliferation of informal settlements. These change in peri urban land use results in shrinking of peri urban land mass to units that are unviable for agricultural production. This has driven peri urban residents out of cultivation (Abbas and Afua., 2013; Mandere et al.,2010). For instance, in a study conducted by Abbas and Afua (2013) the authors observed that the number of farming households in Peri urban Kumasi, Ghana, went down from more than 89% in 1986 to 40% in 2013. On the other hand, a study of peri-urban Nyahururu by Mandere et al. (2010) revealed that the percentage of households dependent on farming for their primary income had dropped from 90% in 1960 to 49% in 2010.

The studies above have shown that while agriculture remains a major economic field in peri urban areas, its economic worth diminishes dramatically on account of the decline in the percentage of households that make farming their primary source of income. This could be attributed to overlapping land uses: residential, commercial, recreational, manufacturing, public use, transport, etc (Abbas & Afua,2013).

Several theories have been put forward to explain the relationship between distance from the town centre and peri urban land use activities. Based on Alonso's (1964) bid rent theory, businesses have an incentive to locate in close proximity to the city's core because of the central area's superior accessibility, agglomeration of economies, and opportunity for better profit margins. As a result, land uses near the city centre pay a higher rent, which

decreases with distance from the city centre. Therefore, only land users that can afford higher rents, such high-end retail or service providers, will be ready to pay the highest prices for real estate in the Central Business District (CBD).

Ernest Burgess (1925) proposed the concentric ring model, which portrays land use patterns in concentric rings radiating outwards from the CBD, with each zone including distinctly different land uses. From the CBD, rents gradually decrease depending on the accessibility of nearby public transit. The two claims agree that ease of access is the most important factor in determining optimal use of urban space. The proximity of land to CBD boosts both its productivity and value. However, neither of these ideas considers how cultural norms affect the differentiation of urban land uses. In view of the issues raised above, the relationship between distance from the town centre and peri urban land use activities should be characterized by rent differentials, government policy and residents' cultural norms.

Mutua (2015) examined how peri-urbanization has affected the incomes of native families in peri urban Machakos using a sample of 50 respondents. Mutua attributed the motivation by peri urban residents to change the use of their land especially away from agriculture to proximity to an urban settlement. Thuo (2010) conducted a similar study in the Nairobi urban fringe and concluded that rapid land conversions are attributed to low returns from farming and high demand for housing facilities. Studies by Afriyie et.al (2013) in peri urban Kumasi and Omondi et.al (2017) in peri urban Kisumu arrived at similar conclusions. The aforementioned studies support the theories by Hoyt (1939) and Alonso (1964) who postulates land uses as a function of distance and rent differential from the

CBD. They however fail to consider the influence of residents' culture urban land use pattern.

From the studies, it can be concluded that land close to an urban settlement is generally considered more rewarding for nonagricultural use. But according to Pribadi and Panleit (2015), agricultural land use can still persist in the wake of urban expansion around fast-growing urban centres. Although land prices may be very high around the town center, increased demand for high-priced, perishable foods grown close to major towns offers vital commercialization opportunities for agricultural products hence high profitability (Moustier and Ranting,2015; Thuo,2010). According to Thuo (2010) it is possible to specialise in higher-value horticultural crops and increase the intensity of peri-urban agriculture if farmers are located closer to and have easier access to the growing needs of urban consumers. In this case, Whether or not agriculture is replaced depends at least in part on how farming is done and how markets work in each area.

2. 4 Strategies for sustainable urban development

The process of urbanization has led to a shift in livelihoods from a rural agrarian economy to an urban economy in peri-urban areas. The phenomenon of urban growth presents both favorable prospects and limitations that have significant consequences for inhabitants residing in peri-urban areas.

In light of these circumstances, several inhabitants of peri-urban areas have developed tactics to adapt to the alterations in peri-urban land utilization (Mandere et al., 2010; Thuo, 2010; Abbas and Affua, 2013; Lupala, 2015 and Sithole et al., 2015). The aforementioned tactics effectively motivate households residing in peri-urban areas to pursue a range of

options in order to ensure their existence. The range of opportunities within a community is contingent upon the availability of livelihood sources and the degree of access to these resources. According to Abbas and Afua (2013), households employ several techniques, such as farm strategies, non-farm strategies, or a combination of both, in order to adapt to peri-urban land use changes. Sithole et al. (2015) propose that households might employ various tactics, such as diversification, intensification, and relocation, in order to bolster their resilience by either increasing income or decreasing expenditure.

Agglomeration economies offer significant prospects for individuals residing in peri-urban areas. According to Oduro (2014), the expansion of urban areas has resulted in a widespread rise in the need for products and services. In the peri-urban area of Accra, Oduro et al. (2014) conducted a study and discovered that various types of businesses, such as retail establishments and personal services like hairdressing and dressmaking, as well as industrial activities including food processing, saw milling, metal fabrication, and cement block manufacturing, are flourishing due to the city's expansion. The researchers discovered that women tend to engage in small trading and personal services, like as hairdressing, as significant means of sustaining their livelihoods. This is especially notable given women typically do not partake in the more profitable land leasing enterprise, even if they come from families who own land.

In a study conducted in peri-urban Kumasi, Abbas and Afua (2013) discovered that households transitioned from land-based livelihood activities to non-land-based income-generating activities. The research conducted by Lupala (2015) in peri-urban regions of Dar es Salaam and Thuo (2010) in peripheral parts of Nairobi city exhibits a comparable trend to the one identified in peri-urban areas of Kumasi. The provision of alternative

means of livelihood for displaced farmers is crucial in mitigating the hazards associated with land transformation in peri-urban regions. Atamanov and Berg (2011) conducted a study on the microeconomic analysis of rural non-farm activities in the Kyrgyz Republic, located in central Asia. Their findings indicated that households were compelled to transition from agriculture to non-farm activities due, in part, to the presence of limited land sizes and low land quality. The communities are drawn to engage in non-farm work options due to their exposure to the urban monetary economy, which is a significant factor resulting from the growth of urban settlements (Abbas and Afua, 2013).

The literature study indicates that not all households transition to non-farm employment in response to the challenge of diminishing agricultural land. According to a study conducted by Oduro et al. (2014), farmers who continued to have access to arable land implemented agricultural intensification as a means of adapting to changes in peri-urban land use. According to Ng'ayu (2015), individuals residing in peri-urban areas were found to be involved in the cultivation of fast-maturing horticulture crops, specifically vegetables and fruits, with the intention of selling them in the market. Additionally, the individuals were involved in the practices of poultry farming, dairy farming, and pig farming (Thuo, 2013). The intensification of agricultural practices serves to enhance food accessibility for peri-urban dwellers while also generating supplementary revenue for households. Nevertheless, this practice might result in the depletion of soil nutrients, hence necessitating the use of substantial quantities of fertilizers. The aforementioned factor subsequently leads to an increase in production expenses, rendering agriculture economically unsustainable over an extended period of time (Mandere et al., 2010; Oduro et al., 2015).

Livelihood diversification is an adaptive approach employed by peri-urban inhabitants, involving the pursuit of numerous vocations, wherein small-scale farming frequently constitutes one of the pursued activities. Lupala (2015) conducted a study in peri-urban Dar es Salaam, which revealed a notable shift among households from cultivating traditional crops such groundnuts, maize, and passion fruits to cultivating cucumbers, watermelons, green peppers, okra, and cassava. This transition is attributed to the higher market value associated with the latter commodities. Mandere et al. (2010) have made a similar observation in their study conducted in peri-urban regions of Nyahururu, Kenya. The findings of their study indicate that conventionally grown crops, including wheat, sweet potatoes, cassava, and arrow roots, had become extinct, whereas crops such as Irish potatoes, beans, peas, tomatoes, and carrots had been embraced as substitutes.

The researchers have observed that the novel crops have garnered significant market attention, in contrast to the declining popularity of traditional crops. The surge in demand for the new crops can be linked to the influx of migrants into the area, whose dietary preferences differed from those of the indigenous people of the peri-urban zone. A study conducted by Oduro et al. (2014) investigated a similar topic in the peri-urban area of Accra, Ghana. In contrast to the findings of Lupala (2015) and Mandere et al. (2010), the present study reveals a shift in families' focus towards livestock production and poultry farming. The authors' investigation suggests that these alternative agricultural practices use less land compared to traditional crop farming.

Urbanization is a distinguishing characteristic that is coming to the fore in the study of the evolution of human settlements. Management of urban expansion is essential because it affects the distribution of public goods and the layout of cities (Mativo, 2015). This expansion calls for careful planning and management to guarantee complementary growth and optimal performance. When cities have better urban planning, they are better able to accommodate population expansion (Asamoah, 2010). Land use planning aims to improve efficiency through the standardization and management of physical developments, including residential, industrial, educational, public utility, transport, commercial, recreational, and institutional areas (Mativo, 2015).

Kenya's urban growth is continuing in a disordered fashion, despite the existence of a blueprint outlining the ideal National City plan and format (Ng'etich et al., 2014). Kenya's urban core is characterized by organic expansion and haphazard building because it has rarely been the subject of purposeful urban planning activity. Land development in urban and peri-urban areas is hampered by inadequate planning, rapid population and economic growth. This results to urban sprawl and shortage of infrastructure in urban areas (Republic of Kenya, 2009).

Kenya's urbanization process has been free of significant political intervention from the start. The success of land use planning and implementation is likewise given just a minimal amount of attention. This is primarily due to the fact that the authorities responsible for physically preparing physical plans at both the national and county levels are geographically dispersed, institutionally weak, and understaffed (Kiita, 2013). Therefore, rapid population expansion proceeds without the requisite community planning and management capability to ensure healthy urban livelihoods (Opata et al., 2013).

In the peri-urban areas of Kimilili, increased subdivision of land culminated in an uneconomic land sale. The succession rights, high land speculation and increased population are the causes of land subdivision. The introduction of the development control regulations on freehold property, therefore, presents challenges to most land in the region (ROK, 2018). The result is mixed spatial growth, rival land uses and construction trends (Opata et al., 2013).

Kenya's Constitution highlights the need for urban planning regulation to be re-engineered and re-aligned for improved urban design and development. The government of Kenya has developed a National Spatial strategy in line with this constitutional aspiration, which is the first spatial vision in Kenya that describes the general pattern and the course of the country's spatial growth. The National Spatial Plan tackles the divisions between spatial and economic planning which have led to uncoordinated and unequivocal growth through the introduction of a broad physical plan policy that promotes economic and sectoral planning. The National Spatial Plan also presents a strategic framework describing the manner in which national space is used in order to ensure sustainable urban growth.

To effect a change in progression, to fewer areas of farm potential, the proposal calls for a mixed-use community that is both compact and diverse, re-construction and Restoration and expansion of existing towns, as well as management of their future growth and development. Consequently, in order to resolve shifts in lifestyles, economic activities arising from population growth and sustainability, the government devised a National Land Policy 2009 to promote the coordinated development of urban and peri-urban areas with regard to the development of housing, commercial, industrial and infrastructure.

In Kenya, advancements have been made on a number of different policy fronts, including the establishment of policy frameworks such as Vision 2030, the Kenya Urban Development Policy 2016, and the National Spatial Plan 2015. To guide its physical and strategic planning, land usage planning, and built environment. Bungoma County Government developed the 2018 County Spatial Development Plan.

2.4.1 Institutional structure guiding urbanization

Based on the discussion, it is clear that many different types of organizations need to work together on urban planning and management, and these organizations' connections to one another form the institutional framework for urban management. Wapwera (2015) specifies that the organizations apply to a set of principles, ideals and beliefs structured to ensure that goals are met whilst the mechanism promotes the ties between two and more subsystems to ensure the easy transfer of knowledge or data from one subsystem to another (*Ibid)*. The institutions according to North, D (1991) and Ocran (2015) decide the path in which a nation grows.

The structure is crucial in maintaining an urban climate that is more functional and sustainable (Keen, 2018). The author established four key components of the urban management structure: governance, organization, legal and administrative, in a study carried out to institutional challenges for sustainable management of urban areas in Kenya in Kajiado County, Kenya. Governing institutions can be described as the agencies involved in the management at all levels of the country's political, economic and administrative authorities (UNDP, 2011). Governance agencies are typically the conduit by which information flows from top down to bottom or vice versa in the jurisdiction of the administration and in this case, the national government and the county government.

Rydin (2011), citing a 2011 study from the Commission on Global Governance, assert that successful urban governance to be the cornerstone to sustaining the broad-based urban society's general agreement; the voice of the town's impoverished and marginalized as a framework for political, social, and economic goals. This example gives the peri-urban populations a preference regarding participation in urban planning policy making in the peri-urban areas, and in the decision-making phase on the distribution of emerging capital, as is the case in the current research. The UN Habitat (2014) report on urban planning for city leaders observes that successful urban governance can be accomplished if and when urban people are encouraged to take control of their own growth. Kitur, (2019) underlined the logic and fair cooperation between institutional structures and those of civil society as well as efficient and effective urban governance (e.g., NGOs, CBOs, Women and Youth Groups).

However, a strong governance system should be a structure that is capable of regulating urban growth and management of every planning authority (*ibid).*

Wapwera et al. (2015) observes that urban planning agencies and organizations established by statute and working on behalf of the Government are engaged in delivering urban planning and urban growth management services aimed at controlling and implementing urban development. In this study, the Municipal Board of Kimilili and the legal service providers are included in the organizational framework to oversee and administer the development of the town. In order to address the fundamental components which, meet immense urban needs and the urban climate, such a structure must also be successful (Kinzer, 2016; Keen, 2018).

With respect to the legislative system, the legal regime places an important function in overseeing the delivery of public services to the general populace and regulating involvement in urban policy processes by the relevant stakeholders (Wapwera et al., 2015). The regulations can be viewed as deliberate interference in the work of the target community, with a binding setting of criteria, supervision and sanctioning, according to Koop and Lodge (2015). Kinzer, (2015), regulations as noted, applies to tools for urban management policy declarations, at least within the framework of urban planning and management. These laws have to be responsive, if the intended effects of the urban management process are to be reached (Levi-Faur, 2011; Rydin, 2011). Regulations as used as an approach can be an effective way to define and recommend, via urban planning and management regulations, how regulatory implementation mechanisms better facilitate compliance (Keen, 2018). Levi-Faur (2011) also pointed out in the 2011 Handbook on Politics of Regulations that a regulative strategy intended to trigger managed urban growth and management cannot take a strictly disincentive approach or be viewed as being solely cooperative for the purpose of guaranteeing productivity, efficacy and credibility. The institutional system and its definition, as well as the debate that follows, provide a significant point of view from which current institutional frameworks for urban management can be evaluated and the degree to which they are implemented in the sense of Kimilili Town.

2.4.2 Policy framework

2.4.2.1 Vision 2030

Kenya's Vision 2030 aims to make Kenya an affluent and competitive nation by 2030, where people can enjoy a high standard of living. The goal emphasizes preparing for good

and high-quality urban livelihoods for Kenya's urban people. It acknowledges that Kenya's urban areas are inadequately managed and seeks to improve this situation by strengthening regional and urban development plans, starting with providing better homes for people living in slums.

2.4.2.2 National Land Policy of 2009

The National Land Policy is anchored by the provisions of the 2010 Kenya Constitution, in particular the Land and Environment chapter 5. The Policy leads the country towards land use that is fair and egalitarian. Land policy calls for urgent action to resolve environmental issues such as deforestation, soil depletion and contamination that impact on land. The National Land Policy lays down the principles of the conservation and management of natural resources dependent on land and the preservation and management of vulnerable and vital habitats, including wetlands and arid lands. In an effort to resolve persistent land tenure instability and injustice, the Policy also calls for comprehensive revision of existing policies and structures. National Land Policy categorizes all land in Kenya as either public, private (freehold or leasehold tenure), or community/trust land owned, administered, and utilised by a specific group. The goals of this land policy are to deal with issues including land distribution and management, land ownership, land use planning, environmental destruction, armed conflict, and the spread of squatter camps.

2.4.2.3 The National Spatial Plan

The National Spatial Plan (2015) aims to improve the utilisation of land and natural resources for sustainable growth and to establish human settlements in urban and rural areas that are livable and economically viable. According to the National Spatial Plan, urban centres should be constructed according to their capacity and population. Through

the development of integrated transportation and communication networks, it also seeks to improve rural-urban connections.

2.4.2.4 The National Urban Development Policy of 2016

Inadequate availability of high-quality land for different uses has undermined Kenya's economic growth and land administration has been embroiled with corruption, controversy and arguments. The strategy proposes a number of reforms to property developers, land distribution and use, real estate taxes, and land enterprise resource planning in an effort to improve access to land for economic growth.

In light of the problems and constraints identified in the urban planning and management literature and in accordance with the 2016 National Urban Development Policy, Vision 2030, and National Land Policy (2009), this analysis aims to fill these gaps by analyzing urban planning policies and management responses to land use shifts in the urban region of Kimilili peri urban and utilizing these data to resolve these gaps.

2.4.3 Legal framework

2.4.3.1 The Constitution of Kenya

This is the fundamental law of the Republic from which the powers and legality of all legislation and statutes originate (Republic of Kenya,2010). A two-tier government is provided for under the current constitution: The State Government and the County Government. Laws have been passed under the current constitution to direct urban governance as well as modalities for collaboration and coordination between the two tiers of government.

The administration and maintenance of metropolitan regions and towns is provided for by Article 184 of the Constitution. It provides, in particular, for the establishment of

requirements for the designation of areas as metropolitan areas and towns, for the establishment of principles of governance and management of urban areas and cities, and for the involvement of people in urban and urban governance.

2.4.3.2 The Urban Areas and Cities Act, 2011

On August 27th, 2011, the Act was enacted in order to allow for the classification, administration and control of metropolitan areas and towns. With respect to the administration of towns and municipalities, the Act points out that the governance of towns and municipalities shall be delegated to the county governments and governed by the urban management boards. Urban management boards are established by the Act to govern public and private sectors' land use, subdivision, construction, and zoning decisions in areas such as industrial, commercial, market, retail, and employment centres, as well as residential, recreational, park, entertainment, transportation, agricultural, and freight and transit hubs. The Act mandates that an integrated growth strategy for a town or urban area be coordinated with the local governments' planning policies and strategies.

2.4.3.3 The County Government Act, 2012

County planning authorities can be any combination of county offices, municipalities, sub-counties, or wards. Under the Urban Areas and Cities Act of 2011, the county is responsible for drafting the County Comprehensive Development Plan, the County Spatial Plan, and the Integrated Urban Areas Development Plan to guide, harmonize and stimulate growth in the county.

2.4.3.4 Physical and Land Use Planning Act No. 13 of 2019

This statute was enacted by the national government to regulate the allocation of land and other real estate assets and to provide uniform standards for these activities. The Act

ensures orderly physical and land use growth in metropolitan areas by mandating strict compliance with previously approved plans for such development. All land designated for open areas, parks, urban forests, and green belts is set aside and properly maintained in accordance with the authorized physical and land use development plans, and public input is encouraged throughout the decision-making process.

2.4.4.5 Constraints affecting urban planning and management framework

When available resources are insufficient to fulfill demand, they pose a barrier to effective urban administration and coordination across the various parts of the institutional framework (Wapwera, 2015). The structures for urban environment conservation in most developing countries are very limited hence urban ecosystems are not handled effectively and sustainably. Therefore, the lack of efficiency in services and haphazard growth can explain the overall social and ecological problems that have occurred in most urban areas in the developing world.

Keen (2018) blamed governments in developing nations for poor fiscal, social, cultural, physical, and urban management circumstances in a working paper on urban management in less developed countries. According to him, the central governments of developing countries have delegated the responsibility for enforcing and coordinating urban management systems in to devolved units. Theses devolved authorities have exhibited inadequate governing procedures, limited institutional competency, inconsistent legal processes, and imprecise organizational frameworks.

Keen (2018), argues that local governments in developing countries consistently faced the problems of structural disabilities; inadequate and underdeveloped organizational institutions; lack of specifically defined urban management agency functions and

responsibilities; lack of or insufficient necessary expertise, skills, and experience among the key players responsible for the execution of delegated urban processes. While they are responsible for upkeep of metropolitan areas under their jurisdiction, urban management authorities often aren't formally constituted as legal bodies, making it difficult for them to borrow money from the private sector or form legal alliances with private sector or community organizations.

2.5 Theoretical framework

The present study will be guided by the following theories

2.5.1 Concentric ring theory

This theory built on the basis of the City of Chicago by Ernest Burgess in the 1925 was an improvement over Von Thunen's Location Theory. The concentric model consists of five concentric zones, which include the central business district (CBD), the transition zone, low-class housing, middle-class housing, and high-class housing (Waugh, 2002). The central business district (CBD) is characterized by the prevalence of high-rent establishments such as retail malls, theatres, hotels, offices, and banks, among other commercial entities. Within the transitional zone, a diverse range of land uses can be observed, encompassing both towering residential complexes and commercial establishments such as shopping malls. Factory workers typically reside in neighborhoods characterized by low-income levels, whereas professionals and middle-class families tend to inhabit areas with moderate income levels. The fifth ring refers to a high-end residential district characterized by affluent residents who possess the financial means to own private vehicles.

According to Burgess (1925), it may be observed that rapid urban growth leads to a phenomenon where the inner zones gradually dominate the outside ones, similar to the process of natural succession. In contrast to this, urban degradation is characterized by the lack of movement in the outer zones, while the inner urban borders of the transitional zone gradually retreat towards the central business district (CBD). Nevertheless, it is important to note that the applicability of the model to cities beyond the United States is limited, particularly in cases where these cities were developed within distinct historical frameworks. Nonetheless, it can be acknowledged that the model does provide a reasonably accurate representation of urban land use patterns in such situations. The idea elucidates the peculiar geographical pattern observed in the United States, whereby the urban core has high levels of poverty and deprivation, while the surrounding suburban areas exhibit affluence and prosperity. Contrary to prevailing circumstances, this phenomenon is not observed in other regions, particularly in developing nations of the Global South, such as Kenya. The theoretical framework posits a homogeneous and static geographical setting, disregarding the influence of topographical characteristics that can impede the expansion of urban areas in specific orientations. Furthermore, the analysis fails to acknowledge the occurrence of gentrification, a phenomenon characterized by the transformation of low-income communities into affluent residential areas. The concept fails to take into account the ramifications of globalization or the political dynamics inherent to individual cities. Below is a diagram (fig.2.3) that serves as a visual summary of the preceding content.

1. CBD
2. Transition zone
3. Low-class housing
4. Medium-class housing
5. High-class housing
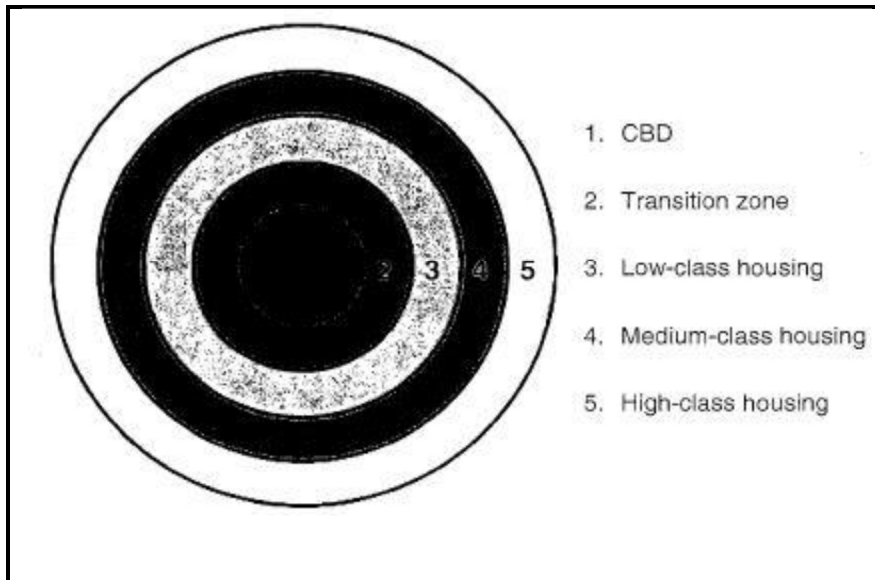
Figure 2. 3: Concentric Zone Model

Source: Waugh,2002

2.5.2 Bid-rent theory

In 1817, David Ricardo, a classical English economist, first formulated this idea in an agricultural context. The bid rent hypothesis claims land users compete for sites closer to the city centre because of the central business district's superior accessibility, agglomeration economies, and profit potential. As a result, rents in the CBD are higher than in the suburbs. In this sense, only land uses, which require small spaces such as retail, banking, offices and so forth can be located in these areas.

Sullivan, (2012) argues that the difference in rents is a key component in explaining the diversity of land uses in urban areas. Alonso (1964) in his theory "Location and land use" provides an explanation for this difference. The model assumes a linear relationship between distance from the CBD and commuting costs. The approach also presupposes that individuals and businesses alike have complete awareness of the variations in land value

across the city's various zones. According to the model, the users with the second steepest bid rent curves are given the most conveniently located spaces in urban settlements. These users include high-order commercial activities, which the model predicts that they will locate on the next ring outward from the city centre. Due to the gentle nature of residential development, such land uses are pushed to the city's edges. While infrastructure and commercial forces are important, Firey's (1974) research on Boston found out that socially entrenched beliefs and ethnicity are the primary causes of urban land use patterns. Alonso (1964) ignores the significance of cultural values in determining urban land use. The schematic diagram in figure 2.4 below explains the information above.
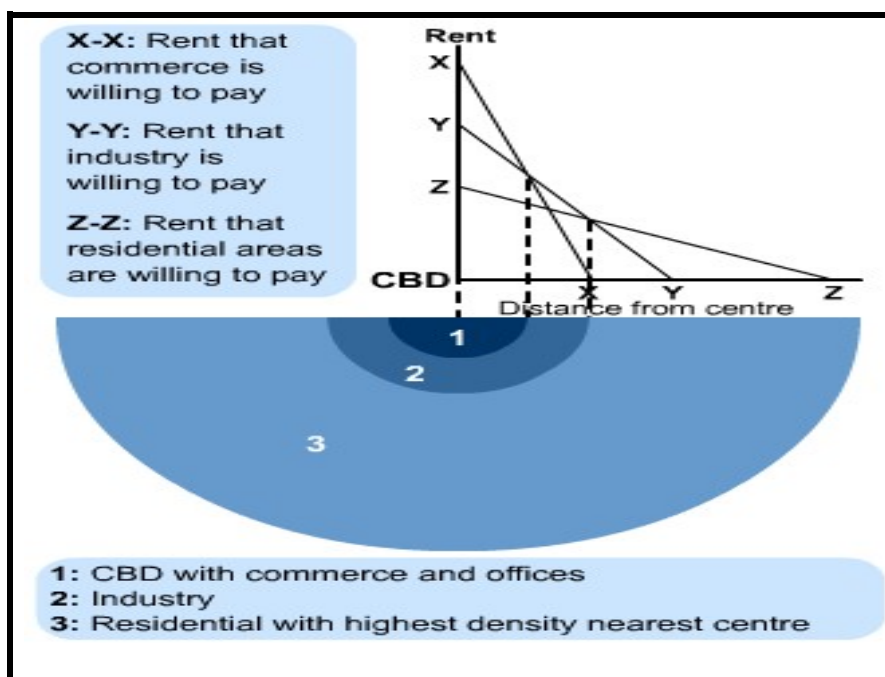
Figure 2. 4: Bid rent curve

Source: https://www.s-cool.co.uk/a-level/geography/urban-profiles/revise-it/central-place-and-bid-rent-theories

2.5.3 The sector Model

Land economist Homer Hoyt first developed the sector model in 1939. Within a single CBD, this theory envisions a circular pattern of neighbourhoods with varying land uses.

The CBD is the easiest place in a town to get to. Following the pattern set by transportation arteries, land value and price gradually decrease outside of the CBD. In this example, high-income residential districts near the roads attract high-order business operations, which cluster in the surrounding neighborhoods.

Hoyt's (1939) sector model and Burges' concentric model emphasizes the direction away from the CBD. However, in the sector model, developments lie side by side to each other depending on the topography or communication routes growing outward from the CBD while in concentric model developments occur in a circular pattern growing outward from the CBD. Limits in geography and topography may necessitate a departure from concentric ring model. In spite of its seeming lack of complexity and its overemphasis on residential growth, this model offers a more compelling explanation for urban land use differences than the concentric one. Unfortunately, the model does not account for the emerging idea of edge cities. Edge cities are urban complexes comprised of a huge concentration of office buildings with a greater number of workers than residents. The text above is summarized in a schematic diagram (fig 2.5) below.
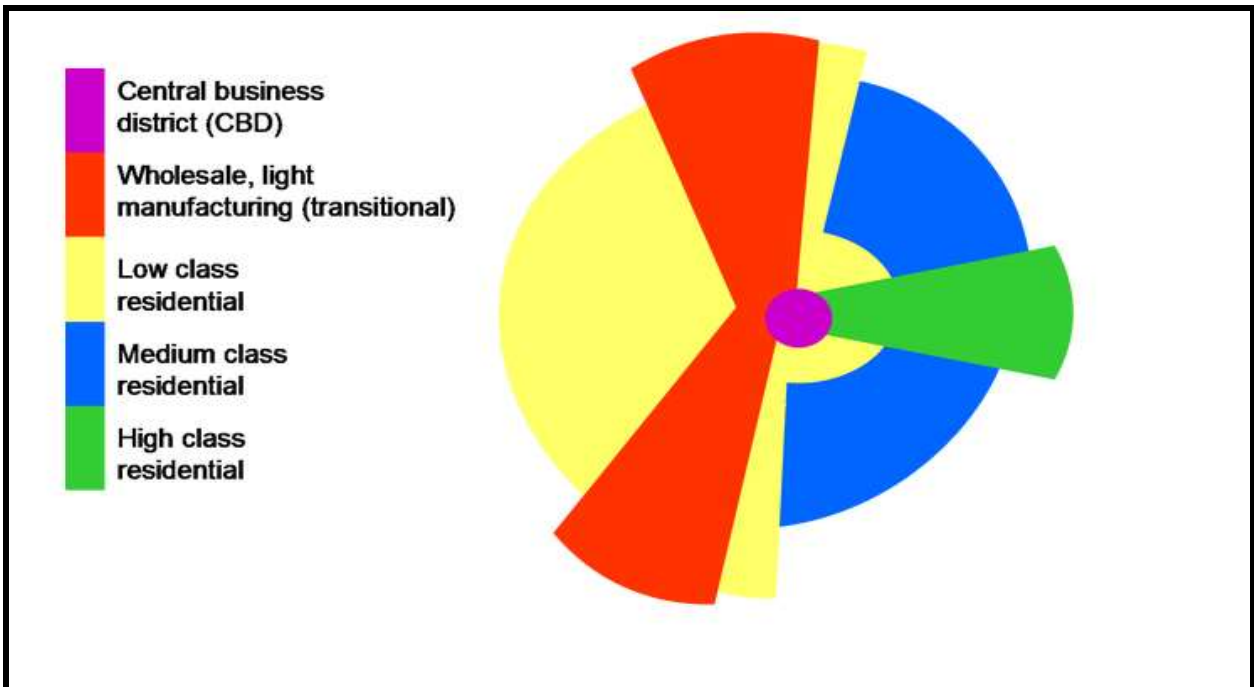
Figure 2. 5: The Sector model

Adapted from: https://geographycasestudysite.wordpress.com/urban-land-use-patterns-and models/(2018).

As noted by aforementioned scholars, urban land use patterns are a function of land value speculation and environmental considerations. This informed Howard (1898) to theorize a Garden City as an approach to solve the problem of peri urban growth. Garden City was an attempt to counteract the trend toward unplanned, piecemeal growth in the suburbs and outer boroughs of major cities. Howard (1898) envisioned a community with common location of private and public structures on privately owned land is placed throughout a huge core town with retail centres and manufacturing facilities situated along the periphery. Howard envisioned a centre metropolis of 1,000 acres with 58,000 inhabitants bordered by 5,000 cultivable acres.

Figure 2.6 provides a visual summary of the Garden city concept presented in the text.
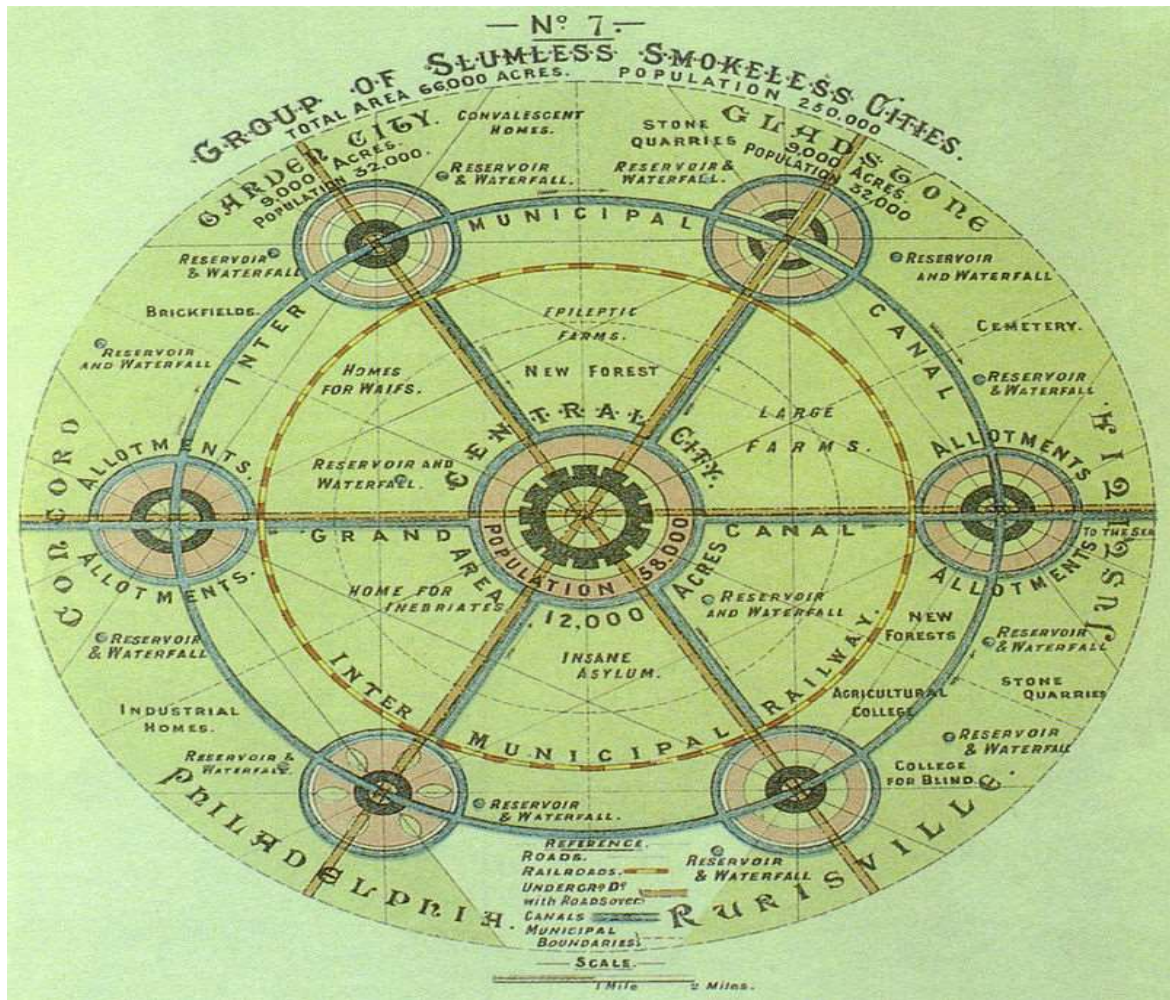
Figure 2. 6: The Garden city Model

Source: (Gallion,1963)

2.5.4 Suitability of garden city model in contemporary urban planning in Kenya

The garden city model is perhaps more applicable to contemporary urban design in comparison to a century ago. This is due to contemporary emphasis in increasingly centered on the environmental philosophy of sustainable development, which shares the same concept of equilibrium and harmony as Howard's social city concept. Some elements of the Garden City concept include providing an appropriate living and working environment, creating sustainable communities of a certain size that have a shared sense of

identity, and so on and a method for coping with rising land prices and ensuring benefits for the entire society, remain desired goals (Hardy.,1989; Evalina and sawab,2011).

In Kenya, Ebenezer Howard's plan is being used to construct Konza technological city and Tatu City just outside of Nairobi. This is occurring, but under novel and intricate settings. These cities develop with promises of imposing amenities and functional systems that mirror the lives offered by the majority of cities in the Global North. The objective is to create cities that are more globally linked, sustainable, and interconnected than traditional cities. These cities are being designed solely by architects, engineers, and real estate developers.

However, the lack of involvement of urban planners and managers, county governments, and the general public in the creation of these communities is extremely concerning. Tatu city, for example, will be built on prime agricultural land that was formerly a coffee plantation. This introduces the issue of land usage, especially in nations with weak regulatory systems and cultural impacts on property ownership. Given that many African urbanites are impoverished, these cities may also contribute to spatial fragmentation, social and spatial polarization.

The basis on which garden cities are conceived does not account for the urban poor. Kenya can learn from Nova Cidade de Kilamba, a garden city in Angola that was established in response to a housing scarcity and the need to construct mixed-use structures on the outskirts of Luanda. However, the city is currently an empty shell due to the inability of nearby slum inhabitants to afford pricey residences and the unwillingness of high-income residents to leave the CBD's economic activity and facilities.

2.6 Conceptual Framework

Due to rural-to-urban migration and natural growth, the number of people living in cities is growing, which puts pressure on cities to grow into the peri-urban area. As a result of shifts in population growth between 1990 and 2020, there is an increasing need for additional land for the construction of residential, industrial, educational, recreational, commercial, public utility, and infrastructural projects to meet the requirements of a more populous urban population. This is likely to have ripple effects on the socio – economic activities of the households. This may cause a shift in the region's population composition as well as a shift in the economic composition of peri-urban households, both of which could contribute to further urbanization. Figure 2.7 provides a conceptual framework that summarizes the aforementioned text.
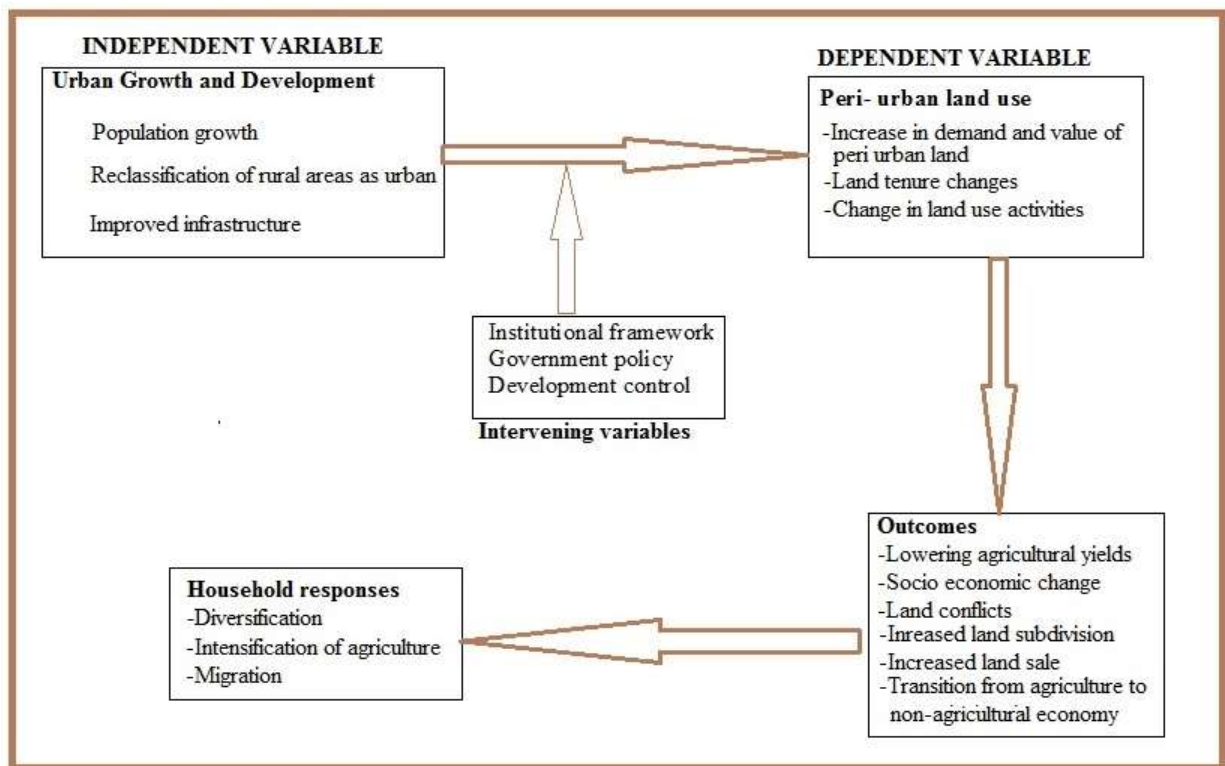
Figure 2.7: Conceptual framework
Source: Researchers Construction (2020)

2.7 Gaps identified in the literature for this study to fill

Urban expansion is a global problem as alluded to by (Mubea, 2014; Thuo, 2010; Omondi et al., 2017) in their study of Nakuru city, Urban Fringes of Nairobi City and peri urban Kisumu, both in sequence and separately. The authors discused how urbanization affects peri-urban land usage; however, they focus exclusively on large cities in Kenya. There is a lack of information about how urbanization affects smaller and medium-sized communities like Kimilili. In light of this knowledge gap, we set out to conduct this study.

Multiple studies have been conducted in recent years to analyze the patterns of urbanization. Mandere et al. (2010), for instance, used surveys and interviews to analyze peri-urban expansion, livelihood change, and household income in peri-urban Nyahururu. Other studies have discussed economic growth and its consequences in selected sub-Saharan African peri-urban areas (Amoateng et al.2013; Mutua, 2013) in peri urban Kumasi and peri urban Machakos respectively.

While some of the aforementioned studies performed descriptive study of the impact of economic development on urban land use in sub-Saharan Africa, others used data from land use plans and traditional mapping techniques (Amoateng et al.2013; Cobbinah and Amoako,2012, Mugisha and Nyandwi,2015). Land use plan details provide for an estimation of the precise distribution of land utilization in planning areas. However, this might underestimate the amount of built-up land in the sample area. Land use plans in Kenya, for example, may provide details only for land usage plan regions. In addition, since the physical planning teams do not regularly update their proposals, data produced are often inaccurate. This study of Kimilili draws on these original studies and scientific findings. Furthermore, data sources and methods, the strategy and contribution to the

present study vary substantially from the previous studies. This is the first research to try using satellite data to measure urban growth in Kimilili town over a thirty-year period (1990-2020).

Kitur (2019) explored obstacles to productive planning in Nairobi, Nakuru and Eldoret towns in Kenya. The research was confined to the three towns with long planning history with major legacies of development control from colonial to post-colonial periods. While the author discussed planning challenges, no analyses of modern metropolitan histories have been undertaken on small and medium urban areas. By analyzing urban development policies and management reactions to land use changes and their problems, this study tried to fill this gap by coming up with a plan for how to plan and manage land use in peri-urban areas of small and medium-sized cities.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter explained the approach that was used in the study. The focus was on research design, target population, sample size and sampling methods, research tools, instrument validity and reliability, data collection process, data and ethical issues and data analysis techniques.

3.2 Location of the study area/Study site

Kimilili is a settlement located in the administrative region of Bungoma County. Kimilili Sub County is characterized by its administrative center. Bungoma County comprises a collective of nine subordinate administrative divisions, among which Kimilili Sub County is included. Kimilili Sub County is geographically surrounded by Mount Elgon Sub County to the north, Webuye West Sub County and Webuye East Sub County to the south, Trans Nzoia County and Tongaren Sub County to the east, and Bungoma Central Sub County to the west.

The geographical coordinates of the settlement are around 00°47′ latitude north of the Equator and 34°43′ longitude east of the Prime Meridian. Kimilili is situated approximately 500 kilometers to the west of Nairobi and 300 kilometers to the north of Kisumu. The geographical coordinates of the site are situated at the intersection of the Kisumu-Kitale Road and the Kitale-Lwakhakha Road. The research area was inhabited by a total of 16,833 individuals, with a population density of 1,840 individuals per square kilometer. According to the Kenya National Bureau of Statistics (KNBS, 2019), the present population is approximately 17,939 individuals. The town encompasses an area of 9.1 square kilometers. The majority of the land in the vicinity of Kimilili town is utilized

for agricultural purposes. The municipality is situated on the lower inclines of Mount Elgon, positioned at an altitude of approximately 1,700 meters above the Earth's sea level, and has a modest amount of precipitation on a yearly basis. The region in question possesses extensive volcanic soils characterized by their profound fertility, rendering them very suitable for a diverse array of agricultural activities. This town comprises two distinct administrative divisions, namely Kibingei and Kimilili wards.

Kimilili serves as a hub for many different industries and businesses, including housing, manufacturing, education, recreation, government, commerce, public services, transportation, marketing, and agriculture. Tarmac roads connect it to other smaller commercial centres such Misikhu, Matili, Bokoli, Kamukuywa, Kapsokwony, etc. The town of Kimilili was picked at random to symbolize the rapidly expanding medium towns across the country. Additionally, the study site was conveniently accessible to the researcher, making it cost-effective. The geographic scope of the investigation is delineated in figure 3.1 below.
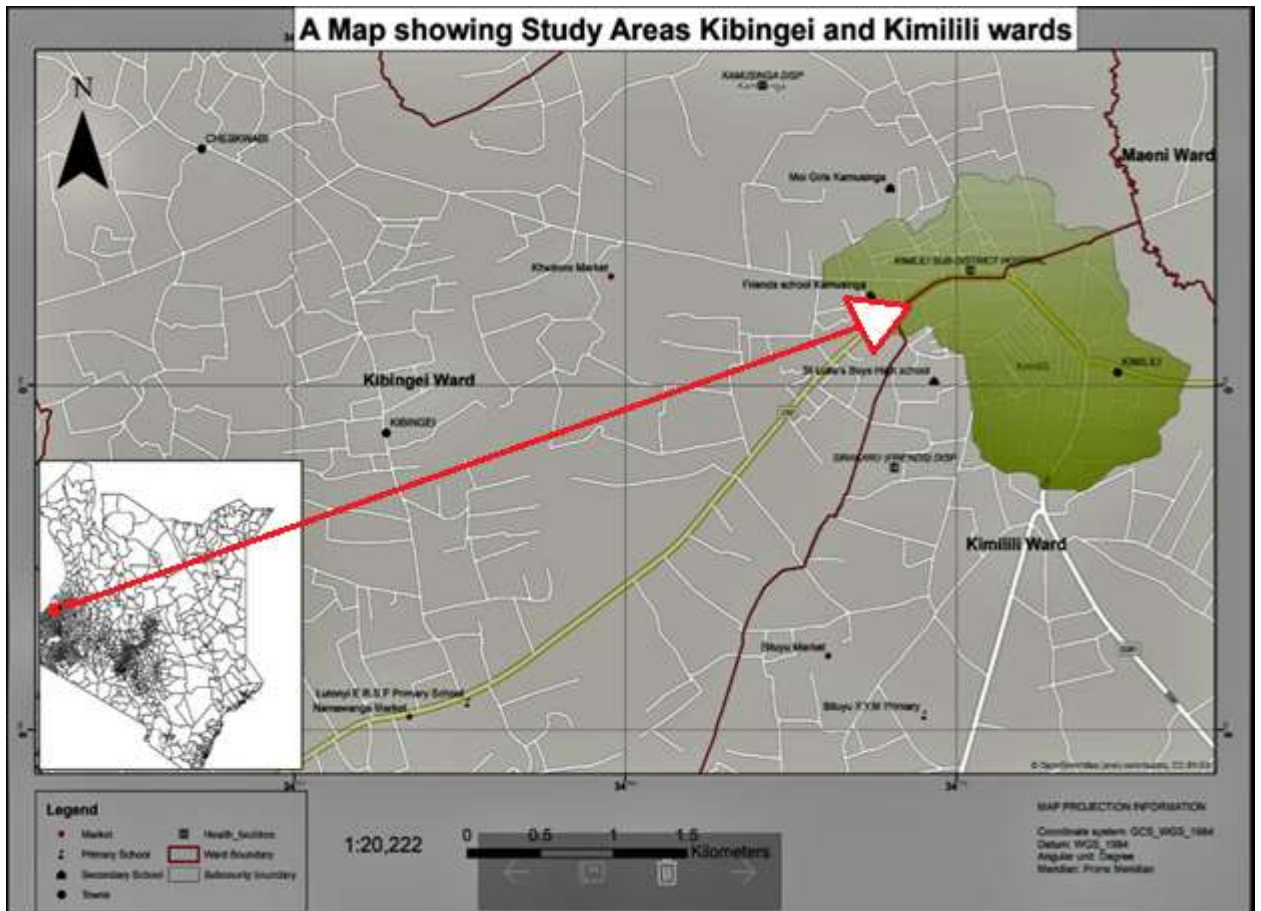
Figure 3.1: Location of the study area

Source: ISUDP KIMILILI (2020)
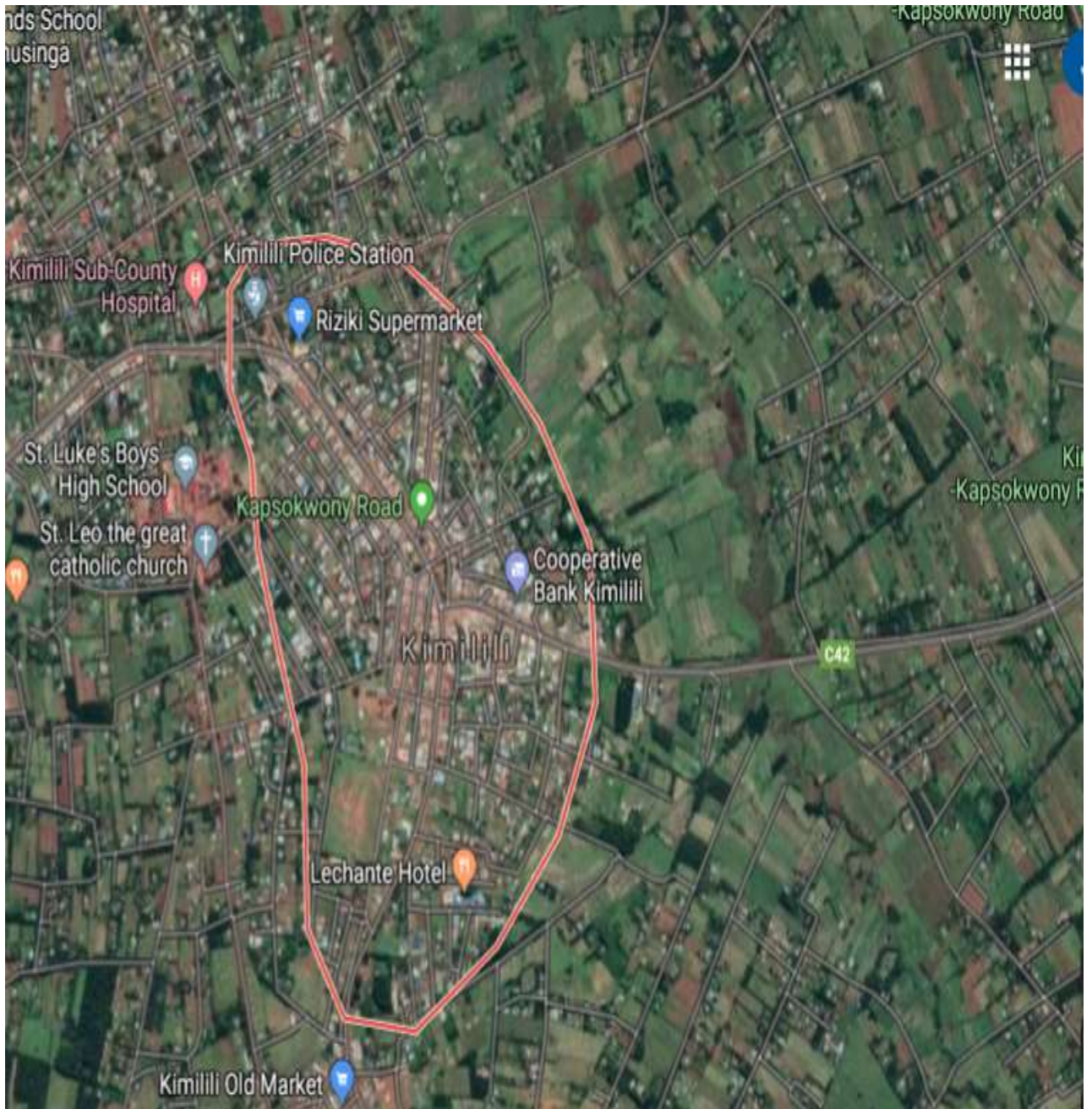
Figure 3.2: Aerial Map of Kimilili town

Source: Google (2019)

3.3 Research design

The study used a descriptive research design in order to analyze the effects of the spatial development of Kimilili town on the utilization of peri urban land. Various instruments were employed to collect data. Quantitative and qualitative methods were used in this study. Remote sensing and GIS analysis was utilized to determine land use variations over time in the research region over the previous three decades (for the period 1990-2020). In descriptive research design, the researcher describes the state of affairs as they exist. This may often result in the formulation of important principles of knowledge and solution to significant problems (Kombo and Tromp, 2018).

3.4 Study population

The target population comprised 17, 939 residents of Kimilili town and its peri –urban area and one physical planner, one Sub county Lands officer, one Sub county Agricultural officer, two officers from the Municipal Board, two ward administrators, and five assistant chiefs.

3.5 Sample size and sampling techniques

3.5.1 Sample size

A sample size of 384 respondents was selected from the five sub locations to form a representative sample that targeted one responded in every household. When dealing with a population of over 10,000 people, Mugenda & Mugenda (1999) recommended a sample size of 384. Mugenda and Mugenda recommend the formula

$$nf = \frac{n}{1 + \dfrac{n}{N}}$$

According to the above formula:

Nf = desired sample size when the population is less than 10,000

n= desired sample when the population is more than 10,000

N = estimate of the population size

3.5.2 Sampling techniques

The town of Kimilili extends over two electoral wards—the Kimilili ward and the Kibingei ward and a total of five sub locations. The population of the town proper is estimated to be 16,833 people (KNBS, 2019). Kamusinga, Township, Khamulati, Bituyu, and Kimilili are all examples of such rural sub locations. Kimilili ward is home to the town's CBD and open-air market, whereas Kibingei ward is where the majority of the town's administrative offices (both national and county) are situated. Therefore, subjects from both wards served as study participants. Institutional respondents were chosen using a purposeful sample technique, and this included the planning department, the department of lands, the department of agriculture, the Municipal board, the ward administrators, the land owners, and the chiefs from the selected areas.

Due to their expertise in urbanization and spatial planning, these organizations were prioritized for inclusion in the study. The township was purposefully sampled to choose the five sub-locations of Kamusinga, Township, Khamulati, Bituyu, and Kimilili Rural. Each of these neighborhoods' households served as the sample frame. Then, in each of the five regions represented by the samples, households were selected using simple random sampling. Mugenda and Mugenda (2003) suggested a sample size of 384 when the

population is 10,000 and above. The desired sample size was, therefore, determined using the formula adapted from Mugenda and Mugenda (2003) as indicated below.

$$N=\frac{Z^2pq}{d2}$$

where

N-The desired sample size (assuming the population is greater than 10,000)

z- The standard normal deviation set at 1.96, which corresponds to 95% confidence level.

p-The proportion in the target estimated fraction of the target population that possesses the measured attributes.

q=1-p (probability of non-success)

d-is the level of statistical significance set at 0.05

The fraction of the target population with particular features is 0.5, the z statistic is 1.96, and the desired level of precision is 0.5.

The necessary sample size, then, was calculated as follows using the aforementioned formula:

$$N=\frac{(1.96)^2(0.5)\,(0.5)}{(0.05)^2}$$

=384

The sample size is tabulated as follows:

Table 3.1: Household sample size

S/No.	Sub Location	Households (Target)	Sample size	Percentage (%)
1.	Kamusinga	3,476	96	25
2.	Township	3,524	97	25
3.	Khamulati	2,194	61	16
4.	Bituyu	925	26	07
5.	Kimilili Rural	3,757	104	27
	Total	**13,876**	**384**	**100**

Source: Researcher's construction and KNBS (2019)

Population data for 1989, 1999, 2009 and 2019 was used to project annual population for subsequent years up to 2020. With reference to built-up area, actual figures were derived from satellite classification for 1990, 2000, 2010 and 2020.

Population projection was calculated using the formula.

$$P_n = P_0 (1+r)^t$$

Where;

P_n = Estimated population at a given year

P_0 = Base year population

R = Growth rate

t = Number of years projecting for

This data was used to project average annual increment in built up area during the respective periods as aforementioned.

3.6 Research Instruments

This study's primary data gathering instruments included questionnaires, guidelines for in-depth interviews, document analysis, and focus group discussions.

3.6.1 Questionnaire

The questionnaires including both open-ended and closed-ended items in varying proportions were given out to the heads of sampled households and other influential people. Data was collected through a questionnaire to provide quantifiable primary data. The household questionnaires were distributed to the 384 selected household respondents. The questionnaires consisted of three sections. The purpose of Part A was to collect broad information about the respondent's demographics. Part B was aimed to gather data on the effects of Kimilili town's growth on peri urban land use, while Part C was made to gather information on the societal and economic effects of Kimilili town's expansion on peri-urban households, as well as suggestions for addressing these effects from the community at large.

3.6.2 Key Informant Interviews

In order to gather information, interviews with key informants were conducted with members of the County government, the Planning department, the Lands department, the National government administration (Chiefs), and professional organizations and sectors, including surveyors, estate agents, commercial and business sectors, etc.

3.6.3 Remote sensing images

The degree of urbanization during the past three decades in the study area was calculated using a collection of remotely sensed data. The United States Geological Survey provided access to Landsat imagery from 1990, 2000, 2010 and 2020. Images were chosen since there was a complete lack of clouds and they were readily available. In other words, the US Geological Survey's images are processed before they are sent to you. To accomplish this, we used Arc GIS (version 10) and ERDAS imagining (version 2018) to process, analyze, and combine the spatial data and geographic information. All satellite imagery of Kimilili, Kenya, has been aligned with the same Universal Transverse Mercator (UTM) projection using the same datum (UTM zone 34N, World Geodetic System 1984). Images were classified as urban, agricultural, densely vegetated, or barren using a supervised classification approach in ERDAS IMAGINE's maximum likelihood Algorithm. A geographic Markov model and a cellular automata model were used to estimate the spatial distribution of different land uses through time. Simple subtraction between the area of each land use type in the first and last year yielded the decadal area of land use land cover change. The difference showed the land use shift in terms of spatial coverage. Calculations were made to determine the rise or fall in each land use category as a function of time.

3.6.4 Focus Group Discussion (FGD)

The FGD were meticulously designed using a structured approach and requested comments on land use changes from 1990 through 2020. In all the areas where we conducted in-depth interviews with residents, we first met in smaller groups for in-depth discussions at the sub location level. Members of the community's elder and assistant chief classes helped choose the volunteers. Six to eight people, including native landowners and

newcomers, participated in the conversation. The local landowners were interviewed to collect data on Kimilili's past development and land use patterns, while others were asked about their motives for moving to the area and provided insight into current land use trends.

3.7 Validity and reliability of the research instruments

3.7.1 Validity

Validity of the instruments is the degree to which they accurately measure what they are designed to measure (Kombo and Tromp,2018). Preliminary analyses of the questionnaire's readability and applicability allowed for the removal or revision of questions that were found to be inadequate in their ability to measure the intended variables.

3.7.2 Reliability

This is how consistently a research tool produces the same results when used multiple times (Mugenda & Mugenda,1999). As such, it is a metric for assessing the reliability of test results (Kombo and Tromp,2018). Chwele town served as the testing ground for the study instruments, which were piloted using a test-retest reliability approach by being given to the same group of participants twice, with a two-week gap in between. Chwele town, which is similar to Kimilili town, was chosen for the pilot research. Pearson's product moment correlation coefficient was used to calculate the degree of association between the two datasets (r). In this investigation, a reliability coefficient of 0.6 was considered satisfactory.

3.8 Data collection procedures

Before beginning the process of collecting data, the researcher obtained a letter of introduction from MMUST and afterwards submitted an application for a permit to the National Commission for Science, Technology, and Innovation (NACOSTI). The investigator returned to the place of the study three times for further observation. During the initial visit, the researcher addressed himself to the Deputy County Commissioner Kimilili Sub County, stated the goal of the visit/study, and asked for permission to carry out the research. Research participants were informed that their participation was completely voluntary and that they would be compensated for their time. Moreover, respondents were made aware that they were not being timed and may take as much time as they needed to complete the survey.

3.9 Basic Assumptions.

It was expected, initially, that the participants in the study would be truthful and impartial in their responses. All information provided by participants was to remain anonymous and confidential, and participation in the study was voluntary. The sample was thought to be a good representation of the whole population from which conclusions were drawn. It was also assumed that the respondents would all be willing to participate in the interviews, filling of questionnaires considering the busy schedules of some them.

3.10 Data processing and analysis

Data analysis involves examining the obtained information from a survey or experiment and drawing inferences and deductions (Kombo and Tromp, 2018). Quantitative and qualitative approaches were used to examine the data. Editing, coding, entering, and validating the collected data were all performed. Data editing was performed to ensure

continuity and accuracy, remove anomalies, and fix mistakes. After settling on a coding method, the collected data was entered into a computer and analyzed to weed out any anomalies.

SPSS (Statistical Package for the Social Sciences) and Excel were utilized in the generation of study variables, as well as the coding and analysis of questionnaire data. Quantitative and qualitative data from open-ended questions were analyzed and presented in narrative and numerical formats, respectively, to meet the aims of the study. Inferential statistics, such as the Pearson product moment correlation and Regression analysis were used to demonstrate the strength of associations between independent and dependent variables. Pearson product moment correlation was applied to establish the relationship between distance from the central business district and peri urban land use as well as the relationship between population growth and increase in built up area. Regression analysis was conducted to find out the contribution effect of distance from CBD to peri urban land use as well as contribution effect of population growth on increase in built up area. Measures of central tendency and dispersion like the mean, median, and standard deviation as well as more pictorial displays like bar graphs and pie charts were used to describe the data.

3.11 Ethical considerations

Given the potentially delicate nature of the researcher-subject relationship, appropriate precautions were taken in accordance with the code of ethics established by Masinde Muliro University of Science and Technology. Therefore, all data collected from participants during this study was kept strictly secret and used for academic purposes only. Therefore, the respondents were instructed to not provide any identifying information on

the survey, including their names, phone numbers, or any other marks. When participants in a study are given the assurance that their identities will not be revealed, it increases the likelihood that they will provide a greater quantity of information of a higher quality than they would if confidentiality was not guaranteed.

CHAPTER FOUR: RESULTS AND DISCUSSION.

4.1 Introduction

This study sought to establish the effect of expansion of Kimilili town on peri urban land use. It describes the trend of urban expansion in Kimilili town from 1990 to 2020, establishes the impact Kimilili town expansion has had on peri urban land use pattern and identifies strategies for sustainable development of Kimilili town and other small and medium sized urban areas in the country.

4.2 Response rate.

The study purposed to collect data from 384 household heads in Kimilili peri urban area. The respondents were distributed among the five sub locations; Kimilili rural, Bituyu, Township, Kamusinga and Khamulati. 369 respondents were able to return the filled in questionnaires as summarized in table 5 below constituting a response rate of 96%.

Table 4. 1: Response rate

S/No.	Sub location	Number of respondents selected	Returned Questionnaires	Response rate %
1.	Kamusinga	96	93	96.9
2.	Township	97	92	94.8
3.	Khamulati	61	58	95.1
4.	Bituyu	26	24	92.3
5.	Kimilili Rural	104	102	95.6
	TOTAL	384	369	96%

Source: (Researchers field study 2021)

According to researches, a response rate of 70% and over is excellent. It, therefore, implies that a response rate of 96% in this study was representative hence suitable for data analysis and reporting.

4.3 Demographic information of the Respondents

The research study obtained information from household respondents whose demographic information is presented in the subsequent section. This information was done to ensure the inclusiveness of the respondents in the study and reduce bias.

4.3.1 Respondents gender

Figure 4.1 shows that males accounted for 51.1% of respondents while females made up 48.9%. This suggests that the study was gender balanced.
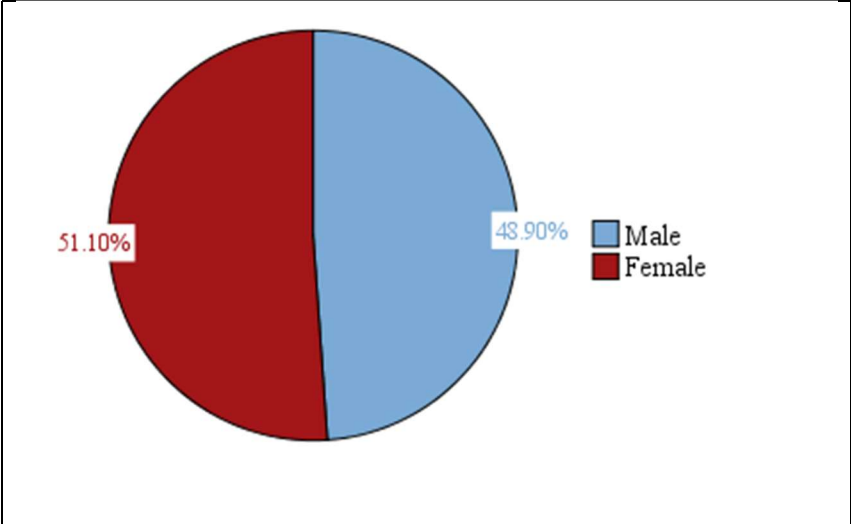
Figure 4.1: Distribution of respondents by gender

Source: Field data 2021

4.3.2 Respondents' age

According to the findings on the ages of the respondents, 5.15 % of them ranged from 18 to 25 years old, 14.36 % of them were between 26 and 35 years old, and the remaining

5.15 % were older than 36 years old. 16.8 % fall in the bracket of 36-45 years, 33.06 % of the respondents were age 46-55years, 21.68 % of the respondents were aged 56-65years and 8.9% of the respondents were aged 66 years and above. This indicates fair participation of respondents from all age brackets.
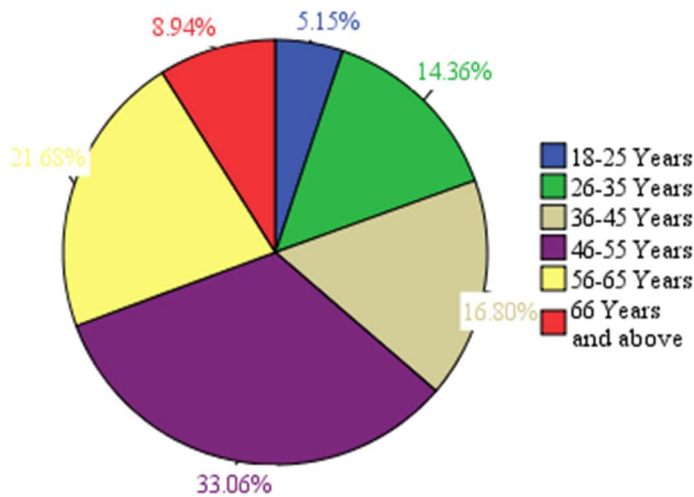
Figure 4.2: Distribution of respondents by age
Source: Field data 2021

4.3.3 Respondents academic qualification

Information about respondents' academic qualification was established and results presented in (Figure 4.3). This was necessary to ensure respondents' ability to respondent adequately to the questionnaire. Majority of the respondents (16.53%) had Diploma and certificate qualification, (10.3%) had secondary certificate, (29.27%) had degree certificate, (11.65%) had primary certificate, 13.01% had Master's degree, (1.08%) had PhD, whereas 12.47% had no formal education at all. Drawing from these results, majority of respondents in this research study had prerequisite qualification hence able to respond to the research questions effectively.
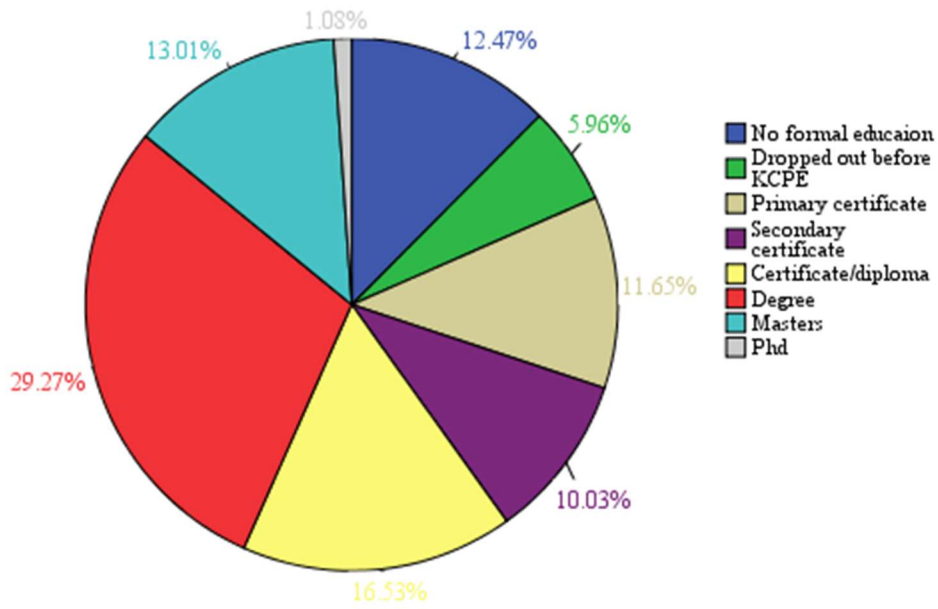
Figure 4. 3: Respondents academic qualification

Source: Field data 2021

4.3.4 Respondents Occupation
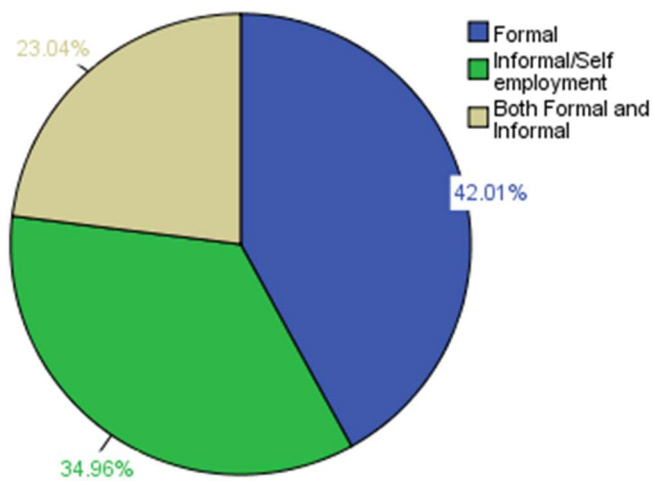
Figure 4.4: Distribution of respondents by occupation

Source: Researchers Analysis (2022)

Study findings (Figure 4.4) revealed that (42.01%) of the respondents had formal employment, (34.96%) who formed the majority, had informal/self-employment and (23.0%) had both formal and informal employment. This could be attributed to inadequate opportunities for formal employment pushing people most residents into self-employment as an alternative source of income.

4.3.5 Length of stay in the study area

From the results (Figure 4.5), majority of the respondents (60%) had lived in the area for 10 and above years and had, therefore, clear understanding of the area of study and were able to give detailed and accurate responses pertaining to the subject.
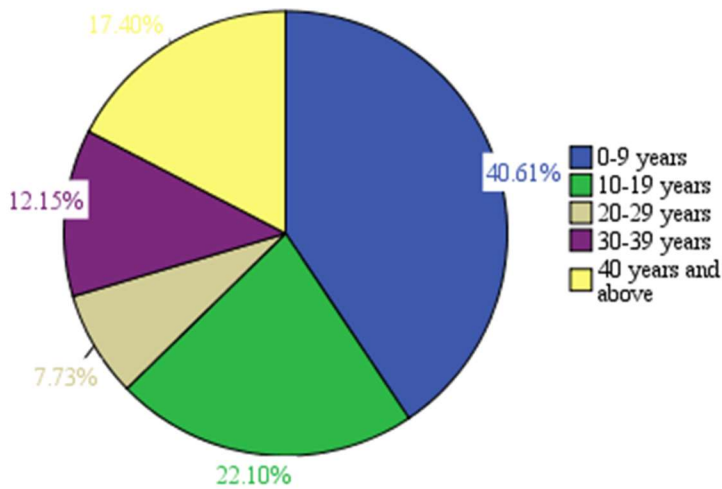
Figure 4.5: Distribution of respondents by length of stay in the study area.

4.3.6 House hold family size

Findings of the study in (Figure 4.6) reveal that majority of the respondents had a family of between (1 – 5) members. This is consistent with the findings of El Nassar and Overberg (2011) who observed a reduction in household family sizes in most peri urban areas of cities in the United States.
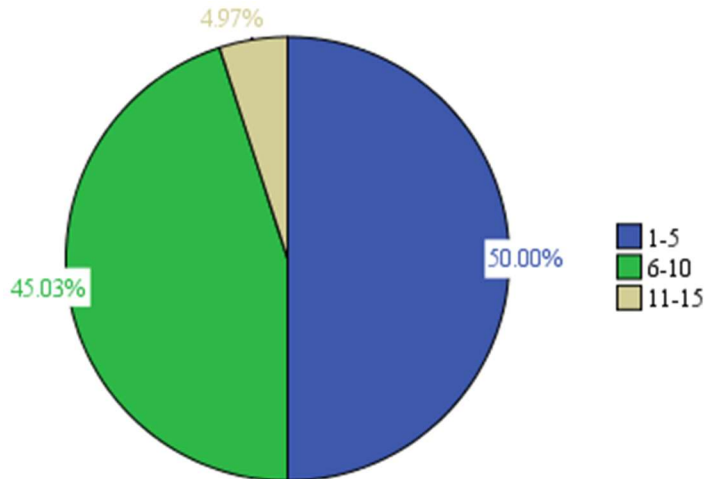
Figure 4. 6: Household family size

Source: Field Data 2021

4.4 The trend of urban expansion in Kimilili town from 1990 to 2020.

The first objective of this study was to use Geographic Information System to find out how much Kimilili town expanded in size from 1990 to 2020. To achieve this objective, Landsat data for 1990, 2000, 2010 and 2020 was downloaded from USGS website. The data was then processed, analyzed and integrated to spatial data and Geographic information. The findings from the study are described in the subsequent section.

4.4.1 Land use and land cover classification from 1990 to 2020

The main sources of remote sensed data for this study were Landsat images for 1990, 2000, 2010 and 2020. The land use gains and losses for the four periods and land use land cover changes were documented (table 4.2) and discussed in the succeeding sections.

Table 4. 2: Satellite images used in the study

Data	Year captured	Scanner	Spatial resolution
Landsat 4	07.02.1990	TM	30m
Landsat 7	14.09.2000	ETM+	30m
Landsat 5	21.01.2010	TM	30m
Landsat 8	13.09.2020	OLI	30m

Source: USGS Explorer

The data and figures as described in table 4.2 are explained here under;

4.4.1.1 Landsat satellite

This is a U.S. scientific satellite that studies and photographs the earth surface by using remote sensing techniques. Examples of Landsat satellites include Landsat 4, Landsat5, Landsat 7 and Landsat 8 Landsat data (Table 6).

4.4.1.2 Landsat data

This imagery has a moderate spatial resolution of 30 metres, providing widespread, repeatable data coverage at a big enough scale to reveal finer details of human-scale phenomena like urbanization without resolving individual buildings (Wikipedia). The satellites carry on board spectral sensor/scanners that capture remote data around the world. The study relied on data gathered by Thematic Mapper 4 (TM 4) which was carried on Landsat 4 satellite, Thematic Mapper 5(TM 5) aboard Landsat 5 satellite, Enhanced Thematic Mapper Plus (ETM 7+), aboard Landsat 7 satellite and Operational Land Imager scanner aboard Landsat. This study utilized spatial data captured by Thematic Mapper 4 scanner on 7.02.1990, Enhanced Thematic Mapper plus scanner (ETM+) on 14.09.2000,

Thematic Mapper 5 (TM 5) on 21.01.2010 and Operational Land Imager (OLI 8) on 13.0.2020 all the scanners have a spectral resolution of 30 meters.

4.4.2 Land use and land cover classification.

The study area was defined to have four land use land cover classes: Agricultural land, Bare land, Built up area and Dense vegetation. Land use maps were generated from classification results for 1990, 2000, 2010 and 2020. The maps showing changes over a period of three decades were as described as in table 7,8,10 and 11.

4.4.3 Land use and land cover classes and spatial extent for 1990.

The results (table 4.3) and figure 16 describes land use and land cover for 1990 using Thematic 4 data.

Table 4. 3: Land use classes and spatial area coverage for 1990

Land use type	Spatial coverage (Ha)	Percentage %
Agricultural land	2876	59.5
Bare land	526	10.9
Built up area	54	1.1
Dense vegetation	1374	28.5
Total	4830	100

Source: Field Data, 2021

From the corresponding results (Table 4) and figure 14, more than half of the land in the study area (59.5%) was under agriculture. However, built up area accounted for a paltry 1.1% of the total area covered by the study. This implied that a higher percentage of land in the study area was under agricultural use. The built-up area in this case includes

commercial units, residential units, and industries, educational and administrative structures. The results in Table 4.3 are summarized in figure 4.7 below.
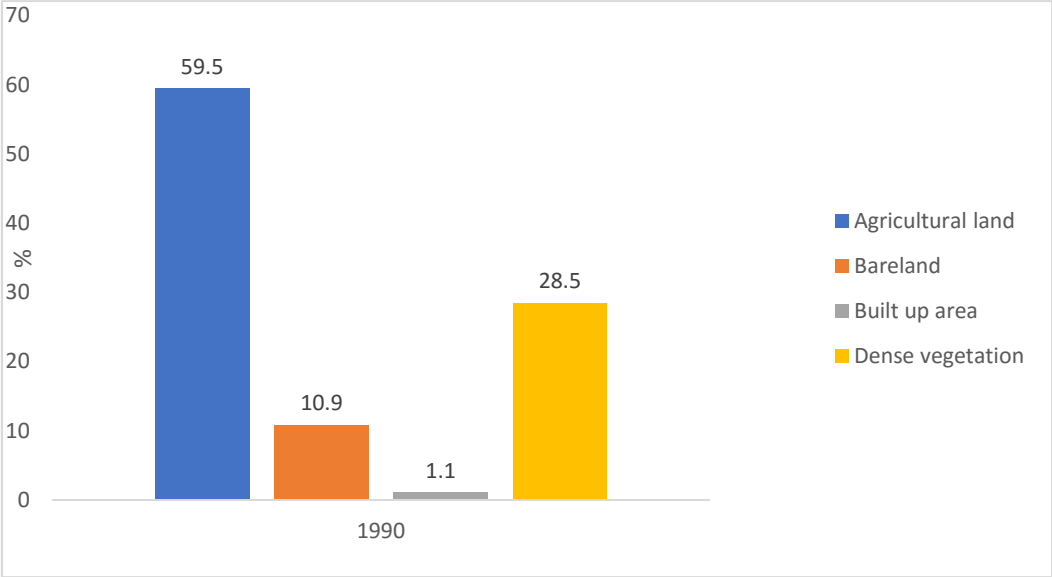
Figure 4.7: Land use classes and spatial area coverage for 1990
Source: Researchers Analysis (2022).

The Land Use Land cover map for 1990 based on Landsat TM 4 satellite image is shown in figure 4.8 below.
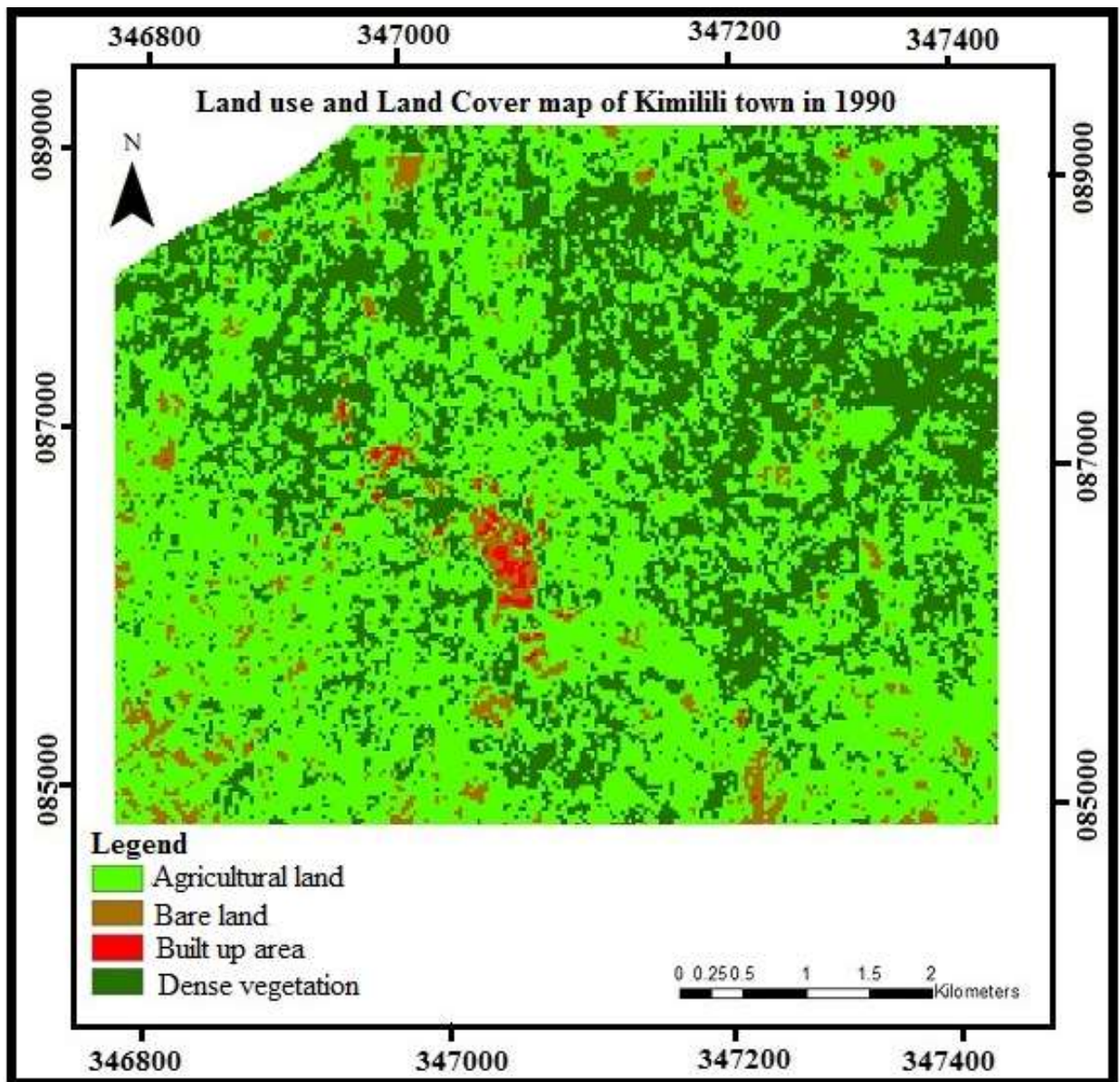
Figure 4. 8: Land use change map of the study area for 1990.

Source: Researchers Analysis (2022).

4.4.4 Land use and land cover classification for 2000

Findings of the analysis as described (Table 4.4) revealed that by the year 2000, land under agricultural use accounted for 56.8% of the total land under study. Agricultural land

however recorded significant areal decrease by 2.7% in 2000, while built up area increased in area coverage to 5.9% of the total area.

Table 4. 4: Land use classes and spatial area coverage for 2000

Land use type	Coverage (Ha)	Percentage %
Agricultural land	2742	56.8
Bare land	560	11.6
Built up area	287	5.9
Dense vegetation	1241	25.7
Total	4830	100

Source: Field data 2021

The survey found that the amount of land that had been built on had increased by a considerable 4.8% when compared to the results from 1990. Further analysis of the data revealed that the built-up area experienced the greatest percentage rise in growth between the years 1990 and 2000.

Results in table 5 are summarized in figure 16 below.
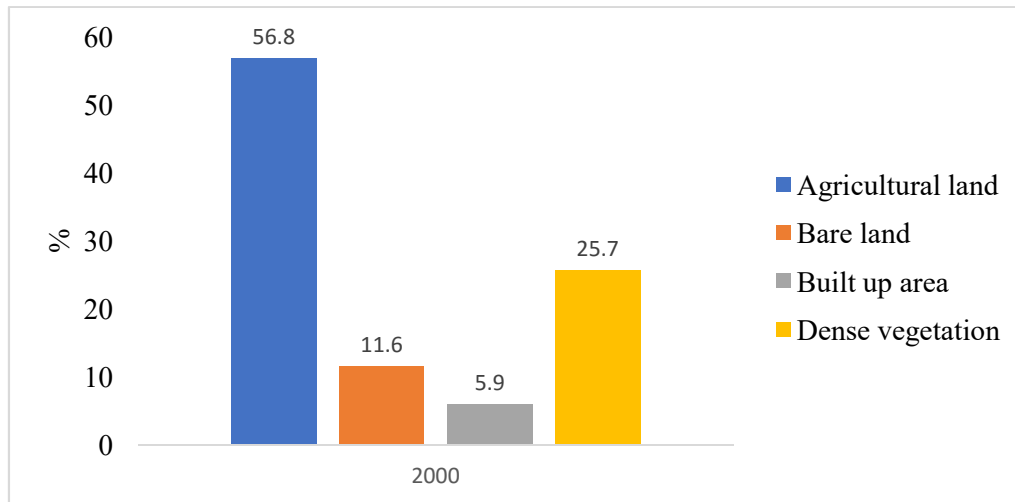
Figure 4. 9: Land use classes and spatial area coverage for 2000.

Source: Researchers Analysis (2022).

The Land Use Land classification for 2000 based on Landsat ETM+ 7 satellite image is shown in figure 4.10 below.
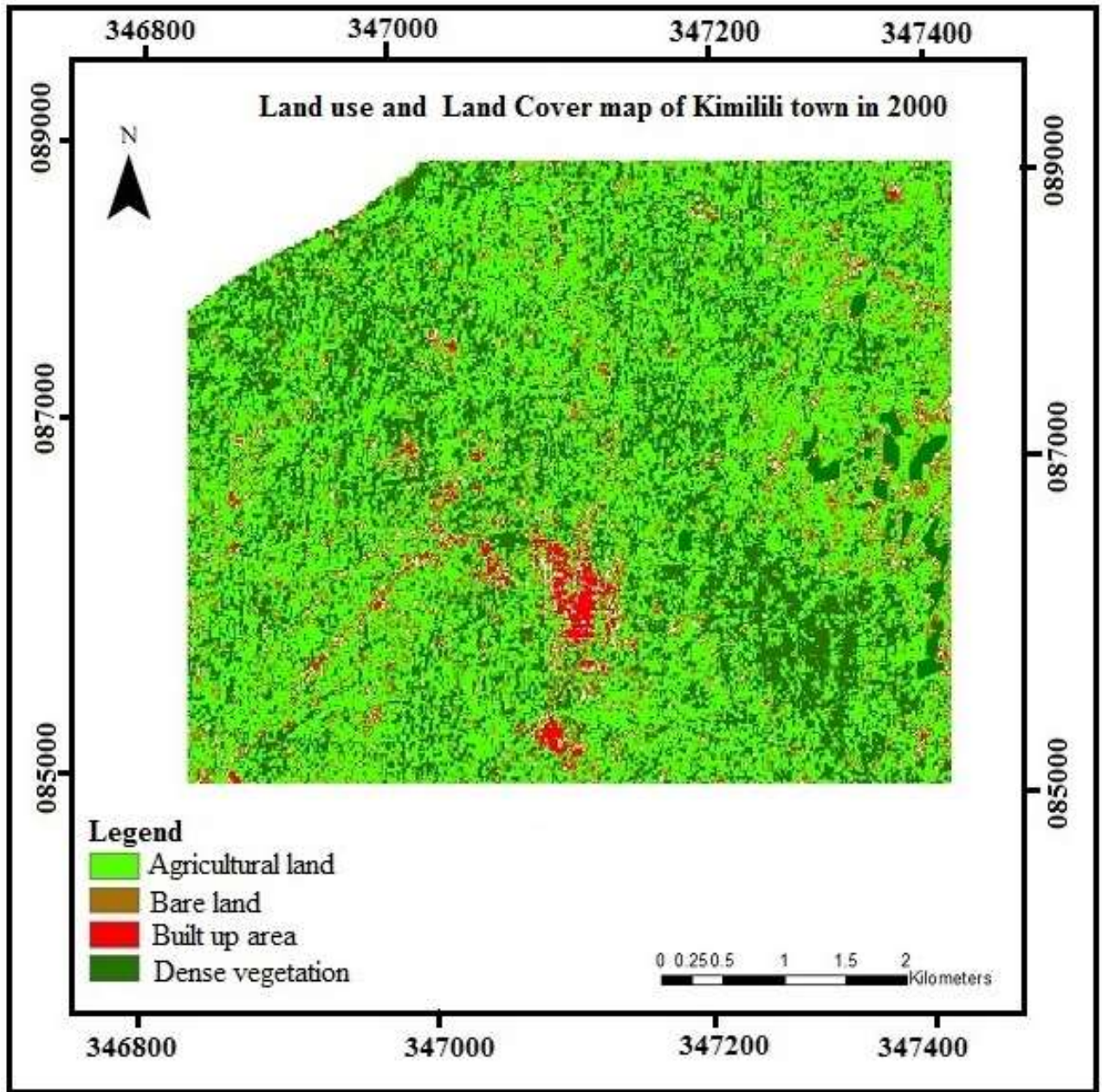
Figure 4. 10: Land use Land cover map for the year 2000.
Source: USGS Explorer.

4.4.5 Land use and land cover classification for 2010.

From the corresponding results in table 4.5 below, agricultural land decreased further to 52.5%, while built up area rose to 7.8% in 2010.

Table 4. 5: Land use classes and spatial area coverage for 2010

Land use type	Coverage(Ha)	Percentage (%)
Agricultural land	2536	52.5
Bare land	1010	20.9
Built up area	378	7.8
Dense vegetation	906	18.8
Total	4830	100

Source: Field data 2021

The results in table 4.5 are summarized in figure 4.11below.
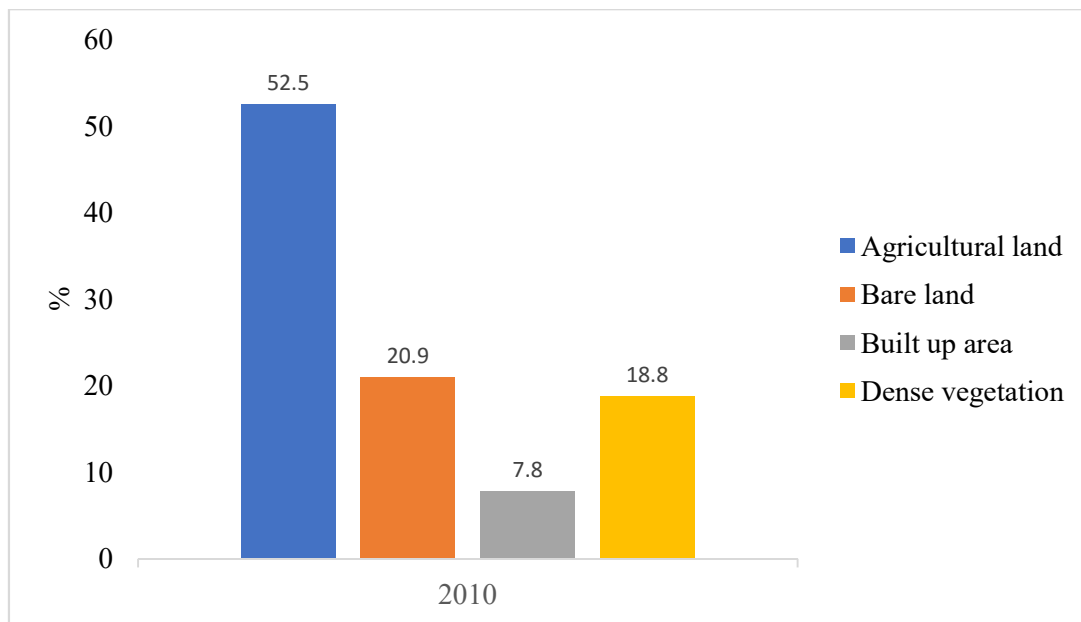
Figure 4. 11: Land use and land cover classification for 2010.

Researchers Analysis (2022)

The Land Use Land classification for 2010 based on Landsat TM 5 satellite image is illustrated in figure 4.12 below.
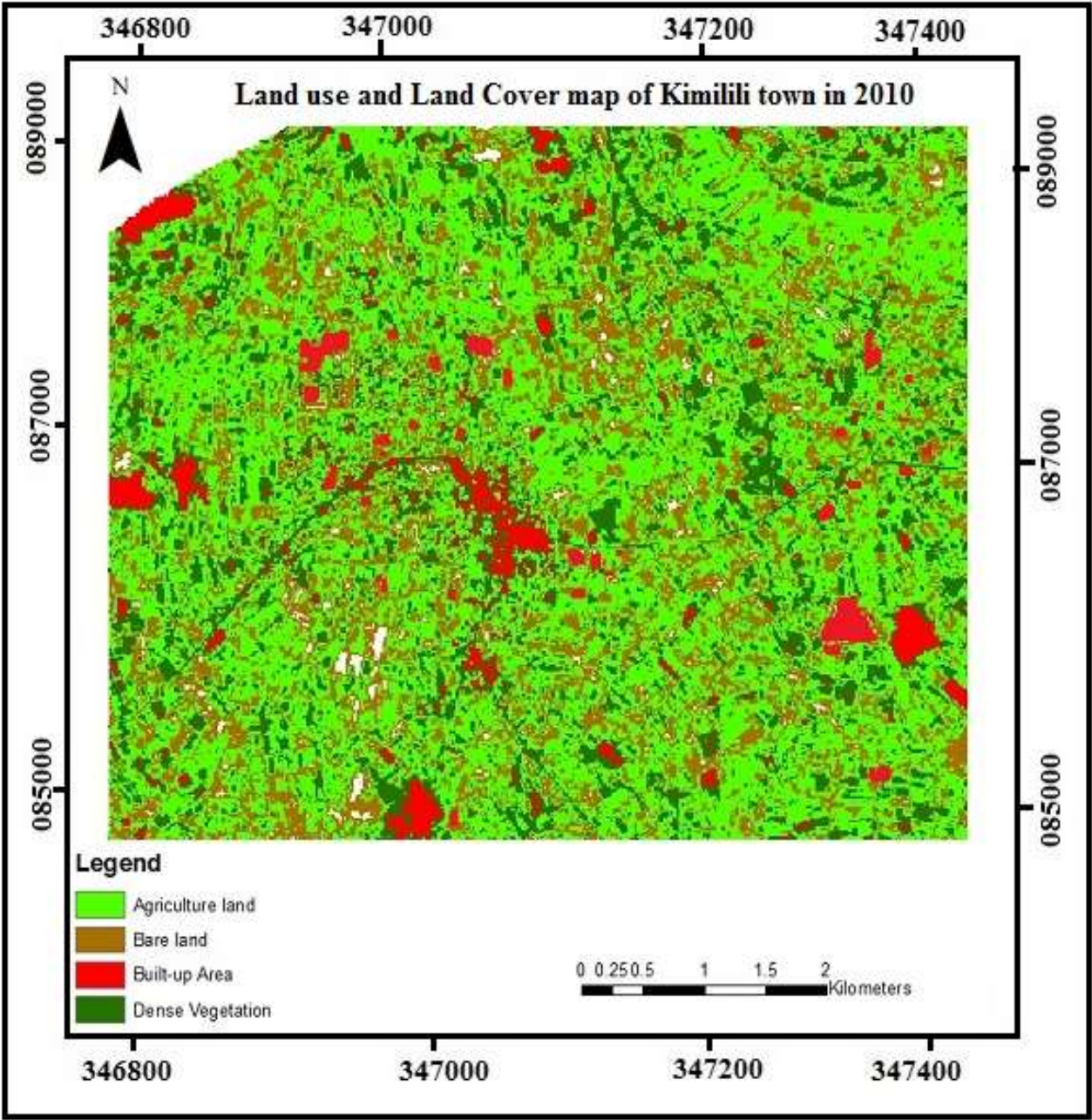
Figure 4.12: Land use Land cover classes and spatial area coverage for the year 2010.

4.4.6 Land use and land cover classification for 2020.

As tabulated in table 4.6, agricultural land constituted 42.7% of the total area under study.

The built-up area rose to 17.7% of the total land in the study area.

Table 4. 6: Land use classes and spatial area coverage for 2020

Land use type	Coverage(Ha)	Percentage
Agricultural land	2067	42.8
Bare land	1591	33.0
Built up area	856	17.7
Dense vegetation	317	6.5
Total	4830	100

The results in table 4.6 are summarized in figure 4.13 below.
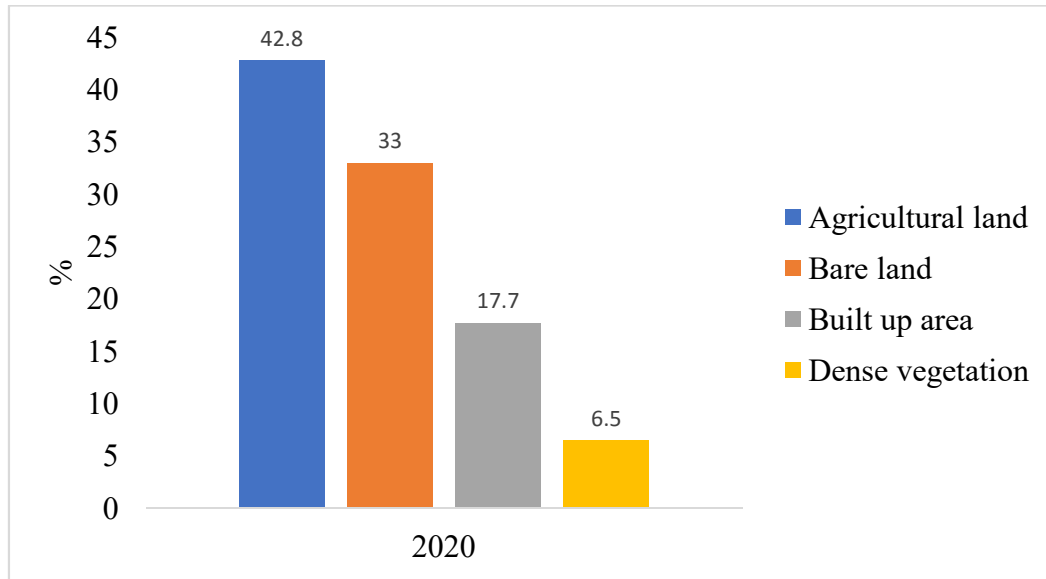
Figure 4. 13: Land use and land cover classification for 2020.

Source: Researcher's analysis (2020).

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The Land Use map for 2020 based on Landsat 8 OLI satellite image is shown in figure 4.14 below.
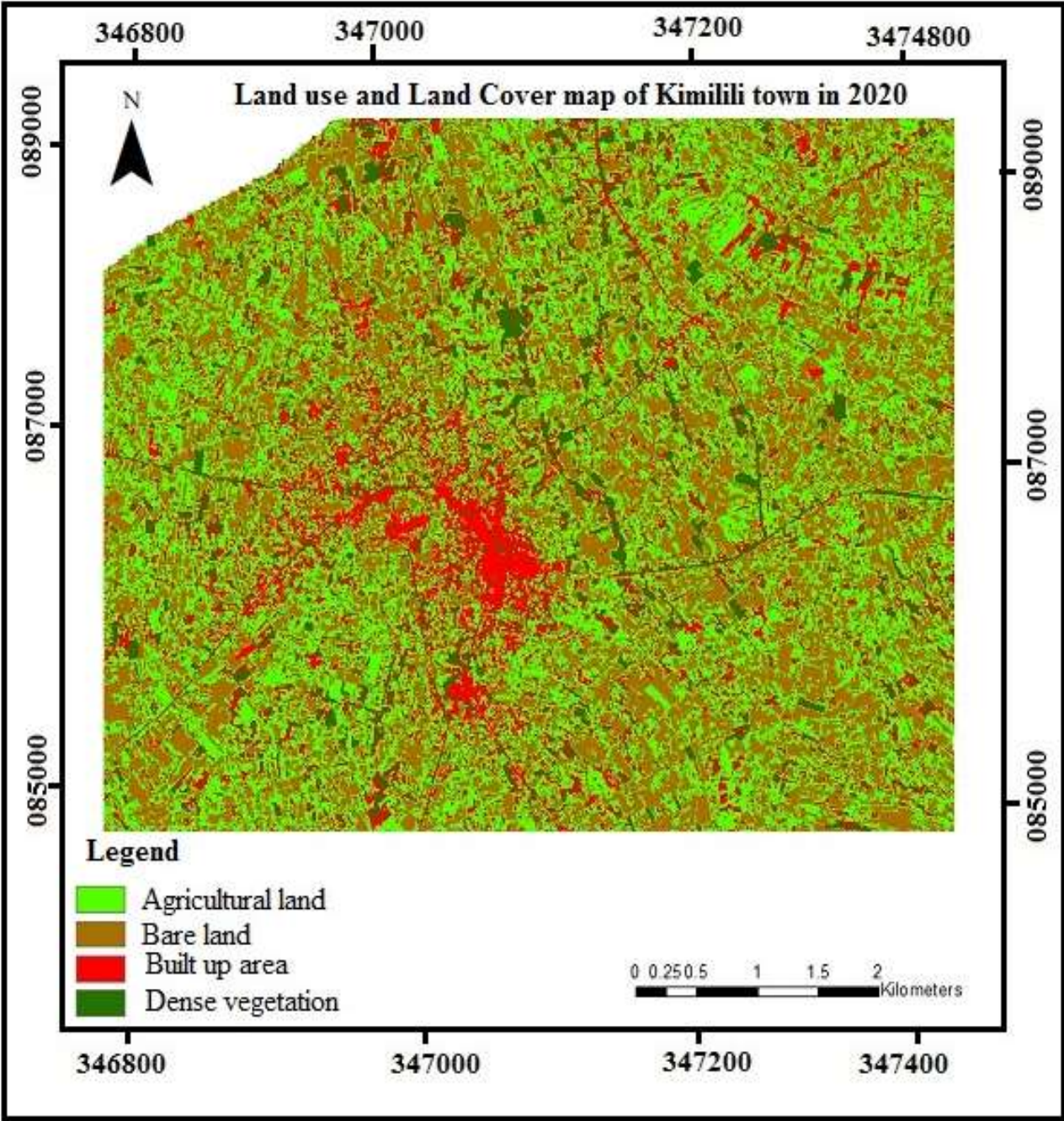
Figure 4.14: Land use Land cover classes and spatial extent for the year 2020.
Source: USGS explorer

The results of land use classification in figure 17, 19, 21 and 23 depict a land use pattern that could not entirely conform to the neo classical theories of land use. Although no clear land use pattern existed, traces of concentric ring model, Sector model and bid rent theory were noticeable. The concentric ring model, developed by Ernest Burgess in 1925, shows how metropolitan areas use their land in concentric rings expanding outwards in rings from the CBD with different land uses. This theory is applicable to a certain extent to the urban form of Kimilili town. According to Waugh (2002), the CBD contains major retail outlets and offices, a pattern replicated in Kimilili town. The town's Central Business District is the epi-centre of commerce and services as depicted by functions such as banking, hotel industry, supermarkets and retail outlets, petrol stations and pharmaceutical shops. The transition zone is characterized by old houses and generally degenerating informal settlements. The next zone is occupied by residential units of medium class housing. This is qualified by the presence of medium density residential areas such those around Kimilili boys, Kamusinga estate among others. Residential properties, both single-family homes and multi-unit complexes, tend to be of higher quality in these locales.

However, whereas the land use zones as characterized in the theory are active in the study area, its application to the study area has some contradictions. The demarcation lines for each land use are not distinct and the zones are not clearly homogenous. The land uses in the study area are conflicting as some low-class houses are mixed up high income residential in some sections particularly those reserved for low cadre housing. Therefore, complete monocentric pattern of land use does not entirely exist in the study area as suggested by Burges concentric model but light imprints of the sector model by Homer Hoyt (1939) can be traced. Kimilili's urban growth pattern can be understood in light of

this theory, which is shaped by the availability of various modes of transportation and the nature of the economic activity taking place in the area.

Results of the analysis show that road junctions and transport routes especially the highways in the study have attracted urban activities and population settlements along these transport routes linearly and in wedge shape. The town is growing more westwards, northwards and southwards along transport corridors to Misikhu, Chwele and Kamtiong. On the contrary, little growth of the town occurred along Kimilili-Kamukuywa road and Kimilili-Kapsokwony road towards the eastern part of the town. The eastern part of the town towards river Kimilili is steep, marshy with loose soils hence prone to flooding and mosquito attacks hence not amiable for settlement. The expansion of the town as illustrated in the aforementioned land use maps is, therefore, constrained by the physical characteristics of the land and this explains why expansion of the town towards this direction is limited.

Results of the analysis of Kimilili urban growth from 1990 to 2020 revealed a significant increase in built up area. This happened majorly at the expense of agricultural land which appeared to shrink as the town continued to grow horizontally. Different forms of land use as described by Alonso (1964) generate different bid rent curves and this may explain the current changes in built up and agricultural land in the study area. The place of bid rent has long been established by David Ricardo (1817) and although the theory was first developed in an agricultural context, it has been applied to simulate the conversion of agricultural land into urban development in a concentric model.

Land values are higher at the CBD and its immediate surrounding areas. Medium land values are found in the middle zone but low land values are observed in the outer lying peripheries. Distance from the town centre, proximity to the highway and road access has profound influence on land value. This influence is replicated in the study area. The concentration of built-up area is more along Kimilili to Misikhu highway, Kimilili to Chwele highway and Kimilili-Bungoma highway than the concentration of built-up area along Kimilili to Kapsokwony highway and Kimilili to Kamukuywa highway. This skewed ribbon like pattern of urban growth can be explained from the point of view of differential land values. The Eastern part of the town is steep and marshy hence prone to flooding and mosquito infestation. This area is characterized by low residential settlement with low income residential households this makes it an unappealing option for families with a high net worth. The growth of the settlement towards this area is constrained and this explains why the area has low concentration of built-up area.

4.4.7 The trend of Land use change in the study area between 1990 and 2020.

The trend of land use change in the study area is tabulated in table 4.7 below. It describes how Kimilili town has expanded overtime within the period under investigation.

Table 4. 7: The trend of land use change in the study area between 1990 and 2020

	1990		2000		2010		2020		1990-2020 % Change
Land use type	Ha	%	Ha	%	Ha	%	Ha	%	%
Agricultural land	2876	59.5	2742	56.8	2536	52.5	2067	42.8	- 16.7%
Bare land	526	10.9	56	11.6	1010	20.9	1591	33.0	22.1%
Built up area	54	1.1	287	5.9	378	7.8	856	17.7	16.6%
Dense vegetation	1474	28.5	1241	25.7	906	18.8	317	6.5	- 22.0%
TOTAL	4830	100.0	4830	100.0	4830	100.0	4830	100.0	

Source: Researcher's analysis (2021).

Area of land usage and land cover was calculated each year by subtracting the area from the first year from the area in the last year. The difference illustrates the shift in land use both in terms of the spatial area it affects and the direction it moves in. The percentage change of each land use was then computed to define the percentage rise or reduction of each land use. The findings are tabulated in table 8. The results in table 4.7 are summarized in figure 4.15 below.
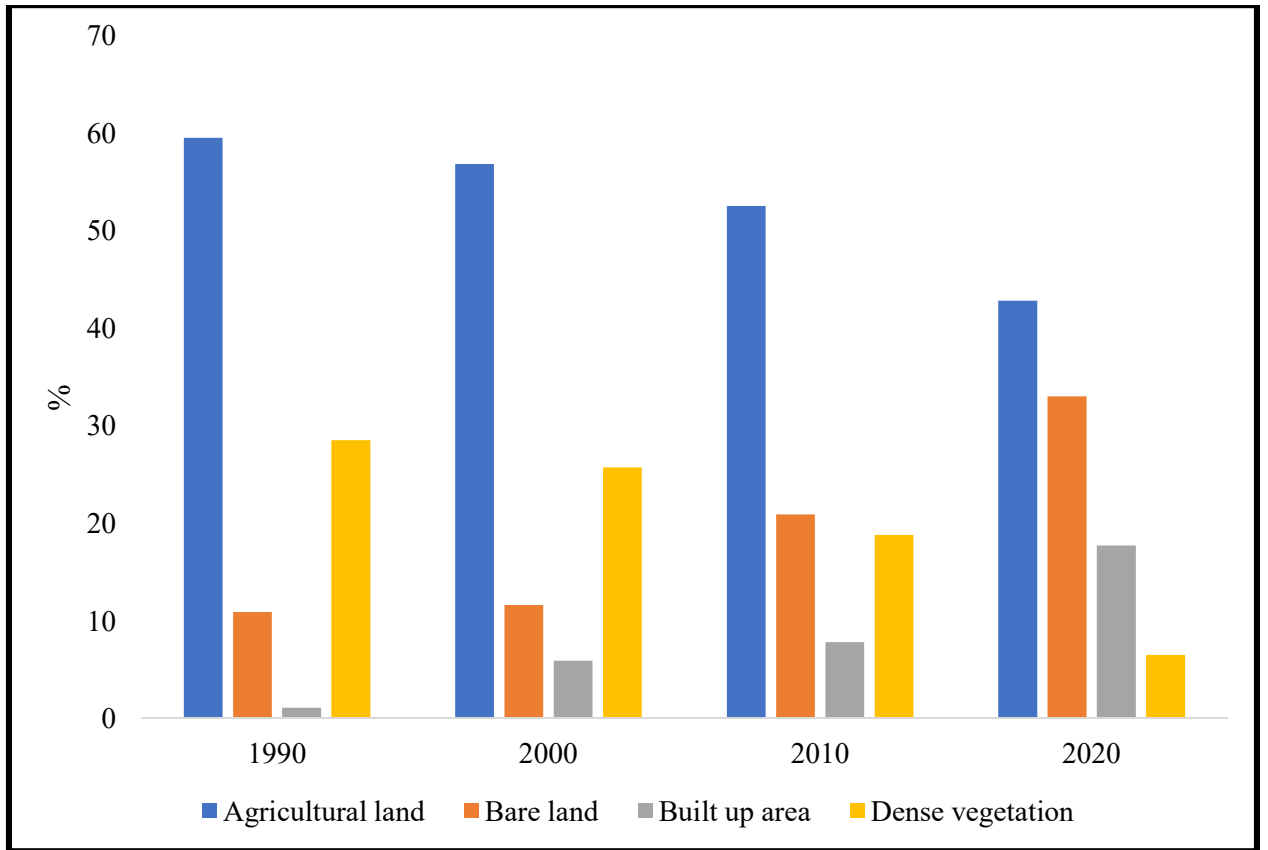
Figure 4. 15: The trend of land use change in the study area between 1990 and 2020.
Source: Researchers Analysis (2022).

As demonstrated in table 4.7 and in figure 4.15, in 30-year period, built up area increased significantly from 1.1% in 1990 to 17.7% by 2020 accounting for 16% change. Area under agriculture on the other hand, showed continuous decline from 59.5% in 1990 to 42.8% in 2020 representing 16.7% decrease over a period of 30 years. The results, revealed a negative relationship between built area and agricultural land, implying that an increase in built area results to a corresponding decrease in agricultural land. This may indicate increased land conversions in the study area majorly from agricultural use to non-agricultural use. The results further revealed an increase in bare land during the period under study. This may be indicating increased subdivision of land for sale in the study

area. The plots are then left fallow for speculative purposes in anticipation for higher prices. The trend of land use change between 1990 and 2020 is summarized in figure 4.16 below.
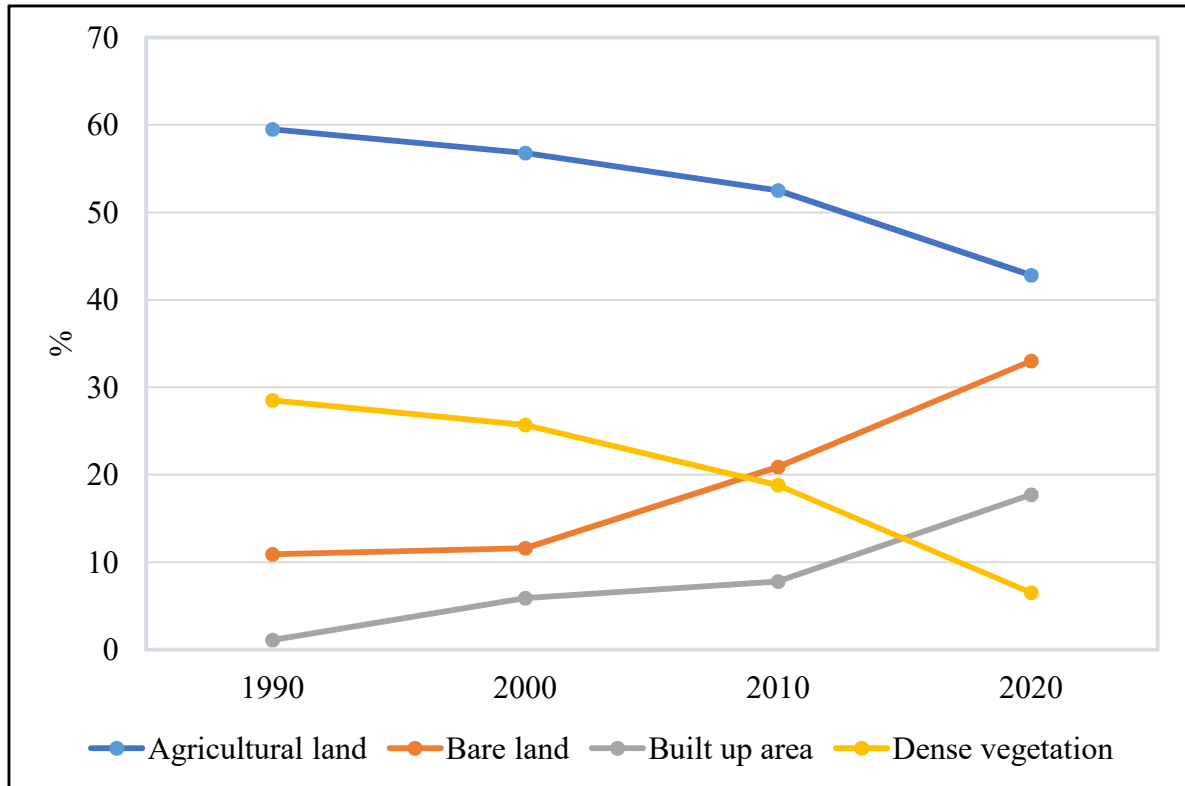
Figure 4. 16: Figure: Land use change trend from 1990 to 2020.

Source: Researchers Analysis (2020).

The first objective of this study was to determine the trend of urban expansion in Kimilili town from 1990 to 2020. The corresponding null hypothesis therefore, was that there was no relationship between distances from the CBD and peri urban land use change. Pearson product moment correlation was performed to test this relationship. Table 4.8 below summarizes the findings.

Table 4. 8: Pearson moment correlation results between distance from the CBD and land use activities.

	Correlation	Distance from town centre	Land use activities
Distance from Town centre	Pearson Correlation	1	.469
	Sig. (2-tailed)		.000
	N	369	369
Land use activities	Pearson Correlation	.469	1
	Sig. (2-tailed)	.000	
	N	369	369

Source: Researchers Analysis (2022).

Pearson moment correlation results showed a positive correlation between distance from CBD and land use activities (r = 0.469, P = .000, N= 369) implying that a unit increase in distance from the CBD would result to variation in land use activities by 46.9%. Since P< .000 there is no evidence to support the null hypothesis with 95% certainty. This means that distance from the CBD has a bearing on peri urban land use activities. Further tests were performed to establish the contribution effect of distance from the town centre to peri urban land use activities; a simple regression analysis was performed. The results are summarized in table 4.9 below.

Table 4. 9: Results of regression analysis: Model summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.469[a]	.220	.217	.30650

a. Predictors: (Constant), Distance from the town centre

Source: Researchers Analysis (2022).

From the results, the coefficient of determination Value (R^2) of 0.220 was obtained, which indicated that distance from the CBD accounted for up to 22% of the variance in peri urban land use activities other factors notwithstanding. These findings indicate there is a great variance on household land use activities as one moves from the CBD into the periphery. It must therefore be taken into consideration while designing a planning framework to guide sustainable urban development. These results corroborate the findings by Afriyie et.al. (2013), Appiah et al. (2014) and Mutua (2015).

Land use activities as described by Appiah (2014) are location specific. Its position in describing urban land use process had long been established by Ernest Burgess concentric ring model (1923), who observed a systematic variation and spatial distribution of land uses from the CBD to the outer lying peripheral areas of an urban settlement. Findings further indicate a high concentration of commercial functions in the town's CBD. Commercial activities are depicted by functions such as banking, hotel industry, supermarkets and retail outlets, petrol stations and pharmaceutical shops etc. Since shops want to make as much money as possible, they will pay the highest possible rent if it means being close to the CBD (Alonso 1964).

It is valuable to locate these enterprises in the CBD, because a huge population is concentrated there, making transportation easy, which is crucial for businesses that rely on high volumes of customer traffic. Furthermore Alonso (1964) argues that agricultural activities decrease closer to the CBD because they generate low bid rent a similar view expressed by Thuo (2010) and Cobbinah et al. (2015).

Pribadi and Panleit (2015), however argue that agricultural land use can still persist in the aftermath of urban expansion around fast-growing urban centres. Greater proximity to and ease of access to the CBD, can temporarily avail new opportunities for intensification of peri urban agriculture with focus on high value horticultural crops such as vegetables and fruits and zero grazing of dairy cows (Thuo, 2010; Moustier and Ranting,2015; Mutua, 2015; Willkomm et al.,2016).

Plate 1: Vegetable and fruit farm

It is imperative to note that intensification of peri urban agriculture by households near urban settlements largely depends on their economic endowment (Owens, 2016). In the study carried out in peri urban areas of Nakuru City, Kenya, Wilkom et al. (2016) found

out that small scale on-site farming is a practice common among poor households as a survival strategy. Owen (2016) claims helps to secure land. This strategy is a common practice in East African cities and is utilized as a transitional measure prior to residential construction and other non-farming developments take place. On the other hand, households with greater capital, intensify production to high value perishable goods for the urban markets.

4.5 The extent to which expansion of Kimilili town affects peri urban land use

This research also set out to establish the impact of population increase on peri urban land use change. Participants in the study were asked to respond to a set of statements to provide data intended to describe the status of land use activities. Urban expansion under this objective was defined in terms of population growth and its impacts on peri urban land use change. The status of land use change was rated as large extent, moderate extent, low extent and no extent. Results of the data on land use activities (dependent variable) are summarized in table 4.10 below.

Table 4. 10: Results of data on land use activities.

	Large Extent	Moderate extent	Low Extent	No Extent	Mean	Standard deviation
Agriculture	129(35.0)	72(19.5)	105(28.5)	63(17.0)	2.7	1.1
Residential	148(48.0)	37(10.0)	78(21.1)	77(20.9)	3.0	1.0
Commercial	177(45.0)	29(7.9)	90(24.4)	84(22.8)	2.9	1.2
Agriculture/Residential	71(19.2)	84(22.8)	179(48.5)	35(9.5)	2.5	0.9
Agricultural/Commercial	13(3.5)	113(30.6)	205(55.6)	38(10.3)	2.3	0.7
Residential/Commercial	36(9.8)	116(31.4)	216(58.5)	1(0.3)	2.5	0.7
Overall Mean					**2.7**	

data (2021)

Source: Field

The results in table 4.10 above suggested that the percentage of respondents who utilized their land for agriculture, residential and commercial purposes was 35%, 48% and 45% respectively. This indicates that majority of peri urban households engaged in these activities. The overall mean rating on land use activities was 2.7. The mean was moderate implying that most of the respondents utilized their lands for multiple land uses.

A statistical test on the effect of population increase on peri urban land use change was carried out using land size trends in years (Table 4.11). The null hypothesis was that there was no relationship between population increase and expansion in built up area in Kimilili town between 19990 and 2020. To achieve this, population data for 1989, 1999, 2009 and 2019 was used to project annual population for subsequent years up to 2020. With reference to built-up area, actual figures were derived from satellite classification for 1990,

2000, 2010 and 2020. From the researcher's projection, built up areas increased by 43.15% annually between 1990 and 2000 3.17% annually between 2000 and 2010 and 12.7% annually between 2010 and 2020. These annual increments were used to approximate annual expansion of built-up area during the respective periods as aforementioned.

Regarding the population, Kimilili town had a population of 5483 people in 1989, 7734 people in 1999, 13929 people in 2009 and 17939 people in 2019 (KNBS,2019) with an annual growth rate of 3.5% in 1989, 2.8% in 1999, 2.8% in 2009 and 2.3% in 2019.

Population projection was calculated using the formula.

$P_n = P_0 (1+r)^t$

Where;

P_n = Estimated population at a given year

P_0 = Base year population

R = Growth rate

t =Number of years projecting for

This data was used to project average annual increment in built up area during the respective periods as aforementioned. The results are summarized in table 4.11 below.

Table 4. 11: Data on population growth and corresponding built-up area from 1990 to 2020

YEAR	Population	Built up area (Ha)	YEAR	Population	Built up area (Ha)
1990	5675	54.0	2006	9383	350.7
1991	5874	77.3	2007	9646	359.8
1992	6079	100.6	2008	9916	368.9
1993	6292	123.9	2009	13929	378.0
1994	6512	147.2	2010	14319	425.8
1995	6740	170.5	2011	14720	473.6
1996	6976	193.8	2012	15132	521.4
1997	7220	217.1	2013	15556	569.3
1998	7473	240.4	2014	15991	617.1
1999	7734	263.7	2015	16439	664.9
2000	7951	287.0	2016	16899	712.7
2001	8173	296.1	2017	17373	760.5
2002	8402	305.2	2018	17859	808.4
2003	8637	314.3	2019	17939	856.16
2004	8879	323.4	2020	18352	
2005	9128	332.5			

Source: Researchers analysis (2022).

A correlation analysis was performed to test the relationship between the two trends of rising population and expanding urban areas. The results were as tabulated in table 4.12 below.

Table 4.12: Pearson moment correlation results between population and built-up area.

	Correlation	Population	Built up area
Population growth	Pearson Correlation	1	.892
	Sig. (2-tailed)		.000
	N	31	31
Built up area	Pearson Correlation	.892	1
	Sig. (2-tailed)	.000	
	N	31	31

Source: Researcher's analysis (2021)

Results from calculating the Pearson product moment correlation between population growth and the expansion of urban areas showed a considerable positive relationship between the two variables (r = .892, p = .000, N=31) implying that a unit increase in population would result to increase in built up area by 89.2%. The test found a statistically significant relationship between population increase and expansion of built-up area. The null hypothesis was therefore rejected at 95% confidence level and concluded that there was a significant positive correlation between population increase and expansion of built-up area. This implied that an increase in population in Kimilili town resulted to a corresponding increase in built-up areas. Furthermore, to establish whether population

growth was a major factor influencing increase in built-up area, simple regression analysis was conducted. Results were as illustrated in table 4.13 below.

Table 4.13: Model Summary-Population increase on built up area

R	R Square	Adjusted R Square	Std. Error of the Estimate
.892[a]	.796	.789	.100.49
a. Predictors: (Constant), Population growth			

Source: Researcher's analysis (2022)

From the findings, *R* Square value (R^2) was .796 which indicated that 79.6% of variation in built-up area was explained by Population increase. The remaining 20% variation in built up area was explained by factors not captured in this study.

Table 4.14: Regression model

Model	Unstandardized Coefficients		Standardized coefficients	T	Sig.
	B	Std.Error	Beta		
(Constant)	-63.278	45.034		-1.405	.171
Population growth	0.41	.004	.892	10.646	.000
a. Dependent variable	Built up area				

Source: Researcher's analysis (2022)

The P-value in the model is significant (P<0.001) implying that population increase is a predictor of built-up area. The study concluded that population increase is a significant predictor of built-up area in an urban centre. This transformation has led to significant changes in peri urban land tenure in many parts of the world majorly in Sub Saharan Africa (*Ibid*). This has implications on peri urban land use activities (Wamukaya and Mbathi, 2019).

Plate 2: Conversion of agricultural land into residual use
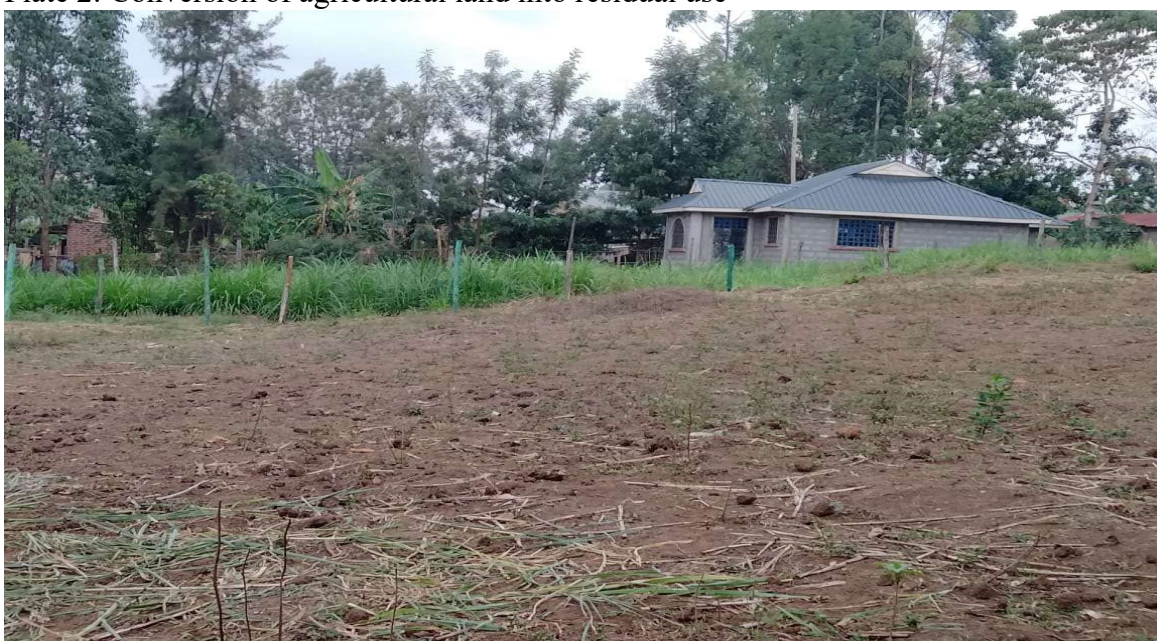
The peri urban region is, therefore, considered a place with actors having competing interests and as a result clashes and overlaps amongst institutions charged with management of peri urban land use is common. A report by USAID (2020) on Land Tenure Dynamics in Peri urban Zambia observed an increased demand for land by the urban elite and property investors. This group preferred to settle in peri urban areas for agricultural or residential development. This has accelerated conversion of land which was

previously under subsistence agriculture on peri urban land to more extensive uses such as commercial, residential and industrial development.

4.6 Strategies for sustainable urban development

Transformation of peri urban land from one based on agricultural production to a predominantly urban economy, has affected peri urban livelihoods. The study established that various household and institutional strategies have been adopted to cope with the changes in land-based livelihood activities in the peri urban interface.

4.6.1 Household strategies for sustainable urban development

An analysis of households' major source of income (Figure 32) reveals that 10.5% of respondents derives their income from farming, 46.4% derived their income from off activities such as hair plaiting, sale of firewood, sand, bricks among others whereas 43% of respondents obtained their income from both farming and non-farming activities.
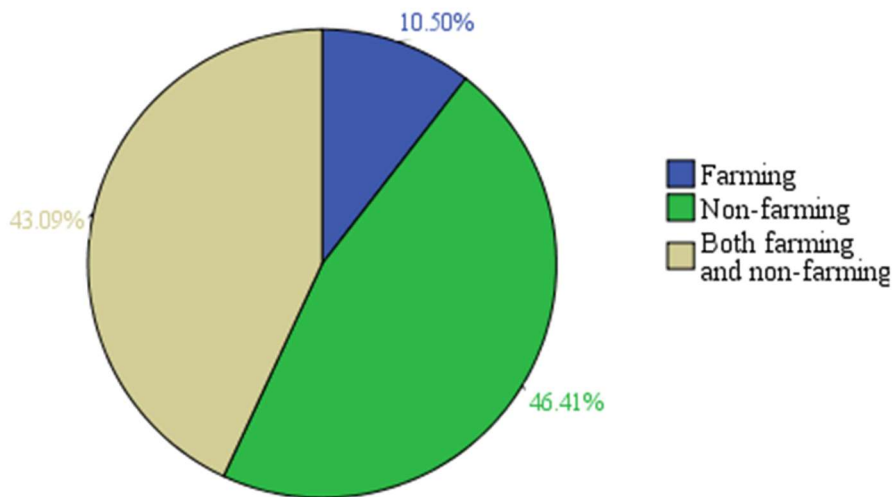
Figure 4. 17: Distribution of respondents by households' sources of income.
Source: Researcher's analysis (2022).

It is clear from the results in figure 24 above that significance of farming as a primary source of livelihood among the peri urban residents has steadily declined over the past years. This could be attributed to factors such as proximity of the households to the core of the urban settlement among others which drives households out of farm-based livelihood activities (Abbas and Afua, 2013). Peri urban residents in the study area adopted various strategies including both farm and off-farm strategies to cope with spatial growth of urban areas and its associated land use changes. These strategies involve agricultural intensification, agricultural diversification, adoption of multiple livelihood sources of income and migration. The strategies offer households an alternative source of income which enhances resilience in the face of peri urban land use changes that are associated with declining significance of agriculture as a source of livelihood.

Households engaging in farm income generating activities do not practice single farm activity only but rather resort to multiple sources of livelihood as a way of coping with changing land use trends in the peri urban areas of Kimilili. Households practice crop growing, zero grazing of dairy cows and poultry keeping on subsistence basis since most farmlands have been subjected to subdivision. Most households have small sizes of land dedicated to farming making farming on large scale practically impossible.

Plate 3: Cattle rearing

Studies on peri urban land use noted that peri urban households when affected by factors that make their existing sources of livelihood unviable, have often responded by employing various strategies. As explained by Thuo (2010) these strategies include diversification and intensification of agriculture and seeking for off farm jobs. These strategies give households an alternative source of income and this enhances their resilience in the wake of peri urban land use changes. The findings are consistent with a study by Abbas and Afua, (2013) where they observed that non-farming households adopted multiple land use activities rather than farming households. As explained by Mandere et al. (2010), this could be attributed to the fact that households that derive its main source of income from professional jobs have relatively higher income than the rest of the households.

Urban economy therefore presents opportunities that result in proliferation of non-farm income activities.

Plate 4: Residential house under construction

Plate 5: Blocks and ballast for   construction

Plate 6: Road side kiosk in a residential area

Though loss of farmlands in the peri urban areas of Kimilili has disrupted households' sources of income and caused distress, the job opportunities availed by urban economy serves to cushion households against loss of economic livelihoods. With increased immigration, opportunities in the construction industry have been created. During focus discussion group (FDG), a villager elder in Kamusinga Sub location had this to say "*new comers into the area have formal employment and their desire is to reside in the outskirts of the town. Most of them build residential houses and as such, they create many opportunities for residents especially the youth who participate in construction work, brick making, and metal work and block making. Given their financial endowment, they provide an alternative and 'improved' source of income*".

Drawing from the aforementioned findings; it is evident that the spatial expansion of Kimilili town has resulted to significant land use changes which have in turn affected peri urban households' livelihoods. There is therefore an urgent need to put into force management regulations to ensure that urban expansion is controlled. The subsequent section examined Planning and management solutions to land-use shifts in the Kimilili urban fringe.

4.6.2 Management strategies for sustainable urban development.

With increased urban sprawl caused by rapid urbanization, incompatible land uses become common. Such development is due to continuous disregard to urban planning and management regulations. Residential development is happening in ecologically fragile areas around Kimilili town. Findings on population trends of Kimilili town show that 64% of the respondents interviewed are immigrants indicating increasing migration of people into the study area for purposes of settlement.

Similar to other peri urban areas, the peri urban zone of Kimilili is characterized by exploding population growth and the construction of built-up areas. Most of these developments seem unregulated and has been a major factor fueling urban sprawl in the study area. Although urban sprawl is found to be a characteristic of all peri urban areas (Kamau,2012); incidences of unplanned physical development and unauthorized land uses in the study area are alarming.

Planning in the Kimilili municipal area is not governed by up-to-date legislation. Besides, there is duplication of functions by institutions mandated to undertake land use planning and management. Uncontrolled land selling and buying activities therefore increase

economic inequalities in the peri urban area and represent hurdles to land use and urban planning. Lack of urban plans that conform to socio economic dynamics of the peri urban residents makes it difficult for relevant authorities to regulate land transactions.

Though development in peri urban areas of Kimilili town is authorized by the county planning department; zoning is never done before lands are subdivided and sold. According to the county physical planning office, zoning is hindered by the fact that most of the land is held under freehold tenure (privately owned) with absolute ownership hence enforcing development control regulation becomes challenging. This has been a significant barrier to effective planning and implementation of physical development and land utilization in the study area's peri-urban areas.

The county government of Bungoma has been undertaking management of the town without proper institutional management and adequate budgetary allocation. In this respect, Eldoret and other major cities are not unique. In Eldoret town, allocation of financial resources gave priorities to sectors such as roads, health and agriculture with no specific allocation to urban planning and management (Kitur,2019).

In her study, Kitur (2019) found that land tenure issues have a significant impact on the planning process. If not addressed, land tenure challenges may hinder urban planning and management. Akuffo (2014) enforces findings by Kitur (2019). In his findings Akuffo (2014) identified land ownership and management as a key contributor to urban sprawl in Kumasi. Land sale is rampant often happening without regulation; the implication being development preceding infrastructural development. In his article "Land Governance in the outskirts of African cities" Schlimmer (2021) laments that adhering to urban planning

standards and provision of other urban services becomes a challenge when agricultural land is subdivided arbitrarily into smaller and uneconomical parcels of land.

The Land Use and Development Planning Act of 1996 was passed to establish guidelines for the management of land. Governments and public bodies that own huge swaths of land have more flexibility in deciding how that land will be used, making it simpler to put such plans into action. However, with 90% of residents of peri urban Kimilili owning land privately, land use planning and management becomes difficult.

To achieve sustainable urbanization in Kimilili town, there is urgent need to develop a dynamic strategy and policy that will address present and future sprawling of Kimilili town. The proposed policies and planning interventions can be replicated in other small and medium urban centres in Kenya.

4.6.2.1 Public participation and advocacy

The municipal management board is promoting sustainable agricultural land use conversions in the study area by enhancing public participation and advocacy of all stakeholders. This gives land owners and developers a sense of connection and encourages peri urban residents to accept physical planning and allow for effective application of development control approaches in the planning areas. Moreover, developers in the peri study area are being encouraged to develop their land in conformity with the towns planning regulations so that spatial expansion of the town into the peri urban area occurs in full compliance with provisions of the planning law. This would also enhance value of resident's land.

4.6.2.2 Promoting smart growth

The Municipal management is reigning in urban sprawl by advocating for smart growth. According to Arku (2009) the concepts of smart growth encourage the development of dense urban areas by focusing population expansion on areas that already include cities. The municipal management in Kimilili town advocates for compact development by concentrating growth within the towns' planning area. This ensures sustainable use of the available land.

The proposed Kimilili Urban Development Plan (Land use Plan) for Kimilili municipality strives to limit the spread of cities into prime farmland in order to maintain large, uninterrupted tracts of agriculture. The plan also aims to locate higher density development near the CBD. Emphasis is being placed on the need to build compact towns where buildings are closely spaced and also encourage infill development where open spaces between buildings are filled up with development structures.

Physical development efforts in peri urban areas of Kimilili town should embrace the basic tenets of settlement growth management. The urban management should anticipate urban sprawl, and make provision for guiding and managing it systematically. The major elements of growth management framework should entail vertical development in order to reduce encroachment into arable land. It was also established that the municipal management has set minimum acreage within the municipal area at 0.045Ha in the CBD and 2.5 acres in the peri urban areas. Permanent agricultural zones have also been designated, and the administration is enforcing a strict policy to protect them from development.

4.6.2.3 Land management

Regarding land tenure, mandates and decision-making, efforts are being made to ensure that powers of different authorities both in County government and National government are made clear to avoid overlaps in drawing plans and implementation of responsibilities. These measures will ensure that debates over planning power do not become a permanent impediment to local level planning.

4.6.2.5 Enforcement of zoning ordinances

There is an effort by the Municipal management to implement economical and development codes and zoning ordinances proposed in the Kimilili Urban Development plan 2019-2029. This has resulted in a vigorous drive to protect agricultural usage in areas designated for such use permanently.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Introduction

This study investigated the effects of growth and development Kimilili town on peri urban land use. This was in relation to declining arable land in the peri urban areas of Kimilili town. The study specifically sought to establish the trend of peri urban land use change in Kimilili town from 1990 to 2020, establish population growth trend and analyzing how Kimilili town's expansion has altered the surrounding area's patterns of land use and propose policy and planning interventions to ensure sustainable urban development in Kimilili.

5.2 Summary of findings

The study was guided by Burges concentric ring theory, Homer Hoyts' sector model and David Ricardo's Bid rent theory. These theories attempted to explain the pattern of land use types progressively from the urban core towards the peripheral areas. The first objective of this study was to determine the trend of expansion of Kimilili town from 1990 to 2020. The study established a significant increase in built up area over a period of 30 years. Results further indicated a decline in agricultural land over the same period under study.

The second objective established the extent to which expansion of Kimilili town affected peri urban land use. The findings reveal a shift in peri urban land use activities from tradition farming to non-agricultural land use activities or a mixture of both. Statistically it was found that there was a significant relationship between population growth and urban

sprawl as indicated by increase in built up area. Thus, urban expansion has far reaching implications on peri urban land use pattern.

The third objective identified both household and institutional strategies for sustainable development of Kimilili town. From the results, households adopted various strategies to mitigate against urban sprawl. These strategies include diversification, intensification and in some cases migration.

5.3 Conclusion

From the summary of the findings of the study, it can be concluded that population growth in Kimilili town has a significant influence on spatial expansion of the town beyond legal limits into the hinterland as exemplified by increase in built up area. The sprawling pattern of Kimilili town increased the amount of land covered by buildings into arable land leading to decline in agriculture as a source of livelihood among peri urban residents.

Although development in peri urban areas in Kimilili is authorized by the county planning department, zoning is never done before commencement of projects. Zoning is hindered by the fact that most of the land is freehold with absolute ownership. Thus, restricting the use of private land by the county physical planning office may be a problem. Land tenure system has been a major impediment in managing physical development and land use in Kimilili's peri urban areas. In view of these findings the study concludes that there is an urgent need to adopt effective management regulations to curb uncontrolled expansion of Kimilili town to avert food insecurity.

5.4 Recommendations

Based on the conclusion of the study, the following recommendations are suggested:

5.4.1 Physical development efforts in peri urban areas should embrace the basic tenets of development growth management. They should anticipate the rapid development which characterize peri urban areas and make provision for directing and managing it.

5.4.2 Develop a policy framework that recognizes the role of peri urban agriculture as part of the urban green ecosystem and as part of the overall urban spatial structure of urban settlements.

5.4.3 Regarding land tenure, mandates and decision-making powers of different authorities should be made clear to avoid overlaps in drawing plans and implementation of responsibilities.

5.5 Suggestion for further Research

The following areas are recommended for further research:

5.5.1 Research to be conducted to establish the extent to which development control is applied to check urban sprawl in small and medium sized urban centres in Kenya.

5.5.2 Research to be carried out to establish the effect of urbanization on land tenure system in peri urban areas.

5.5.3 Research to be conducted to establish the influence of land rents on peri urban land use pattern.

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APPENDICES

APPENDIX 1: Work plan 2020-2021

ACTIVITY	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY
Proposal writing	✓	✓	✓	✓	✓						
Reconnaissance						✓					
Data collection						✓	✓				
Data analysis								✓			
Report writing								✓			
Discussion and presentation								✓	✓	✓	

APPENDIX 2: Budget

S/No.	Description	Costs
1	Research permit	5,000.00
2	Research assistants	50,000.00
3	Principal researcher	150,000.00
4	Logistics (Transport, maps, etc.)	750,000.00
5	Stationary	20,000.00
6	Typesetting, printing and binding	30,000.00
	GRAND TOTAL	**330,000.00**

APPENDIX 3: HOUSEHOLD QUESTIONNAIRE

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF ARTS AND SOCIAL SCIENCES

DEPARTMENT OF GEOGRAPHY

PREAMBLE

I am Kwemoi James Kimtai, a Master of Arts Geography student in the department of geography at Masinde Muliro University of science and technology, Kenya. I am currently undertaking research on: Effects of growth and development of Kimilili town on peri urban land use. I am kindly requesting your participation in the study by completing this questionnaire.

The information collected from this study is strictly meant for academic purposes and will be treated with utmost confidentiality. You are therefore requested to provide accurate information. Kindly respond to the questionnaire by ticking in the appropriate boxes or by filling in the required information. Your cooperation will be highly appreciated. Do not write your name or phone number on this questionnaire.

Thank you.

Questionnaire No…………………...Date of interview…………………………...

Ward…………………   Sublocation……………………………………...

SECTION 1: BACKGROUND INFORMATION OF THE RESPONDENT

Instructions: Please select the questions by ticking (√) appropriately in the brackets or by filling in the information where necessary

1. Gender: Male [ ]   Female [ ]

2. Age (years): 26-35 [ ]   36-45 [ ]   46-55 [ ]   Above

   56-65 [ ]   66 and above[   ]

3. Academic qualification

None [ ]   Primary [ ]   Secondary [ ]   College [ ]

     University [ ]

4. What is your occupation?

……………………………………………………………………….

SECTION 2: HOUSEHOLD BACKGROUND AND DEMOGRAPHIC DETAILS

5. What is the composition of your household?

No family [   ]   Nuclear family [ ]   Extended family [ ] Polygamous [ ]

6. What is the total number of family members in your household?

…………………………………………………..

7. Have you lived in this area since birth?

Yes [ ]   No [ ]

If your answer in 7 above is No,

    (a) where were you living before you settled in this area?

    (b) For how long have you lived in this area?

………………………………………………………..

    (c) What motivated you to move into this area?

Employment [ ]   Marriage [ ] Business [ ]   To farm [ ]

Others [ ] specify…………………....

    (d) Why did you prefer to reside in this area to residing in the town center?

Housing quality [   ]   Affordable rent [   ] Peaceful environment [   ] Other [   ]

Specify…….

8. Do you own the land where you reside? Yes [ ]   No [ ]

  If your answer in 8 above is Yes,

(a) What is the size of the land?

¼ an acre or less (   ) More than ¼ an acre but less ½ an acre ( ) More than ½ an acre but less than 1 acre (   ) 1-2 acres (   ) More than 2 acres (   )

(b) How did you acquire the land?

 Inheritance [ ]   Leased [ ]   Purchased [ ] Others [ ] Specify……………….

9. What is the nature of the land ownership?

      Freehold [ ]   Leasehold [ ] Customary inheritance [ ]

   Squatting [ ]   Others [ ] Specify…………………………

10. What is the distance from your land to the town center?

0-0.5km ( )   0.5-1km ( ) 1 -2km ( ) 2-3km( ) 3km and above ( )

11. Are the lands in the area you reside sub divided before being sold?

Yes [ ]   No [ ]

If the answer in 10 above is Yes

(a) Was your land part of a bigger parcel that was subdivided?

Yes [ ] No [ ]

(b) If your answer in 10 (a) is Yes,

(c) What was the main use of land before your acquired it?

Bare [ ] Farming [ ] Residence [ ] Commercial Others [ ] Specify………………...

(d) What is the main use of your land currently?

Farming [ ]   Residential [ ] Commercial [ ] Unused [ ]   Others [ ]
Specify…………….

(e) If you are putting your land under multiple uses, estimate the percentage under:

Farming [ ]   Residential development [ ]   Commercial development [ ]

Unused land [ ] Others [ ] Specify

12. What is the main challenge you are encountering in developing your land?

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

SECTION 3: LAND USE CHANGES IN PERI URBAN AREAS OF KIMILILI TOWN

13. Are there land use changes in your area of residence?

Yes [ ]   No [ ]

 If the answer in 12 above is Yes,

(a) In the table below, please, name the land use changes and reasons for change.

Previous land use	Current land use	Reason

(b) Have you changed the use of your land before? Yes [ ]   No [ ]

If Yes,

(c) What was the land use before? …………………………………………………..

(d) What is the current use of land? ………………………………………………

(e) What informed the change?...

14. On a scale of 1-4 indicate the extent to which you practice the following land use activities.

	Great Extent	Moderate	Low	No Extent
Agriculture use				
Residential use				
Commercial use				
Agriculture/Residential				
Agriculture/Commercial/Residential				
Recreation and Hospitality				
Education				
Health				
Burial site				

SECTION 4: SOCIO- ECONOMIC EFFECTS OF LAND USE CHANGES ON

PERI URBAN HOUSEHOLDS

15. What is your households' source(s) of income? (Choose all that apply.)

Formal employment [   ]   Informal employment [   ]   Farming [   ]   Family business [   ]

Others [   ] Please specify…………………………………

16. Have land use changes affected your source of income? Yes [   ] No [   ]

(a) If yes,

How are you copying with these changes?...

APPENDIX 4: INTERVIEW QUESTIONNAIRE FOR LAND OWNERS

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF ARTS AND SOCIAL SCIENCES

DEPARTMENT OF GEOGRAPHY

This is an interview guide to collect data on the study titled "**Effect of growth and development of Kimilili town on peri urban land use**". The information collected from this study is strictly meant for academic purposes and will be treated with utmost confidentiality. You are therefore requested to provide accurate information. Thank you.

1. What was the size of your land in acres 10 years ago?

……………………………………………………………………………………………

2. To what use was your land 10 years ago?

Agriculture [   ]   Residential [   ]   Commercial [   ]   Others   [   ]

Specify………………………………

3. Have you sold any of your land?

Yes [   ]   No [   ]

4. Which categories of people have obtained land from you during the past 10 years?

Farmers [   ]   Commercial developers [   ] Residential developers [   ] Others [   ]

Specify……………………….

5. What is the approximate size of the land they acquired?

………………………………………………………………………………………

6. To what uses are the lands currently being put into?

Agricultural [   ] Commercial [   ]   Residential [   ]   Industry [   ]

Recreation [   ]

7. In your opinion, what causes these changes in land use?

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………

8. Have you noted any problems as a result of land use changes?

Yes [   ]   No [   ]

If Yes, what are some of the problems?

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………

9. What informs your decision to sell your land?

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………

10. In your opinion, which land use has been affected more by land use changes in this area?

…………………………………………………………………………………………………

…………………………………………………………………………………………………

…………………………………………………………………………………………………

…………………………………………………………………………………………………

…………………………………………………………………………………………………

APPENDIX 5: INTERVIEW SCHEDULES FOR PHYSICAL PLANNING OFFICER

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF ARTS AND SOCIAL SCIENCES

DEPARTMENT OF GEOGRAPHY

This is an Interview guide to collect data on the study titled '**Effect of growth and development of Kimilili town on peri urban land use'**. The information collected from this study is strictly meant for academic purposes and will be treated with utmost confidentiality. You are therefore requested to provide accurate information. Thank you.

1. For how long have you worked in Kimilili town?

2. In your opinion, is Kimilili town experiencing urban sprawl?

Yes [ ]   No [ ]

Please, explain your answer in 2 above.

3. Which peri urban areas in the town are currently experiencing sprawl?

4. In your considered opinion, does urban sprawl affect peri urban households?

Yes [ ]   No [ ]

If yes, how? Briefly explain…………………………………………………………

5. Is development in peri urban areas authorized by the county planning department?

Yes [   ]   No [   ]

Please explain your answer…………………………………………….

6. Is there selling of land in peri urban areas of the town?

Yes [   ]   No [   ]

If the answer is yes,

(a) Are the lands zoned before selling?

Yes [   ]   No [   ]

Please explain your answer …………………………………………………

(b) Are the lands sub divided before being sold?

Yes [   ]   No [   ]

Please explain your answer…………………………………………………..

7. Which of the following explain urban sprawl of Kimilili town?

Population growth [   ]   Lack of land in the town center [   ] High prices of land in the town center [   ] Planning restrictions in the town center [   ]

 Others [ ] Please specify……………………..

8. What measures has the department put in place to check urban sprawl in the town?

…………………………………………………………………………………………..

a) Have any of the measures been effective?

Yes [ ]   No [   ]

Please explain…………………………………………………………………..

b) What specific planning tools have been used to prevent urban sprawl development?

…………………………………………………………………………………………………

……………………………………………………………………………

c) Have these tools been effective?

Yes [ ]   No [   ]

Please explain………………………………………………………….

9. Does urban sprawl affect peri urban land uses?

Yes [ ]   No [   ]

Please explain your answer………………………………………………….

10. Do you think that the change in land uses has affected the livelihoods of indigenous peri urban communities?

Yes [   ]   No [   ]

If yes, please briefly explain………………………………………………….

11. What causes these changes in land use?

…………………………………………………………………………………………………

…………………………………………………………………………………………………

…………………………………………………………………………………………………..

12. With respect to land use change and urban growth in Kimilili peri urban areas, what is the role of your office?

……………………………………………………………………………………….……………

…………………………………………………………………………………………………..

13. Are you aware of the current land use changes in the peri urban areas of Kimilili town?

Yes ( )   No ( )

If yes, which land use conversion is prevalent?

……………………………………………………………………………………….……………

……………………………………………………………………......................................

14. What are the factors contributing to land sub division and land use change in the peri urban areas of Kimilili town?

………………………………………………………………………………………………

………………………………………………………………………………………………

15. Which laws and regulations do you apply when dealing with land use change and urban growth in Kimilili town?

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16. From your experience, what are the implications of land sub division and land use changes in the peri urban areas?

…………………………………………………………………………………………………..

…………………………………………………………………………………………………..

17. Which challenges do you encounter when enforcing land use and urban growth regulations?

18. Do you involve the public in developing land use and urban growth regulations?

Yes ( )   No ( )

If yes, how has been the response?

19. Which initiatives have you put in place to ensure informed and sustainable urban planning in Kimilili town?

APPENDIX 6: INTERVIEW SCHEDULES FOR SUB COUNTY LANDS OFFICER
MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF ARTS AND SOCIAL SCIENCES

DEPARTMENT OF GEOGRAPHY

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1. Briefly, explain the role of your office in land urban land administration

2. With respect to land sub division, land use change and urban growth what is your position as an office?

3. What considerations do you make when dealing with land subdivisions and land use change?

4. Which laws and regulations do you rely on when making such decisions?

5. What do you consider to be the main factor(s) informing land use change in the peri urban areas?

6. Which other institutions do you liase with when making decisions and what are their roles?

7. With respect to peri urban areas of Kimilili town, what challenges do you encounter when executing your duties?

8. In your opinion, has your office been effective in discharging its mandate in the peri urban areas of Kimilili town? Explain your answer.

9. What do you think are challenges facing indigenous land owners in peri urban areas of Kimilili?

APPENDIX 6: INTERVIEW SCHEDULES FOR SUBCOUNTY AGRICULTURAL OFFICER, KIMILILI.

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF ARTS AND SOCIAL SCIENCES

DEPARTMENT OF GEOGRAPHY

This is an Interview guide to collect data on the study titled '**Effect of growth and development of Kimilili town on peri urban land use'**. The information collected from this study is strictly meant for academic purposes and will be treated with utmost confidentiality. You are therefore requested to provide accurate information. Thank you.

1. What are the main roles of your office?

2. Which problems do farmers in peri urban areas face?

3. What was the average acreage size of farms in the peri urban areas 10 years ago?

4. What is the current average acreage size in the peri urban areas?

5. What accounts for the phenomenon in (3) and (4) above?

6. In what ways does (5) affect the livelihoods of peri urban communities?

7. Is there a policy to protect agricultural land from invasion by other land uses?

8. If yes, how effective is the policy in protecting agricultural land in the peri urban areas?

9. If No, what other measures are employed by your office to protect agricultural lands?

10. What is your perception towards the land use changes you have observed?

11. What measures are you employing to control changes in peri urban land use?

APPENDIX 7: AUTHORISATION LETTER FROM MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

Tel: 056-30870
Fax: 056-30153
E-mail: dps@mmust.ac.ke
Website: www.mmust.ac.ke

P.O Box 190
Kakamega – 50100
Kenya

Directorate of Postgraduate Studies

Date: 20th April, 2021

Ref: MMU/COR: 509099

Kwemoi James Kimtai,
GEO/G/01-52677/2018
P.O. Box 190-50100
KAKAMEGA

Dear Mr. Kimtai,

RE: APPROVAL OF PROPOSAL

I am pleased to inform you that the Directorate of Postgraduate Studies Board has considered and approved your Masters proposal entitled: *'The effect of Growth and Development of Kimilili Town on Peri Urban Land Use'* and appointed the following as supervisors:

1. Mr. Nalyanya Wasike   – SASS, MMUST
2. Dr. J. W. S. Mabonga   - SASS, MMUST

You are required to submit through your supervisor(s) progress reports every three months to the Director of Postgraduate Studies. Such reports should be copied to the following: Chairman, School of Arts and Social Sciences Graduate Studies Committee and Chairman, Department of Geography and Graduate Studies Committee. Kindly adhere to research ethics consideration in conducting research.

It is the policy and regulations of the University that you observe a deadline of two years from the date of registration to complete your Masters thesis. Do not hesitate to consult this office in case of any problem encountered in the course of your work.

We wish you the best in your research and hope the study will make original contribution to knowledge.

Yours Sincerely,

DEAN
SCHOOL OF GRADUATE STUDIES
MASINDE MULIRO UNIVERSITY
OF SCIENCE & TECHNOLOGY
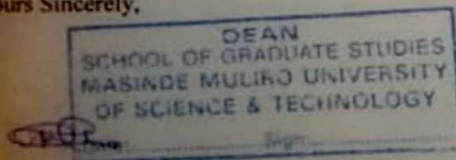
Dr. Consolata Ngala
DEPUTY DIRECTOR, DIRECTORATE OF POSTGRADUATE STUDIES

APPENDIX 8: RESEARCH PERMIT

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION

Ref No: **733773**

Date of Issue: **09/July/2021**

RESEARCH LICENSE

This is to Certify that Mr.. JAMES Kwemoi Kimtai of Masinde Muliro University of Science and Technology, has been licensed to conduct research in Bungoma on the topic: THE EFFECT OF GROWTH AND DEVELOPMENT OF KIMILILI TOWN ON PERI URBAN LAND USE for the period ending : 09/July/2022.

License No: **NACOSTI/P/21/11621**

733773

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR
SCIENCE, TECHNOLOGY &
INNOVATION

Verification QR Code

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