

**URBAN SPRAWL AND ITS IMPACT ON THE MORPHOLOGY OF HOMA BAY  
TOWN**

**By**

**ODONGO, KENNEDY OTIENO**

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**DEPARTMENT OF URBAN AND REGIONAL PLANNING  
FACULTY OF THE BUILT ENVIRONMENT AND DESIGN**

**UNIVERSITY OF NAIROBI**

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**DECLARATION**

This Research Project is my original work and has not been presented for a degree in any other university.

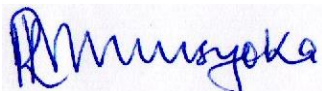


Signed.....

Date.....12/05/2022.....

ODONGO, KENNEDY OTIENO  
(Candidate)

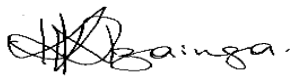
This Planning Research Proposal Project has been submitted for examination with my approval as the University Supervisor.



Signed.....

Date.....13/05/2022.....

Dr. Rose Musyoka  
(Supervisor)



Signed.....

Date.....13/05/2022.....

Plan. Hellen Nzainga  
(Supervisor)

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## **ABSTRACT**

Rapid urbanization is experienced across the developing world with the fastest growth in Sub-Saharan Africa. The migration of people from rural to urban areas in search of better education, jobs, and higher living standards is one of the major factors influencing the urbanization process over time. This has also been the case in Homa Bay town and its hinterland where the increasing rate of urbanization has resulted in changes in the morphological patterns of growth contributing to sprawl. To investigate these changes, this study was guided by the following objectives: To analyze the form and structure of growth of Homa Bay town over time; To assess the drivers of urban sprawl in Homa Bay town; To investigate how urban sprawl has impacted the morphology of Homa Bay town, and to propose the possible planning interventions towards controlling the urban sprawl of Homa Bay town. To achieve these objectives, both spatial and non-spatial methodological techniques were applied. The morphological pattern of growth was identified and modeled using readily available remotely sensed data for the years 2005, 2009, 2014, and 2021. The spatial analysis included morphological growth pattern identification, supervised land use/land cover classification, and spatial and temporal change analysis. Stratified and purposive sampling procedures were applied through which questionnaires, interview guides and observation checklists were employed important tools in the collection of relevant information within the two sub-locations of Arujo and Asego. Study findings indicate a significant rate of urban growth and morphological change from the year 2005 to 2021. The major transport links have registered linear morphological patterns, while radial, clustered and scattered patterns are found around the hilly areas, informal settlements, and rural areas respectively. Development of a comprehensive GIS-based County Spatial Plan with enhanced development control measures; implementation and enforcement of various policies; encouraging infill, vertical, and compact development, as well as the introduction of Urban Service Boundary (USB), are the key measures proposed in this study to curb urban sprawl.

## **DEDICATION**

*I dedicate this work to my family and the people of Homa Bay County.*

## **LIST OF ACRONYMS**

**AU:** African Union

**C.O:** Chief Officer

**CBD:** Central Business District

**CEO:** Chief Executive Officer

**CEC:** County Executive Committee Member

**CIDP:** County Integrated Development Plan

**COVID 19:** Corona Virus Disease 2019

**CSP:** County Spatial Plan

**DFT:** Decentralized Treatment Facility

**DP:** Development Plan

**EACC:** Ethics and Anti-Corruption Commission

**GDP:** Gross Domestic Product

**GIS:** Geographical Information System

**GOK:** Government of Kenya

**GPS:** Global Positioning System

**HOMAWASCO:** Homa Bay Water and Sewerage Company

**ICT:** Information and Communication Technology

**KMTC:** Kenya Medical Training College

**KNBS:** Kenya National Bureau of Statistics

**KPLC:** Kenya Power and Lighting Company

**KRA:** Kenya Revenue Authority

**Ksh:** Kenya Shilling

**MoHB:** Municipality of Homa Bay

**NEMA:** National Environment Management Authority

**NGOs:** Non-Governmental Organizations

**NHIF:** National Health Insurance Fund

**NSP:** National Spatial Plan

**NSSF:** National Social Security Fund

**PDP:** Part Development Plan

**PDQ:** Process Data Quickly

**PIDs:** Preliminary Index Diagrams  
**PIN:** Personal Identification Number  
**PLUPA:** Physical and Land Use Planning Act  
**RDZs:** Restricted Development Zones  
**RS:** Remote Sensing  
**SDGs:** Sustainable Development Goals  
**SPSS:** Statistical Package for Social Science  
**TDR:** Transferable Development Rights  
**UGBs:** Urban Growth Boundaries  
**UN HABITAT:** United Nations Human Settlement Programme  
**UN:** United Nations  
**UN-DESA:** United Nations Department of Economic and Social Affairs.  
**USA:** Urban Service Area  
**USB:** Urban Area Service Boundary  
**USGS:** United States Geological Survey

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# CHAPTER ONE

## INTRODUCTION

### 1.1. Overview

According to World Bank, over 50% of the world's population lives within the urban areas today and the number is expected to rise by 1.5 times to 6 billion by the year 2045 (World Bank, 2020). The increase in the rate of urbanization has contributed to various challenges related to the demand for affordable housing, well-connected transport systems, infrastructure, basic services, and job opportunities. World Bank report explains that the expansion of the urban land consumption has been outpacing the population growth by as much as 50%. These have caused pressure to be placed on the resources that are available, requiring local officials to prepare for expansion and provide fundamental services, infrastructure, and affordable housing to accommodate the growing population (World Bank, 2020).

According to Filho and Sobreira (2005), inadequate planning and administration frequently make it possible for cities in developing countries to urbanize. High development pressure and a lack of affordable land availability are contributing to the creation of unplanned, impulsive areas, which primarily occur in disadvantaged areas (Baud, et al., 2008). Localization of such areas as well as understanding their heterogeneity and development dynamics has become a great challenge for the local authorities and has become a global concern (Martinez, et al., 2008). Ayonga (2015) explains that the observed differences in the cost of development between the city and its ranges may lead to the creation of speculative zones within the suburban areas making the developers maximize their profits. He expounds that developers within the cities do bear some extra costs related to the zoning and planning permissions as opposed to the city fringes where planning is lacking or ineffective (Ayonga, 2015). Bourne (2001) argues that rapid growth makes the municipalities become overwhelmed in planning and delivering appropriate important social services and also makes them unable to finance infrastructure.

Urban sprawl is seen as a sort of urban growth that depends on the process of development (Almeida, 2005). While Conninah and Darkwah (2016) see it as one of the major effects of transformation that results from population agglomeration within urban areas, Allen and Lu (2003)

explain that sprawl has been the cause of the decreased agricultural land, spoiling of the water quality, and experienced rate of air pollution. Fenta et al. (2016) also point out that the need for favorable infrastructures like transportation, water, sewage, and other facilities like housing, commerce, health, schools, and recreational areas is directly related to the unprecedented rate of growth in the urban population that is being experienced worldwide.

According to Bruegmann (2006), the term "urban sprawl" was first used in Britain during the interwar period before being adopted by the US. When it was originally used, it symbolized a rising disdain for the unusually large-scale home building at lower densities than those normal in the more established and central portions of the cities. Its use has remained quite derogatory. The author continued by defining urban sprawl as the unplanned, dispersed, low-density, automobile-dependent development on the periphery that threatens to destroy open spaces, consume agricultural land, raise utility costs, weaken social life, increase inequalities, deplete natural resources, and harm the environment. According to Alttieri et al. (2014), urban sprawl is mostly caused by poor urban planning and the conversion of existing open spaces into constructed areas, both of which have detrimental long-term effects on the environment.

Fathi et al. (2020) draw attention to the fact that the chaotic sprawl development of cities around the world has led to a variety of patterns connected to the spatial organization of cities and their main structures, which has led to the loss of uniqueness of the structure of cities. According to Mokhatarzadeh et al. (2012), urban expansion has increased the scale of cities, which has greatly contributed to the emergence of physical-spatial complexity within the towns, making it difficult to understand and analyze the basic framework of cities and their morphology.

According to UN-DESA (2011), the African Urban population grew on an average of thirteen million people per annum between the years 2005 and 2010 and is projected to reach 25 million per annum between the years 2045 and 2050. Sub-Saharan Africa is typically acknowledged as the region that is urbanizing the fastest, with an estimated 472 million people living in urban areas and an annual urban growth rate of around 3.6% (UN, 2008). Over the following 25 years, it is anticipated that this number will triple. (Saghir & Santoro, 2018). According to a UN-HABITAT (2016) research, this region has an urban growth rate that is about 5 percent higher than that of Latin America and Asia, and the biggest percentage of urban people in the world is known to reside

in slums. Hove et al. (2013) expound that Rural-urban migration acts as the primary driver of population growth in most of these urban areas and this has resulted brought about the expanded demand for built infrastructure contributing to the infill of the undeveloped spaces and development into the rural zones.

According to Nabutola (2012), urban development in Kenya has mostly taken place without the support of a coherent national urban development framework, which has resulted in issues with segmented ideas of urban development, economic growth, and rural development. UN-HABITAT (2006) points out that despite the Physical Planning Act of 1996 delegating planning duties to local governments and the fact that the most recent Nairobi master plan was created in 1973, economic and physical planning were never integrated with land use and land taxation. The urban settlement within Homa Bay town has faced significant planning difficulties as a result of urban sprawl, including inadequate recreation facilities, poor road conditions, mixed developments, inadequate water supply, pollution, inadequate housing units, poor waste water disposal, encroachments onto the restricted areas, a lack of sanitation facilities and the requirement for public facilities like cemeteries, as well as a lack of health facilities (UN-HABITAT, 2010).

The Sustainable Development Goal (SDG) number 11—which encourages the development of cities and communities that are inclusive, safe, resilient, and sustainable—was challenged in this regard by the experienced rate of increase. Uncontrolled and uncoordinated improvement of cities or metropolitan area (Johnson, 2001) and encroachment of rural land by urban land use affects the spatial segregation between urban and rural areas (Liu et al., 2011). It moreover leads to changed rural landscape with significant implications for agriculture and food security (Bristow & Kennedy, 2013).

## **1.2. Statement of the problem**

Towns and cities being major sources of innovations play a huge role in the creation of employment opportunities and economic growth. Massive obstacles, such as access to basic infrastructure, increasing air pollution, and inadequate housing, are being faced in these places due to the tendency of rapid urban growth (UN., 2017). It has been reported that most of the urban areas around Lake Victoria have experienced rapid urban growth rates ranging from 3-7% per



annum (UN-HABITAT, 2010). This has resulted in straining in the agricultural sector resulting from competition from the world markets as well as reduction of farm lands (Ibid)

The Homa Bay municipality's Strategic Urban Development Plan (2008-2030) was created under the direction of UN-HABITAT. This plan is aimed at supporting the urban planning programs and water and sanitation projects and guiding development initiatives and projects within the municipality. However, despite having this plan, the town has experienced haphazard urban growth and this has in turn resulted in unplanned and uncoordinated morphological patterns of urban developments. Due to the insufficient provision of numerous basic services like roads, water supply, sewerage reticulation, and solid waste management, the natural and human surroundings have degenerated to varying degrees, which has facilitated the growth of squatter and informal settlements in urban areas. With residents residing in subpar homes and settlements brought about by the proximity of the informal settlements zones, the municipality also experiences disconnect between housing development and community facilities.

Within the town's informal settlement zones, fishing has historically been the main traditional source of income (UN-HABITAT, 2010). The increased growth of the population has highly affected the sector resulting in the overexploitation of fish in Lake Victoria. Water pollution has also been the norm of the day with the water hyacinth menace being seen in the lake. With the direct release of raw sewage into the lake leading to increased water contamination and improved proliferation of the water hyacinth, the lack of off-site and on-site wastewater treatment has essentially contributed to the breaking apart of the natural quality.

Due to the insufficient provision of numerous basic services like roads, water supply, sewerage reticulation, and solid waste management, the natural and human surroundings have degenerated to varying degrees, which has facilitated the growth of squatter and informal settlements in urban areas. The foregoing factor has made people buy land in the suburbs where land is of lower price and of freehold tenure as opposed to the town center where land is expensive, most of it is under leasehold tenure and the process of acquisition is difficult. In this regard, people usually opt to move out of the town center and build their own residential homes on the outskirts while depending on the town for daily operations. With the absence of a comprehensive urban development plan

for the entire municipality to control upcoming development, the peripheries of Homa Bay town have continued to witness uncoordinated morphological patterns of growth over time

### **1.3. Research Questions**

The research aims to respond to the following queries:

1. What form and structure of growth has Homa Bay town adapted over time?
2. What drives the growth of Homa Bay town towards its outskirts?
3. How has urban sprawl impacted the morphology of Homa Bay Town?
4. What planning interventions can be adapted to control urban sprawl in Homa Bay Town?

### **1.4. Research Objectives**

The objectives of this study are:

1. To analyze the form and structure of growth of Homa Bay Town over time.
2. To assess the drivers of urban sprawl in Homa Bay town.
3. To investigate how urban sprawl has impacted the morphology of Homa Bay Town.
4. To propose possible planning interventions to control urban sprawl in Homa Bay town.

### **1.5. Scope**

This study aims at establishing how urban sprawl has impacted the morphology of Homa Bay town over time. The scope of this study will be Homa Bay Township and its peripheries, where transformative changes in terms of form and structure of development have been experienced. Geographically, the boundary of study will be informed by the approved development plan for Homa Bay town which was developed by the Ministry of Lands, Housing and Urban Development and approved in the year 1992.

## **1.6. Justification**

It is evident from the reviewed pieces of literature that a lot of research on urban sprawl has been done all over the world by various scholars. In Kenya, most of the research has focused on the major poles such as Nairobi, Mombasa, and Kisumu but few have been done on the secondary towns. In this regard, my study intends to analyze the knowledge gap which exists between the western theories and Africa on the drivers of urban sprawl and especially how urban sprawl impacts morphological growth patterns of satellite towns with the focus being on Homa Bay Town.

## **1.7. Definition of terms**

**Sprawl:** Alludes to a low density, auto-dependent land development, which takes place on the edges of an urban zone (Soule, 2006).

**Urban Morphology:** Is the study of how cities are shaped, as well as the forces and processes that influence how they develop through time. (Oliveira, 2020).

**Land Use:** A function that people apply in ensuring land is effectively managed.

**Development Control:** An instrument giving guidelines for the size and use of structures, as well as the air space around them and serves as a tool for general natural quality management. (Nwachukwu, et al 2015).

**Urban Form:** Physical aspects of urban areas, such as settlement size, shape, density, and arrangement (Williams K. , 2014).

**Urban structure:** The configuration of land use in urban areas, as well as the division of public and private space, level of connectivity, and accessibility, are all included in this definition (Batty & Longley, 1994).

## CHAPTER TWO

### LITERATURE REVIEW

#### 2.1 Morphological Structures of Urban Settlement

It is important to study urban centers morphological structure because the majority of municipal growth plans are undergoing arbitrary alterations. According to Anas et al. (1998), urban centers have been dispersing during the past 200 years, although decentralization has recently taken on a more polycentric form, with the majority of work being done within of concentrated employment centers while there is population dispersion. They make it clear that the urban centers located within urban regions constitute an interdependent framework with size distribution and specialty design that is very similar to the framework seen in cities that are part of a larger area or the entire country's economy.

The wild scattering of economic activities caused by the changing financial relationships within and between firms are said to have continued outside the center leading to the current changes being observed within the urban structures. Broadcast communications, information-intensive exercises, deregulation, and worldwide competition have resulted in changes within the work that firms do in-house and in how those capacities are spatially organized. The internal interactions can now be dealt with through media transmission inside inaccessible workplaces. (Anas, et al., 1998).

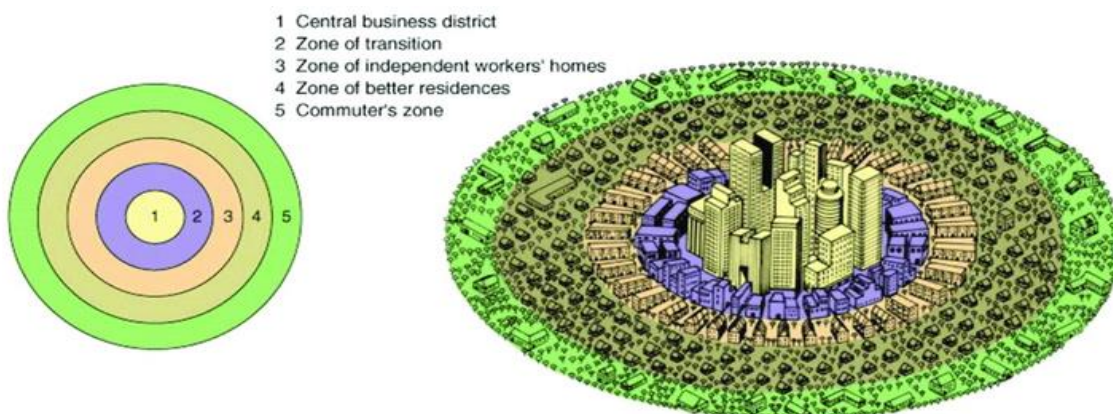
Agglomeration of economies makes first-mover advantage and territorial specialization that are imperative in universal trade (Krugman, 1991a). Any agglomerative constraint places a premium on land at a certain zone enabling the spatially concentrated capital arrangement of buildings and complementing the need to create discrete focuses in space because of the seen increasing return to scale in production (Anas, et al., 1998). There are a few complex and expressive models of urban land use that have been developed over time. Here are some examples of these models:

## Concentric Ring Model

This model was discovered by sociologist Ernest Burgess in 1924 in his observation and study of the state of Chicago. The model classifies the growth of an urban settlement into five ring concentric functional zones depending on class, natural assimilation, and socioeconomic urban landscape. The interior part of the ring characterizes the central business district (CBD) called Zone 1. Zone 2 surrounding Zone 1 contains industry and poorer and deteriorating housing as well as encroachment by businesses and acts as a transitional zone. Zone 3 surrounding Zone 2 represents the zone of independent workers and is established for the blue collar labor force both wage earners and manual laborers. The outermost ring, Zone 5, represents the commuter zone and is made up of white collar workers who can afford to live further out from the CBD. Zone 4 is made up of the middle class, which is characterized by newer and larger homes (Mandich, 2019).

This model appears interactive because the inward zones started to encroach on the outer zones as the city grew. It states that when the socioeconomic structure spreads out from the core business district, the poorer classes dwell near the city center while the wealthier classes live farther away because they commute. The outward extension of the CBD invades adjacent private neighborhoods causing them to extend outward resulting in a concentric model. This model is criticized to be too simple and is constrained in a historical and cultural context. It does not take under consideration the transformations which may happen in cities in future.

*Figure 1: Graphic Illustration of Burgess' Concentric Zone Model*

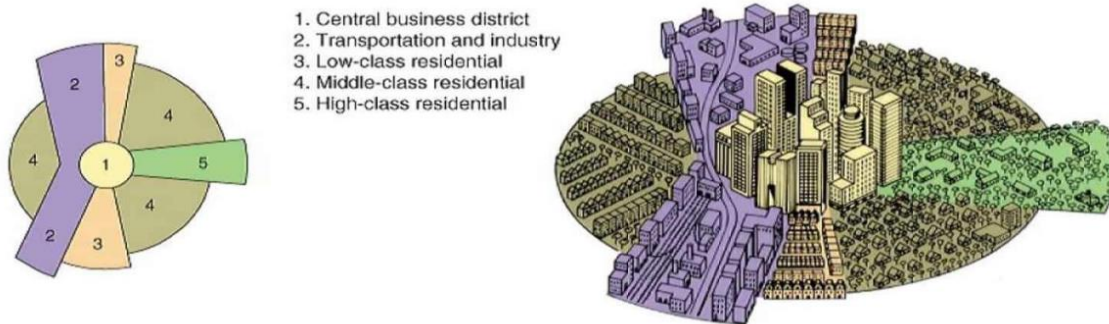


*Source: (Mandich, 2019)*

## Sectoral Model

This model demonstrates the spatial organization of activities inside an urban region. It was introduced by financial analyst Homer Hoyt in 1939. It was applied in America where technological improvement in transport and communication made the city start improving by creating a pie-shaped urban structure. Here, cities are the seed to create in a wedge-shaped form rather than the rings as it appears in the concentric zone model.

*Figure 2: Graphic Illustration of the Hoyt Sectoral Zone Model*



*Source: (Faridi, 2020)*

This concept is crucial for illuminating why specific regions of a town or city are more desirable for particular activities, regardless of whether this is a result of chance, geography, or the environment. These activities develop into wedge-shaped segments that resemble cities as they flourish and spread outward. The model clarifies why some activities develop within the frame divisions that radiates out along the main travel line and why these activities are considered to be the same throughout the sector due to the purpose and functions they serve. Hoyt observed that from the edge of the city, the land rent for the residential, commercial, or industrial might be constant. This pattern has drawn criticism, nevertheless, because it frequently ignores features and contemporary transportation designs that control or coordinate development.

Examining the Hoyt model employed in this research is crucial to understanding why low-income inhabitants frequently choose to live close to railroad lines, commercial areas, and business districts that are inhabited by the less fortunate who typically work in manufacturing to cut down on transportation costs. The model also explains why middle-income residence people live further away from the industrial sectors and in areas that allow for easy accessibility to the CBD that can be desirable to low-income earners. As for the high-income residential, the model clarifies why

costly housing is at the greatest distance from the industrial sectors and the CBD with less vehicular activities, cleaner air and sounds in its surroundings.

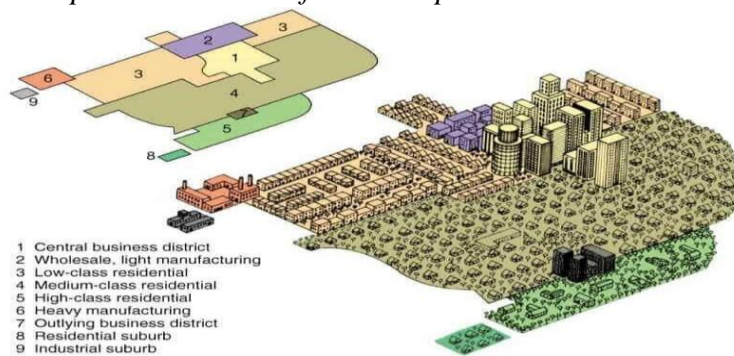
### **Multiple Nuclei Model**

In 1945, Chauncy Harris and Edward Ullman created this model to predict how the city pattern would change as automobile use increased. The model is founded on the realization that there are multiple centers around which an urban or rural area's activities are centered. While some activities try to preserve their status, others are drawn to particular nodes. As cities expand and urban development takes place, there are various changes that the city will undergo. The urban form and urban footprints will get modified over time with compatible activities getting attracted closer to each other whereas the opposing activity keep from congregating in one place. Looking at the structure of Chicago, Harris and, Ullman explain that the complexity of the city structure is a result of growth being experienced over time which influences the central area and the city center.

They reasoned that even a town or city could begin with a single commercial district, but over time, the activities there start to disperse, and the structure changes. These scrambling activities draw residents from the nearby zones and act as smaller nuclei in themselves whereby they expand in size and start influencing the land value and the growth of activities around them. This theory examines the relationships between settlements of various sizes and their associated economic activities (markets) pertaining to the people in order to study the spatial arrangements, trends, and dispersion of urban areas and human habitation (PlanningTank, 2020).

In this study, this model will be applicable in explaining why some nodes such as the beaches, fish landing sites, and facilities attract more residents from the rural areas leading to new spatial patterns of growth.

Figure 3: *Graphic Illustration of the Multiple Nuclei Model*



Source: <https://planningtank.com/settlement-geography/multiple-nuclei-model>

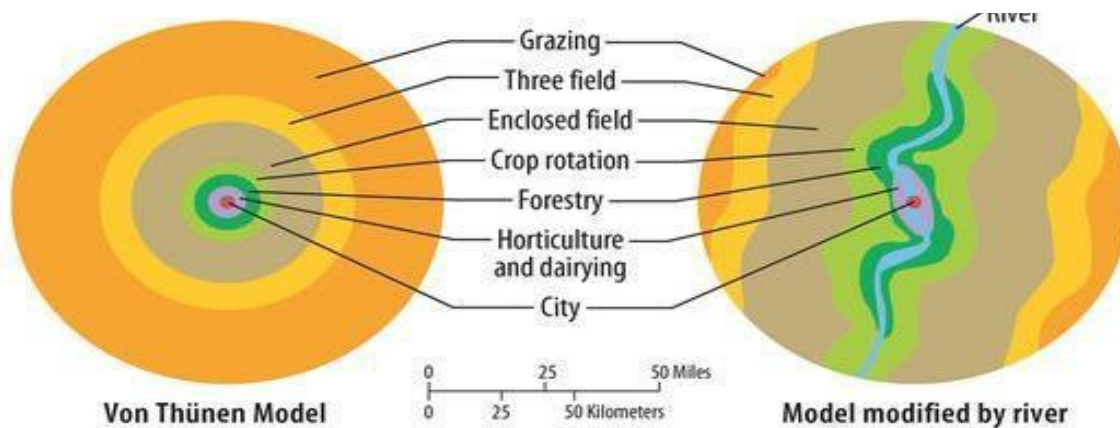
### **Von Thunen's Model of Land Use and Agriculture**

Johan Heinrich von Thunen created the concept in 1826 for his book "The Isolated State" because he was interested in how farmers utilized different areas of the land to grow various crops. He stated that the positioning of the crops in one area was determined by the cost of the land as well as the cost of transportation. In his model, the city or urban center has formed the center which was described as a region where one could buy or sell products and make money. Von Thunen established that the land use pattern depended upon competition between different types of agriculture for the use of specific pieces of land which was being restrained by the competitions which arose from the return gotten from the investment from the land (Sinclair, 1967). Four bands of agricultural activity, including (1) intensive agriculture and dairying, (2) forestry, (3) expanding wide-field crops, and (4) cattle, ranching, and grazing, would surround the city. Anything exterior of the ring would be considered to be wilderness.

The central location of the city and the concentric design of the agricultural land usage around a market that absorbs all the excess products that must be transported were the main presumptions used to develop this model. Understanding this model in this study will demonstrate how the spread of an urban region impacts rural land use further from a built-up area. Sinclair (1967) clarifies that even though urban expansion becomes irregular and chaotic, it is apparent that it forms uniform agricultural configurations within the neighborhoods.



Figure 4: Graphic Illustration of the modified Von Thunen Model.



Source: <https://www.pinterest.com.au/pin/546483736031824570/>

### Urban Realm Model

According to this paradigm, there are large conurbations and associated urban regions that function separately in certain aspects but are connected to one another within the wider metropolitan sphere. The Multiple Nuclei Model was improved upon by James E. Vance Jr. in 1964, and it describes that in the period of post eras, rapid population diffusion was experienced to the suburbs leading to the creation of a nucleus (realm) which in turn reduced the volume of interaction between the central city and the rural hubs driving to creation the of suburban cities.

The model explains that five factors are taken into consideration when determining a realm's nature: the topographical landscape of the area, which may include water constraints and mountain ranges; the size of the city overall; the volume and intensity of economic activity occurring within each realm; the accessibility within each realm in relation to its primary economic function; and finally, the inter-accessibility from across various suburban realms (Langefeld, 2019). Understanding this study's model will be essential to explaining how growth occurs in suburban regions, and how certain functions such as hospitals, schools, and public facilities that are found within the CBD can be moved to be peripheries so that their functions can be felt in those areas other than relying mostly on the CBD.

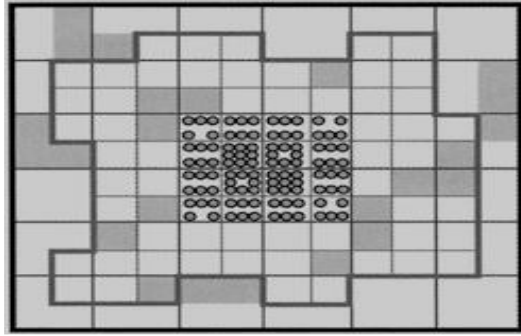
## **2.1 Morphological Forms of Urban Sprawl**

The physical characteristics of an urban setup usually describe the morphology (Burton et al., 2000). Dempsey et al. (2009) define the urban form as the spatial arrangement of elements that encompasses physical qualities such as size, shape, scale, density, land uses, building types, urban block layout, and distribution of green spaces. Pendall (1999) defined urban sprawl as a broad category of urban forms, encompassing leapfrog or scattered development, continuous rural development, and strip development.

According to William (2014), the morphological pattern of development in the United Kingdom (UK), during the Post-War period was highly influenced by the historical settlement and infrastructure. During this time most of the development followed the infrastructure which in turn led to a complex pattern of urban form and infrastructure across the UK (Williams K. , 2014). These morphological forms of urban developments included:

### **Compact Development**

According to Mahriyar and Rho (2013), compact urban development has three indicators namely which cover density, mixed-use, and intensification. They explain that these indicators include variables for residential development, built-up density, and population density. Williams (2014) reviews that this morphological configuration of development is beneficial for: containing a built-up area; protecting rural, agricultural, and open landscapes; regenerating already existing centers; revitalizing historic spaces and buildings; effective and efficient utilization of the available infrastructure; minimal usage of car travel by embracing non-motorized transportation lowering the Carbon monoxide (CO<sub>2</sub>) emissions; improved access to social services and employment; and provision of various cultural experience. However, he argues that this development pattern also leads to an increment in house prices; reduced urban green spaces and gardens; breaching of infrastructure capacity; increased commuting patterns resulting in CO<sub>2</sub> emissions; and exposure to poor urban air. Figure 5 represents the spatial appearance of clustered morphological development.



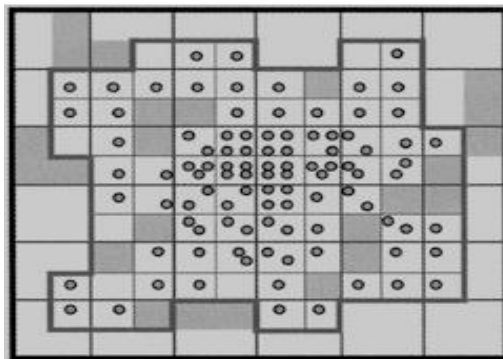
*Figure 5: Clustered morphological model*

**Source:** (Yass, 2017).

### **Scattered/ Dispersed Development**

This morphological pattern of urban growth happens when new upcoming developments take shape within an urban center in a spaced and isolated manner. (Yass, 2017). The pattern separate high-density and low-density populated areas from each other despite the existence of good transport networks (ibid).

According to William (2014), this morphological development pattern is advantageous for providing homes for rural families; supporting the rural economy; Suitable use of the existing buildings and rural brownfield sites; fulfilling lifestyle aspirations, and access to good air quality for the families. However, he explains that this morphological pattern leads to an increased change in the rural landscape and functions; insufficient infrastructure for the generated car users; and variation in local and home needs. Figure 6 below illustrates the spatial appearance of scattered morphological development.



*Figure 6: Scattered morphological model*

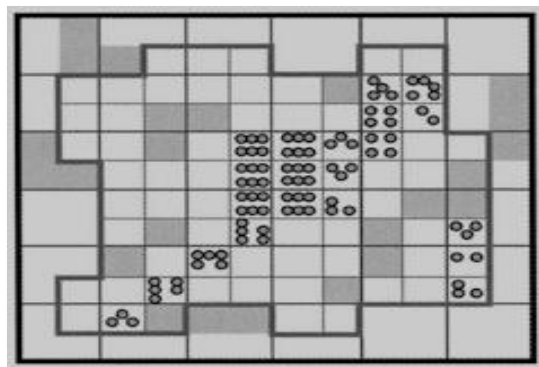
**Source:** (Yass, 2017).

## Linear Strip Development

The concept of linear development was officially launched by Spanish philosopher Soria Y Mata back in the year 1880-ies. The background and the development concept for this pattern were based on the idea of building a light rail line that was intended to connect the city of Madrid with several other settlements within its surrounding (Antyufeev & Antyufeeva, 2019). Urban planning configurations were reformed in the 20th century with the advent of high-speed transportation, which sped up regional urban growth.

According to Antyufeev & Antyufeeva (2019), the strip development concept is advantageous since it may be implemented without significantly altering areas that have previously been developed. Secondly, it is merited for closing connections and creating greater flexibility with nature and the natural landscape. It is also open for growth since the main structures are close to the main lines resulting in easy accessibility in terms of time or effort.

However, the extension of the linear development pattern leads to suffocation of longitudinal arteries and the actual dismemberment of its areas largely gets detached from each other resulting to deterioration of quality of life within the peripheral areas (Antyufeev & Antyufeeva, 2019). Figure 7 below represents the spatial appearance of the linear morphological pattern of urban growth.



*Figure 7: Linear morphological model*

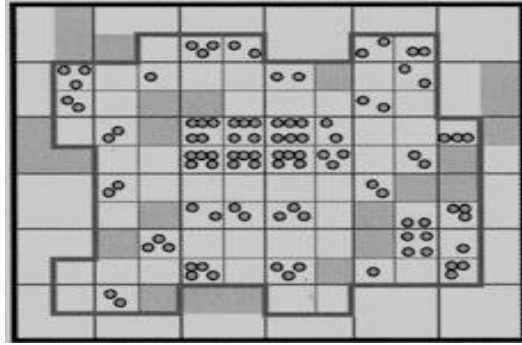
**Source:** (Yass, 2017).

## **Leapfrogging Development**

Leapfrog morphological development happens when developers skip settling in urban areas and instead rush to buy land in the suburbs, ignoring the bare expanses behind them regardless of the presence of infrastructure and other facility establishments (Heim, 2001). According to William Alonso's theory on land rent, the cost of land in metropolitan areas is higher than that of land outside of urban centers. Understanding the spillover impact of leapfrog development and urban sprawl upon institutional failures in Pakistan. Akhter & Noon (2015) explains that leapfrogging type of development occurs when the low-income earning migrants coming from rural areas opt to settle in areas where land is inexpensive, out of the metropolitan area and where the literacy level relating to land issues are relatively low. They similarly expound that leapfrog development happens as a result of developers' likings to build on spacious unused land at the city's periphery than to construct new homes in the older locality (Akhter & Noon, 2015).

However, other than urban sprawl, inefficient land allocation affects leapfrog development which in turn contributes to the land suitability issues. In this case, huge parcels of land are left behind after builders hop over the real estate contributing to patches of developments that are interconnected by road infrastructure resulting in a wastage of land (Akhter & Noon, 2015). Planners and developers also get involved in the construction of homes in form of continuous heaps along the edges of the town by hopping over estates and purchase land away from the metropolitan areas leaving uninhabited and void parcels of land in the way. With this expansion, the interior areas of the town experience environmental degradation and a reduction of farmlands and open spaces (Ibid).

As a manifestation of urban sprawl, Burchell, et al., (1998) and Akhter & Noon, (2015) explains that leapfrog development incorporates low-density developments, linear developments alongside dispersed development. They also argue that the economic condition of a town, improvement in technologies that affects the industrial locations, federal homes mortgage programs, density of periphery areas, transportation subversions, and personal automobile and management policies fosters leapfrog developments which consequently promote sprawl. Figure 8 illustrates the leapfrog morphological pattern.



*Figure 8: Leapfrog morphological model*

**Source:** (Yass, 2017).

## **2.2 Drivers of Urban Sprawl**

Given that the variables causing urban sprawl differ throughout different cities, regions, and nations, it may be challenging to pinpoint the ones that have the biggest impact. Christiansen & Loftsgarden (2011) categorizes these compelling forces into five groups namely: demography, socio-economy, politics, technology, and environmental (Christiansen & Loftsgarden, 2011).

### **Demographic Drivers**

Metropolitan sprawl is shown by Cobbinah and Darkwah (2016) as one of the primary outcomes of changes brought on by population agglomeration in urban areas. Currently, the unprecedented rate of urban sprawl being seen in most cities is said to be caused by the growth in the urban population internationally (Shao, et al., 2020). The phenomenon of urban sprawl, according to Fenta et al. (2017), is the result of a situation in which the population of an urban center grows along with the demand for infrastructures like transportation, water, sewage, and other facilities like housing, commerce, health, schools, and recreational facilities. (Fenta, et al., 2017).

In Europe, EPSON FOCI (2009) and Glaeser et al (2001) represent population growth as the primary cause of urban sprawl. According to Christiansen and Loftsgarden (2011), population increase and inflow into the cities are correlated with economic expansion that results from industrialization and technological advancement in Europe. After the Second World War, the population of the continent of Europe rapidly rose, which exert pressure on the housing market as well as more expensive housing. This phenomenon is described as urbanization. With the

increasing population, urban problems such as traffic, congestion, air pollution, noise, and crime could occur. These factors may force the population to choose to move out of cities to areas such as the suburban regions where these problems are less felt than in the central region (Christiansen & Loftsgarden, 2011).

The EEA-FOEN (2016) report explains that the extent of a built-up area within an urban area is highly affected by the size and structure of the population in that when all the factors are kept constant, and the population becomes larger, there will be the need for more space to accommodate all the people. Omasire et al., (2020) expound that the urban sprawl affects the third world countries more than the developed nations due to their increasing population which leads to the depletion of the available resources mostly the agricultural land which surrounds the town centers. According to Rothwell et al., (2015), the high rate of urbanization which has characterized the growth and development of cities within the developing countries has influenced the rapid physical development and expansion of periphery areas, as urban dwellers relocate to the cities' peripheries.

### **Culture and market forces**

Along with other economic considerations like market pressures, property prices, and transportation costs, cultural influences and individual residential preferences have a stronger influence on development than the population increase (Christiansen & Loftsgarden, 2011). Couch and Karecha (2006) and Wu (2006) describe that the younger generations—particularly the single ones—move towards the city to study or work, and the long-established couples as well move away from the inner city to more remote regions outside of the urban areas because they want to establish themselves in a more rural residential area with wide lots of access to green spaces. They go on to say that the main reason is that housing costs are lower outside of urban areas, giving families the chance to build the larger homes they want with access to gardens rather than the smaller ones they could afford if they lived in the inner city. Ayonga (2015) expounds that the cost of development of areas outside the city areas is low as compared to the Suburban areas and these have attracted the speculative developers from the city who maximizes on the low-cost-high return benefit leading to sprawl.

## **The shift in Gross Domestic Per Capita (GDP)**

The gross domestic product (GDP) per capita measures the number of output produced by each local citizen. Higher incomes are typically associated with purchasing detached homes outside of metropolitan centers rather than apartments inside of them, which contributes to sprawl (EEA-FOEN, 2016). According to Torrens (2006), the socioeconomic driver of urban sprawl can be influenced by a metropolitan area's GDP. For instance, a larger GDP will lead to more people owning and using cars, which enhances their everyday lives in terms of ease, accessibility, and apparent time savings. Glaeser and Khan (2004) consider automobile dependency as the main driver of urban sprawl in that, where there is a well-developed road network, the availability of automobiles will facilitate flexibility, accessibility, and time-saving. Residents' preference to live on the outskirts or at the edge of sprawling urban regions has an impact on their further development (Verburg, et al., 2004). Good road networks provide accessibility outside of urban regions, luring businesses there and enhancing the appeal of suburban areas to business, commerce, and residents, boosting economic competitiveness. (Rogerson, 1999).

## **Development of Transport and ICT Infrastructure**

The presence of cars and the development of transport networks such as the roads act as a major cause of the influx within cities. According to Christiansen and Loftsgarden (2011), there has been a revolution in Europe in terms of the population's prospects for mobility. For long distance travel, people mainly relied on walking while using trains or boats for shorter distances. Because there were few opportunities for long commutes, this factor prevented residents from living far from their places of employment, which led to more densely populated cities.

In an American study done by Glaeser and Khan (2004), cars came out to be the main explanation for urban sprawl. They clarify that the city will expand if transportation costs are reduced. This is due to the fact that traveling in a car is faster than using public transportation. Additionally, they allow passengers to be transported farther distances in the same amount of time and across longer distances without an increase in transit time. They make it clear that if transportation costs are decreased, the city will grow. This is because driving a car is more expedient than using a bus or a train. Additionally, they enable the transportation of passengers over longer distances without an increase in transit time as well as over shorter distances in the same amount of time (Glaeser &



Khan, 2004). Urban sprawl can be accelerated by flexibility and ICT growth since professionals are more likely to work remotely and have better possibilities to do so as technology advances (Christiansen & Loftsgarden, 2011).

### **Land Speculations and Differences in Land prices**

Land speculation also acts as a key driver towards the process of sprawl. Clarke and Harvey (1965) explains that those who own land at the containment boundary of an urban area do hold on the land with the hopes of its prices per unit meter will increase. These factor makes the land in question temporarily unavailable for developments making the investors to move to the fringes where people have are ready to sell due to the huge economic returns that comes with it. These authors blames the aspect of speculation as the main reason for the experienced high and premature subdivisions which happens next to the settled areas (Clarke & Harvey, 1965).

The difference in land prices also acts as a major contributor for people and activities to move to the outskirts of the town centers. Pendall (1999) and Hwang & Woo (2020) contends that Urban sprawl happens primarily when the land prices in the hinterland become lower than that of core areas which are characterized by an increase in the use of private vehicles. When examining Eldoret town, Musyoka (2004) makes the case that formally serviced land is often out of the price range of the town's lower-income citizens because the cost per unit in these high-density, formally served areas appears to be higher than in low-density areas. This was highly attributed to the shooting up of the land prices after the introduction of the basic services in high service areas as compared to the low-density areas characterized by poor service provision and land prices are relatively low (Musyoka R. , 2004)

As explained under the Von Thunen theory, the differences in urban and rural land prices influence the rate of development along the peripheries of an urban center. Sinclair (1967) elaborates that urban land today is much more valuable than once within rural areas since urbanization mostly happens within urban land uses than in rural areas. With the increase in the value of such urban land, developers acquire land in the outskirts from the original proprietor due to speculation. This land that the owner assumes might become urban land, at some point changes its value and further brings the aspect of anticipation because of its association with the urbanized centers (Sinclair, 1967).

## **Informal land Delivery Systems.**

According to Leduka (2004), low-density urban sprawl marked by excessively large illegal plots has been exacerbated by informal land supply procedures. Although informal areas include a wide range of plot sizes, he contends that if they become commercialized and consolidated, there will be additional land subdivisions, leading to smaller portions than those found in the formally designed regions. The formal land delivery mechanisms that were established in African cities by the colonialist and post-colonial governments have been unable to keep up with the rising demands brought on by the continent's rapid urbanization (Leduka, 2004).

According to Rakodi (2004) the informal land delivery system transpires as a product of, first, the flunked formal tenancy and land management systems and secondly, its efficacy in conveying land for housing owed to its user-friendly qualities and social legality. Musyoka (2004) notes that because of how well this indigenous system was known, it was thought that only a formal system based on a European model could possibly provide a framework for urban growth and protect the rights of urban property owners. However, Leduka (2004) expounded that this system was based on a legal concept and administrative system which led to most of the land within the urban development particularly those that were seized by the poor ending up being equipped and fostered outside the state regulatory framework.

Reviewing the informal land delivery procedures in Maseru, Lesotho, Leduka (2004) contends that the number of households or individuals per plot tends to be higher in areas with informal delivery systems, particularly in the more central location and consolidated areas, and that obtaining urban plots is typically reliant on information gleaned from the already-existing groups of friends, relatives, and friends in addition to local administrators.

In Kenya, after the independence, the government encouraged its citizens to pool their resources and jointly purchase land from the former white settlers. Because of this, several land buying groups/companies/ cooperatives emerged (Odhiambo & Nyangito, 2002). Musyoka (2004) explains that the objective of these land buying groups was to purchase land for their own immediate use, either for residential or agricultural use so as to subdivide and sell at a late date. For Eldoret town, Musyoka (2004) argues that despite initial large farms being formerly acquired from their initial settlers, the subsequent subdivision and transfers did not follow the formal

procedures with informal transactions experienced in extended areas of the municipality such as Langas, King'ongo, Munyaka, Yamumbi, Kipyego, Huruma, Kimumu, Kamkunji, Kapyemit, and Maili Nne all of which farms were held under the freehold tenure.

According to Rakodi (2004), the informal land delivery system is advantageous for the provision of land in sizable volumes while meeting the housing demands of innumerable socio-economic groups essentially the poor and women. However, its shortcoming entails inappropriate locations of settlements which are characterized by poor layouts with deficiencies related to the provision of universal infrastructures and services (Rakodi, 2004).

### **Land Tenure System**

The land market and the development of the urban land are highly influenced by the urban land tenure systems. Musyoka and Musoga (2015) note that the arrangement of land tenure acts as the determinant of the supply of the level of urban land where its management and access determine the kind of property rights one may have with respect to land. Land tenure refers to the mode in which land is held or owned by an individual, group, or state (Payne, 1997). In Kenya, land is classified as either Public, Community, or Private land owned under the leasehold tenure system, customary/communal ownership, or freehold tenure systems, respectively, according to Article 61 of the Constitution of Kenya 2010 (Kenya T. R., 2010).

#### ***Leasehold tenure***

This tenure system involves a situation where land or property is rented to an individual under contract by the state, company, or individual for a stated period of time (Payne, 1997). Payne also notes that the terms involved in this tenure system determine the use of the land and length of the lease where the lessee enjoys a number of rights specifically on the use of land which is supposed to be attached to the lease by the tentative landlord being the government who have powers towards control over use and development of land. The effectiveness of the leasehold tenure towards the provision of a sense of security stimulates investments where the land owner and settler can be given the opportunity to make self-reliant tenure provisions permitting the local authorities to focus on the delivery of services and offer motivations for land development through tax concessions (Ibid).

According to Musyoka and Musoga (2015), it is expected that the administration of the public land by the use of leasehold tenure should result in high productivity but this is not the ideal situation that happens. However, being that urban land is such a valuable item, the persuasion for corruption and nepotism are immense where the leases may be given to the under-serving individuals who may not put the land to its optimal use. These beneficiaries are also found to engage in speculations and hence may leave their land undeveloped for several years as they await buyers, leading to the leapfrog type of development pattern. They also argue that this tenure system can act as a better form of land management than the freehold tenure since the regulatory framework gets implemented with reference to the lease conditions.

### ***Freehold tenure***

This is described as a tenure system where a private individual or corporate entity has absolute ownership and the right of selling and transferring the land relies on the owner (Musyoka & Musoga, 2015). According to Payne (1997), the owner has full rights to transfer, consign, mortgage, use, and rights in this type of ownership, unless otherwise limited by law. He says that having a freehold tenure is advantageous since it increases the collateral value of the property or other assets and gives the tenants full access to the improvements' additional benefits.

Giving low-income populations a freehold title can dramatically improve their social standing and an urban area's safety. This allows the tenants to realize the significant increase in land or property prices and market to higher-income groups, according to Payne (1997). By allowing higher-income groups to access commodities and services meant for low-income groups, interferes with land market value and the outlook for the general public. There have been challenges related to the implementation of the planning and development control where the informal subdivisions allowing low-income households to have access to the plots intend to impact negatively on the urban form. These subdivisions are seen to be defying the land management regulatory framework and result in very high densities (Musyoka & Musoga, 2015).

### ***Customary tenure/ communal ownership***

Communities designated by their ethnicity, culture, or other shared interests hold title to and control over community land in a condition known as communal ownership (Kenya T. R., 2010).

According to Payne (1997), this type tenure system grants for individual rights of occupation and use with the right of alienation being shared where leaders belonging to the community have the right to allocate each family head land for habitation and cultivation with reference to the family needs. As a result of the growing population pressure, community land has been transforming from being sacred into a commodity which has resulted in some difficulty in achieving equity in reference to land distribution (Payne, 1997; Musyoka & Musoga, 2015).

Musyoka and Musoga (2015) and Rakodi (2004) argue that this type of tenure can be advantageous in releasing pressure on land by local authorities. It provides options for future residential developments and allows for the supply of land to group members and other individual entities. For this reason, there can be justification as to why sprawl happens outside the boundaries managed by the local authorities.

In Enugu, Nigeria the land-owning communities formally subdivide and sell part of their farmlands (Ikejiofor, 2004) but in Gaborone, Botswana, the land is subdivided but the sale is strictly prohibited unless one disguises it as “inheritance” (Kalabamu, 2004). In this case, Rakodi (2004) contends that the sale of customary land aids to a significant volume of plots for housing development in cities and provides security of tenure to non-members of groups entitling them to free allocation. This process has made it possible for the indigenous groups that have no remaining undeveloped land to obtain plots since they are at lower prices than the parcels with ownership documents purchased through formal private markets.

Musyoka and Musoga (2015) elaborate that the majority of the land in areas inside the municipalities in Eldoret, Kenya, is privately owned and that its distribution is dependent on the willing buyer/willing seller. As a result of population pressure, the medium-sized parcels ranging from 20 to 100 hectares are sold to the individuals of land buying groups who further subdivide into smaller plots of 10-20 hectares and again into much smaller sizes for the ones immediately outside the municipal boundary. Further subdivisions were seen between the years 1978 and 1988 when the municipal boundaries expanded making the plots to be subdivided yet into smaller plots averaging between 0.1-1.0 ha. These forms of subdivisions were seen to have been contributed by the mounting pressure on urban residential land from the growing urban population. These

subdivisions made the large farms transform into sprawling informal settlements without adequate basic services, land for a public purpose, and other social amenities (Musyoka & Musoga, 2015).

### **Political and regulatory framework**

Urban sprawl benefits greatly from the political dynamics and regulatory framework. Politics has the authority to enact laws that can encourage sustainability and stop urban development (EEA-FOEN, 2016). The planning systems, legislative stipulations, subsidies, and taxes can increase or moderate the level of urban sprawl. For instance, in Germany, the government encouraged urban sprawl by providing a 50% tax break on investments in brand-new homes (Nuisl & Rink, 2005). Wiewel, et al. (1999) further explain how subsidies for transportation and the sale of cars contribute to urban sprawl (Wiewel, et al., 1999). The presence of public authorities within localities can decide how land is developed and managed. However, the inadequacy in management resulting from planning and political control may contribute to urban sprawl as well as unnecessary development (Christiansen & Loftsgarden, 2011).

PLUREL (2010) report explains that the political structure and spatial planning policy acts as the major factors in the control and regulation of land development. The political structure section of the paper explains how the link between community, regional, and nationwide levels of governance influences the decision-making process for land use planning (PLUREL, 2010).

Local regulations against development, according to Carruthers and Ulfarsson (2012), can stop scattered developments, but it will be difficult for municipalities to control land development in an area as a whole. Municipalities may have varying goals for land use, and their dispersed duties contribute greatly to urban sprawl. By the fact that strong planning control measures are effective toward the reduction and control of urban sprawl, Couch & Karecha (2006) explains that developers still often prefer the outside areas of the cities because the town centers generally have stringent requirements for planning which are difficult for some developers to achieve (Williams & Shiels, 2000).

According to Ayonga (2019), the informalities experienced in the less developed countries' urban and rural spaces are being driven by the use of planning theories and instruments which have been borrowed from the west. He explains that the ineffective planning in Kenya attributed to the lack

of planning and weak laws that guide planning have contributed to undesirable patterns of developments witnessed in Kenyan cities today. This has led to long traffic jams, poor land use connectivity, poor civic designs, slum settlements, the massive litter of solid waste, poor drainage systems land use conflicts, and urban sprawl (Ayonga, 2019).

### **Technological Drivers**

Prior to the industrial revolution, living and working quarters in towns or cities were close by. Due to the need for labor from major industries, people moved from rural to urban regions. Because there weren't enough drivers, employees favored to live in the residential neighborhoods close to the workplaces (EEA-FOEN, 2016). The availability of automobiles as a result of the amazing technological advancements of the 20th century reduced the significance of people residing close to their places of employment (Knowles, 2006), and more dispersed urban shape was strongly influenced by the high expense of living in urban areas and other factors. (Anas, et al., 1998). Hardill and Green (2003) explain that as technology development goes on, further innovations in communication technologies and automation have rendered people to work from home. This technological change has reduced the need for people to commute and has resulted in an even higher dispersion of dwellings units and further spread of the town.

### **Geophysical Drivers**

The geology and the existence of unrecoverable, unsustainable places like glaciers and lakes restrict the space that may be used for built-up areas, which lessens the likelihood of urban sprawl (EEA-FOEN, 2016). The expansion of urban and industrial areas is, however, less viable in hilly regions than on ground that has been recovered from the sea, according to Lo and Yang (2002). According to EEA-2016 FOEN's report, resource exploration could be a factor in urban sprawl. It highlights that the availability of fertile soils in the arable lands being located within flat areas acts as an important resource for agricultural production. Due to their low cost and pressure to be developed into residential or commercial districts, these lands are vulnerable to development and soil sealing if they are close to already existing metropolitan areas (Mann, 2009).

### **2.3 Effect of Urban Sprawl on Urban Morphology**

The negative and positive impacts of urban sprawl on both social and economic environments within an urban setup consequently increased making it to become a major concern. It has undesirable influences related to public health, quality of life, increasing urban pollution, vehicular dependency, and environmental dilapidation which can affect public amenities and social segregation (Jarrah, et al., 2019). However, it might have a benefits related to the economic growth, more living space, reduced crime rates, and community expansion among inhabitants (Oueslati, et al., 2015).

Urban sprawl has helped shape the way land is used. Unfavorable morphological patterns for the development of sustainable modes of transportation. This, in turn, aids to an increment in the number of private cars, expanded trip lengths, congestion, increased fuel utilization, and air pollution (Cobbinah & Amoako, 2012). According to Agyeman (2018), sprawl has a negative impact on the sustainability of the infrastructure, the social-spatial systems, and the natural environment. Cities and towns have been expanding due to sprawl, and it is becoming more and more common to see homes, businesses, and other types of infrastructure being built. The rapid conversion of wetlands, wildlife habitats, and natural, agricultural, and forestry landscapes into urban and industrial zones is inextricably linked to these changes in development (Agyeman, 2018).

Prince et al., (2006) argue that urban sprawl is a responsible cause of the endangerment of ecologically sensitive resources. He contends that it comes about in abuse, and disintegration of soil and water resources. As he explains that the uncontrolled and unrestricted population growth impacts the livelihoods within peri-urban areas where the arable lands assigned for cultivating are changed into development of concrete and private residential buildings. This activity affects farmers and their source of livelihood since their lands get lost to the real estate developers (Prince et al., 2006). According to Agyeman (2018), human habitations have an impact on and pose a threat to wildlife. The local ecosystem and quality of life are being altered as a result of land consumption and resource abuse, but the species of plants and animals are in danger because their feeding sites are being destroyed and temporary routes are being blocked (Agyeman 2018).



According to Bhat et al. (2017), the reduction in agricultural areas, open green areas, and surface waters is mostly attributable to the influence of sprawl. Technology advancements have contributed to the quick changes in land use and cover within the built environment, which have resulted in a significant emigration and the environmental devastation of metropolitan areas (Rasool, et al., 2018). With agricultural land being the richest land for many upcoming cities, they often get lost forever due to continuous urban development while the marginal ones that can be recovered in the future end up not compensating for their use and productivity (Bhat et al., 2017).

Expanded urban sprawl within the peripheries of urban centers engages the utilization of automobiles. These vehicles produce air pollutants such as ozone and air-borne particulates which are dangerous to the environment (Frumkin, 2002). Fewer possibilities exist in communities designed to encourage the use of automobiles for people to engage in physical activity, such as walking or cycling to school or work, which is essential for many different areas of health, including weight control, stress management, and cardiovascular health. Socioeconomically, urban sprawl through the use of automobiles can reduce water quality. By increasing the amount of surface runoff, vehicular oil spillage is channeled to the lakes and other water bodies through streams and rivers. This poor quality of water can be related to negative health challenges such as kidney and cancer diseases. (Frumkin, 2002).

According to some, a dispersed city encourages ways of life that reconnect people with nature without sacrificing the benefits of urban living (Ewing, 1997). Breheny (1996) asserts that by preventing overpopulation around a single center, the development of large, polycentric cities ultimately contributes to the realization of a more effective dispersal of social and economic activity.

Briggs (2007) explains that urban sprawl exacerbates social problems already present in cities when discussing the social and economic repercussions of sprawl. This is demonstrated by the coexistence of many social classes, which typically correspond with diverse ethnic or religious groupings. Cities in this region with decaying downtowns support the growth of sizable, hazardous urban ghettos (Briggs, 2007).

According to Kotchen and Schutle's (2009) interpretation of the connection between land use and local fiscal condition of local government, there will be an advance in the fiscal position of local

governments as urban population and urban density rise. However, the effect typically leads to a worsening of the fiscal situation when the population grows without increasing in density (Kotchen & Schulte, 2009).

Urban sprawl results in longer distances between people and a lower population density, which undermines the success of mass transit. This is due to either the high cost of infrastructure in urban centers for commuter rail and subways or the increased number of stops that render the urban bus transport system extremely inefficient. This causes the public transportation system to degrade, which in turn makes citizens more dependent on private vehicles for transportation (Camagni, et al., 2002).

Because of this, the center is harmed by the shift in transit, and as a result, the urban center's scattering process is accelerated. Weakened centers lose their ability to remain compact. (Schneider & Woodcock, 2008). According to Camagni et al. (2002), urban areas that rely on private vehicles for transportation and fail to create effective public transportation networks incur higher dispersion.

## **2.4 Planning Interventions in the Management of Urban Sprawl**

### **Growth Management Strategies**

The idea of regulating urban expansion to maximize land use gave rise to the phrase "growth management" in the United States back in the 1970s. It came into focus after World War II, when cities in Europe and the United States expanded quickly. This was followed by the unchecked spread of urban areas, which further contributed to the recent development of the sustainable development paradigm, making growth management an explicit goal of the two continents' spatial planning (Fertner, et al., 2016).

In order to manage urban growth, the USA adopted the Senate Bill 100 policy, which provided a mechanism for extensive land use planning (Seltzer, 2009). Concerns about the damage suburbanization posed to local agriculture and the timber industry, which would result in the loss of rural and forest area, served as the impetus for passing this statute. Pendall, et al. (2002) explain that new legislation resulted in the formulation of state-wide planning goals that mandated that all cities conform to the urban growth boundaries. The policies were designed deliberately to control

the spread of urban areas throughout the United States and other western countries who as well adopted the urban growth boundaries together with other containment measures that existed within their land-use planning laws and legislations. Urban containment policies, according to Pendall et al. (2002), aim to use at least three different tools to control metropolitan growth in the United States. These included: Greenbelts and Urban growth boundaries influencing the “push” factor, and urban service areas influencing the “pull” factors.

### **Greenbelts Strategies**

This is a restrictive urban confinement policy that employs the usage of a belt that is drawn roughly tightly around a city or other urban area that planners suggested would be challenging to change or rather be permanent (Bengston & Youn, 2006). In order to protect areas of land or water resources from the effects of development, Jabareen (2006) defines greenbelts as areas of maintained open space or areas with significantly fewer developments. As a prohibitive form of the urban containment policy, the idea of encompassing cities with a belt of agricultural land or other open spaces is seen to be an old thought dating back at least to the 13<sup>th</sup> century B.C. and Levitical cities of Palestine (Bengston & Youn, 2006). According to Bengston and Youn (2006), greenbelts can be used to generate social and environmental advantages in the form of amenities, recreational value, inheritance value, and protection of open space, agricultural land, natural resources, and services that sustain human life.

The greenbelt practice was seen to be actualized in Seoul, the Republic of South Korea where the green belt policy had been applied since the year 1971 under the authoritarian government of President Park Chung Hee where it was seen to have resulted in net worthy social benefits (Bae, 1998). Moreover known as the confined development zones (RDZs) in Korea, it was presented in the City Planning Law in the same year and was shaped in 1973 under the 1972-1981 National Comprehensive Physical Plan (Bengston & Youn, 2006). According to Bae, (1998), the establishment of Seoul’s greenbelt was implied to reply to seven key objectives namely: National Security; eradication of unlawful shanty towns on the edges of the town; control of urban sprawl; a decrease of rapid population growth and industrial concentration in the capital region; limiting the speculations within the metropolitan region; protection of agricultural land and promoting food security; and lastly the greenbelt was to guard to the environment and natural resources.

The greenbelt procedure, however, has long been regarded as a dubious open policy tool because of its implied adverse effects, including increased land and housing prices in urban areas that the greenbelt contains, decreased greenbelt land prices, loss or restrictions on development rights for greenbelt landowners, and increased urban congestion (Bengston & Youn, 2006). It has also been under criticism for the resultant havoc within the urban core since attempting to control growth within the urban area, exerts pressure on the housing, and due to the limited land supply the housing costs rise (Hall, 2002).

### **Urban Growth Boundaries**

An urban growth boundary (UGB), often referred to as the urban containment policy, is a boundary between urban and rural areas that uses regulatory tools like zoning to limit development outside of the urban bounds (Pendall, et al., 2002). The approach was used in the United States to account for growth for a predetermined time, ranging from twenty to thirty years (Pendall, et al., 2002). According to Staley et al. (1999), the UGB's main goals are to prevent sprawl, preserve open space, or support the rehabilitation of inner-city areas. They explain that the strategy operates under the six objectives namely: The preservation of open spaces and farmlands, the reduction of land use through smaller plot sizes and higher residential densities, the separation of rural and urban uses, the assurance of a smooth transition of land from agricultural to urban uses, the promotion of a sense of cohesive community, and the assistance in the reduction of infrastructure costs are all important.

UGBS are not that effective by just demarcating them but require the additional measure to ensure their applicability. As opposed to individual communities managing growth independently, elected officials in Oregon have a significant role in the management and adoption of the regional model. The metropolitan region as well does an inventory after every 20 years on the basis of demand for land review within the containment boundaries (Fertner et al, 2016), the same case applies to the Copenhagen finger plan developed based on the transport network. Most of the metropolitan management bodies have however combined UGBs with greenbelts which makes it more effective in the management of growth in urban areas.

This strategy is aimed toward the compact development of an urban area and has as well a negative impact on the economics, environmental sustainability, and social perspective of an urban

community in case not well actualized. This can be evident because when setting up, the house rent is likely to go up hence pushing the urban poor to the informal settlement which affects the quality of the environment leading to social decay (Nechyba & Walsh, 2004).

UGBs can be used to help local governments achieve their planning goals, such as improving transit viability by concentrating development, encouraging mixed-use development near residences and workplaces to reduce the number of car trips, maximizing the use of existing infrastructure, and minimizing the costs of new infrastructure, revitalizing downtowns and town centers, and maintaining the working land base, such as agricultural, rural, forested, and other natural areas (BC, 2013).

UGBs sound like the best approach to urban growth management as adopted in the western world but the question of our desires to urbanize because to them they are in different phases of urbanization and on regional approach in planning, the developing countries are still using urbanization as models towards regional growth so the question of their suitability and application arises. This brings in the need for the development of growth management approaches that suit our desire to achieve regional growth as we try to urbanize sustainably.

### **Urban Service Boundaries (USBs)**

An urban service boundary (USA) is a region within a municipal boundary that is formed under the comprehensive plan of the local government and included in the zoning or other land use rules and has the capability of providing access to public services like water, sewage, and transit (Leshner, et al., 2018). USBs signify the edge of the urban service area and delineate the line past which a city has chosen that its development in infrastructure ought not to expand (Pendall, et al., 2002). By limiting development outside the USB, there is a realistic strategy to reduce urban sprawl and thus increase densities (Leshner, et al., 2018). Urban sprawl is said to consume the greener spaces within the urban areas that were formerly set by the municipal area to act as school yards, playgrounds, public seating areas, areas to do public engagements, and vacant lots (EPA, 2018).

The local government will effectively create legal borders within which it is not allowed to perform its services by enforcing the law within the USBs. Leshner, et al. (2018) contend that the ordinance

should be composed in a way that will enable the local government to increase or decrease the urban service area in order to promote urban growth or prevent it.

### **Infill Development and Redevelopment**

Enhancing the appeal and quality of life in urban areas serves as a complementary method of urban management. Implementing urban regeneration initiatives, setting up running programs in underserved neighborhoods, and taking other rehabilitation steps should make the city center more appealing and less noticeable as the population declines, hence reducing urban sprawl (Fertner et al, 2016).

Because of the significant investments made in the city's urban regeneration over the past three decades, Larsen and Hansen (2008) explain that Copenhagen is currently going through a phase of re-urbanization, even though it was accompanied with gentrifications in some districts. Other than the new districts of Orestad, advancements were made at the central harbor through the designated urban organization, where numerous districts inside the city center underwent area-based regeneration initiatives. According to Fertner et al. (2016), integrating urban renewal initiatives, infrastructure improvements, and urban design measures into a larger urban development serves as a technique for relieving pressure on green spaces from development.

### **Supporting Rural and Agricultural Structure**

The forms of rural areas around an urban agglomeration are expected to vary. For example, the farms may be smaller and wider, and full-time agriculture and bigger plots of land may become economically unviable in the perimeter because land rentals are more than the outcomes of production (Rij, 2008). In some areas like the Netherlands, the policies go towards the promotion of increased farm sizes thus bringing competitiveness while in some areas comparable to Denmark, part-time farming is increasingly being practiced in metropolitan areas (Zasada, et al., 2011).

Land use rules including zoning, subdivision, and protection acts are therefore considered to be essential instruments for supporting rural and agricultural structures inside urban regions, according to Fertner et al. (2016). Urban development can be stopped and land speculation avoided with the help of clear laws and plans that can be properly carried out. In this way, the land use restriction on rural land might be integrated with an urban containment plan. Specific rules were

added in Oregon and Washington to protect rural land from development. In this case, the size of land within the rural areas has considerably increased in recent decades (Fertner et al, 2016).

### **Market-Based Economies**

Despite being frequently used, especially on rigorously planned developments, the market-based components are typically considered as having outstanding potential for moving development pressure and restraining urban growth (Fertner et al, 2016). According to Nuisl and Schlaack (2009), Taxes, subsidies, and transferable development rights (TDR) can be applied as an instrument for the control of urban development. Although tougher to use for a specific issue and governed by national law, taxes and subsidies are necessary for the common state of urban development and the operation of the planning system. The TDR is a market-based program that allows a willing buyer and a willing seller to exchange the right to develop a specific piece of land in a free-market setting. A preservation easement protects the sending location, while the property receiving the development right obtains an additional allowance within the built-up density (Kaplowitz, et al., 2008).

### **Coordinating and Co-operating across Administrative Boundaries**

Inter-jurisdictional engagement is viewed as a crucial tool for growth management because the pressure caused by urban development typically stops at administrative boundaries (Pallagst, 2007). According to the article of Jorgensen et al. (2011), at least three requirements must be met in order to carry out well-organized planning and guarantee balanced development. These include the need for a legitimate organization with regional expertise, conformity between various planning levels, and agreement on a strategy and the motivation to implement it.

Local governments determine which land use plans are legally binding, and occasionally they are given a lot of leeway within the generally intended local framework. In a broader sense, we can distinguish between two problems important for growth management. Initially, top-down compliance where overall vision and plans are reviewed and included into community level planning. The second concern is to the local level's involvement in the formulation of the vision or plan. Despite the expense of a very strict plan, a combined approach could substantially increase

the local levels' commitment to the regional vision. (Healey, 2007). The secret to efficient compliance amongst the various levels of administration appears to be a clear goal and technique.

## **Zoning and Land Use Planning**

Urban shape is frequently guided by zoning and land use planning, both of which are substantially less expensive. However, for them to be useful in growth management, a remarkable bargain of law execution and devotion is needed. Rezoning can be used to change urban pressures in addition to the restrictions for where specific land uses must be located (Fertner et al, 2016).

That approach has its challenges as well since the demand for land in urban spaces varies and it's hard to allocate land correctly but constant reviews are of essence for their effectiveness, there is also the aspect of shocks which are responsible for outward growth and shrinking of urban areas which are rarely planned for.

## **2.5 Theoretical Framework**

### **Natural Evolution Theory**

This theory was highly elaborated by Mieskowski and Mills (1993) in their explanations of suburbanization. They explain that wherever a city's employment was centered in the middle, around a harbor or a railhead, private residential renovations would entail working from the inside out. And to reduce the cost incurred in transportation, the land within the central regions of the city gets filled making the improvements open tracts of land within the suburbs. As a result, larger, more contemporary homes are built on the outskirts, and the income groups who can afford them choose to settle there.

These philosophers explain that the majority of the middle class apparently prefers larger single-family lots in the suburbs instead of denser multi-family homes inside the central city, and that their propensity to live in the periphery is motivated by transportation advancements and considerations of travel time. This theory emphasizes the demographic and lifecycle changes in that when the income level changes, the household and other attributes would induce the household demand for newer and larger housing which are located within the suburban and rural areas.



This theory is thought to place a strong emphasis on the separation between residential areas and the main workplaces, the effects of changing livelihoods over time, the need for new homes and land, as well as the diversity of the housing stock. Additionally, it takes into account other crucial aspects of transportation expenses, advancements in intra-urban mobility, and changes through time in the relative advantages of various income groups while traveling large distances to work (Mieskowski & Mills, 1993).

### **Flight from Blight Theory**

This idea highlights the importance of the core city's diminishing public services and lifestyle in comparison to suburban and rural areas (Nleya et al., 2017). It explains that amenities, distance, and land costs influence the choice of location of a household and the (Ibid). According to the hypothesis, suburbanization is being fueled by challenges with core city living, including crime, violence, and racial tensions, as well as poor public services and environmental quality. According to this idea, families that have the means to relocate from the city to the suburbs will do so in quest of a safer area, superior educational opportunities, nicer surroundings, and communities made up of others who lead similar lifestyles. In this study, understanding this theory will be very important in assessing how changes in household income influence the movement of residence from the inner city out to its peripheries.

### **Bid Rent Theory**

The amount of rent a user is willing to pay for a more convenient location but is willing to accept at a rate for a location that is further from the center built-up region is referred to as bid rent (Narvaez et al., 2013). This theory, which William Alonso first proposed in 1964, focuses on the investigation of how transportation affects land use and incorporates the core idea of urban economy (Chidi, 2019). The amount a household may pay for rent in a different area with different transportation costs is how Alonso defined the bid rent function in order to get the same level of satisfaction. Due to the relative expense of open land in the suburbs compared to areas closer to the CBD, this feature makes it possible to choose different dwelling spaces at different locations. It also makes it possible for higher income households to choose to live there (Watkins, 2020).

According to Chidi (2019), an urban site's rent rises in proportion to how easily it can be reached from a well-known place. According to Alonso's model, the real estate market, including retail and commercial applications, is prepared to pay more to live in the city center where there is a bigger concentration of people and activity and a tendency for it to be more active than other sections of the city. According to him, as the distance from the CBD or city center grows, the amount of land available for less money diminishes (Narvaez et al., 2013).

## **2.6 Legal and Policy Framework**

### **Sustainable Development Goals**

Goal 11 includes a section on urban sustainability. This goal aims to create inclusive, safe, resilient, and sustainable cities and human settlements. Urban areas are facing issues related to social exclusion, extreme poverty, unemployment, bad environmental conditions, and excessive greenhouse gas emissions as a result of the growing population there. The SDG 11's implementation will guarantee that everyone has access to essential services and housing that is appropriate, safe, and affordable inadequate housing has a detrimental influence on urban fairness and inclusion, urban safety, urban livelihood prospects, and the root of poor health. This will solve these issues.

Second, achieving this aim will solve the major issue of a safe, affordable, accessible, and sustainable transportation infrastructure that plagues emerging nations. Improvement of road safety by providing adequate infrastructure makes transportation easy and these act as the major reason contributing to sprawl since commuting to and from work place becomes easy and safe on the road improves. The achievement of SDG 11 will make it possible to plan and manage human settlements in a collaborative, integrated, and sustainable manner as well as to achieve inclusive and environmentally friendly urbanization due to the growing urban centers and municipalities in which the level of land consumption is increasing and surpassing the rate of population growth.

Urbanization-related risks include those related to poor planning, high risk exposure, environmental degradation, and climate change, as well as increased urban population and economic activity. SDG 11 promotes safeguarding the underprivileged and those who are in vulnerable circumstances in order to significantly lower the number of fatalities and those

impacted by such catastrophes. In addition, the goal ensures that everyone has access to inclusive, secure, and easily accessible public spaces that have a positive impact on property values. Retail expansion, efficient and effective mobility, town attractiveness, increased safety, social cohesion, equality, health and well-being (UN, 2018).

### **African Union Development Agenda**

The Organization of African Unity (OAU) established Agenda 2063 in May 2013 as a 50-year continental strategic framework for socio-economic and political transformation based on the AU's vision of an "integrated, prosperous, and peaceful Africa, driven by its own citizens and representing a dynamic force in the international arena." (AU, 2015). The Agenda 2063, which shared a strategic plan with the AU, had as its objectives an integrated, politically united Africa, effective governance, and respect for the rule of law. Along with caring for the children, it also aspires to assure development that is people-driven and depends on the potential that Africans, particularly women and youth, have to give.

In order to promote inclusive growth and sustainable development, the Agenda aims to: provide social security and protection; eradicate poverty; address income and opportunity disparities; create jobs; address the problems brought on by rapid urbanization and population growth by promoting improved housing conditions and access to necessities like water, sanitation, and electricity; transforming African agriculture; exploitation of the blue economy; and putting measures in ensuring management of the rich biodiversity, forests, land, and waters as well as applying adaptable measures towards addressing climate change. It calls for the preservation of the inland, terrestrial, coastal, and marine waters, equitable sharing and exploitation of the transboundary natural resources to the benefit of the citizens as well as new methods of farming as a result of climate change.

### **Kenya Vision 2030**

The goal of Kenya Vision 2030, a long-term development plan, was to transform Kenya into a newly industrializing, middle-income country that provides all of its citizens with a high standard of living in a secure environment (Kenya R. o., 2007). The vision was built on three pillars: economic, social, and political governance. These pillars served as a guarantee for macroeconomic

stability, continuity in governance reforms, increased equity and opportunities for the underprivileged to create wealth, infrastructure, energy, land reforms, technology and innovations, as well as other things.

Within the urban setup, there is a call for stability in terms of economic development with the key players being the local leaders and those from the national government. Advocating for infrastructure, energy, technology, and innovation within our towns leads to the improvement of livelihoods as well as increased opportunities for the poor living within the urban setup and this acts as a key contributor toward sprawl. The policy calls for land reforms since it is a key factor towards a rapid economic transformation of a place. It advocates for the respect of land property rights whether owned by communities, individuals or companies, or the government. The National Land Use Policy must be implemented, and the legal system must be strengthened, for the policy to be effective in resolving land conflict concerns.

### **Sessional Paper No. 3 of 2009 on National Land Policy**

This strategy was implemented to close the gap left by several conflicting land laws, which led to a convoluted system of land management and administration. The policy sought to guide the country toward the efficient, equitable, and sustainable use of land for both the present-day prosperity and the future generations. The policy offers a solution to the land-related problems caused by urbanization, such as fragmentation, poor land administration, disparities in land ownership, and poverty that has resulted in social, economic, and environmental problems like deterioration of land quality, homelessness and squatting, urban squalor, under-utilization and neglect of agricultural land, tenure security, and conflict.

The policy offers a framework that directs toward land accessibility, land use planning, environmental degradation, and the unplanned growth of informal settlements in order to address the issues with sprawl that affect the pattern and morphological form of development within an urban area. Additionally, the policy protects the rights of communities and individuals to own and control land usage and development on both private and customary lands. Additionally, it supports providing every citizen with the opportunity to access, occupy, use, and benefit from land, using land in a way that is economically viable, socially equitable, and environmentally sustainable,

operating land markets in a way that is effective, efficient, and affordable, and effectively using land and land-based resources.

### **Sessional Paper No. 1 of 2017 on National Land Use Policy**

This policy was developed with the goal of addressing crucial land use issues connected to business operations, environmental safeguards, habitations, food security, and climate change. Urban and rural communities in the United States have significant issues with inadequate land use planning, unsustainable industrial and agricultural production methods, poor environmental protection, and substandard cultural practices as a result of the growing urban population. This policy aims to develop policies that offer a legal, administrative, organizational, and technological framework for the best exploitation and production of land-related resources in a sustainable way in order to address these concerns. The policy calls for the mapping and documentation of all land uses as well as the development of land use plans at both the national and local levels that shall be strictly adhered to and enforced in order to ensure the efficient, fruitful, as well as sustainable use of land as well as address problems associated with land cover during the rapid urbanization process.

### **National Spatial Plan (2015-2045)**

This plan offers suggestions for the long-term spatial development of Kenyan regions through coordinated, integrated, sustainable, and balanced development mechanisms that will guarantee efficient, productive, and sustainable use of land, aims to address the issues related to sprawl that are highlighted in this document. As a strategy for addressing the challenges related to rapid and unregulated urbanization, environmental degradation, and skewed/ unbalanced development patterns and ensuring sustainable urban development, the NSP encourages county governments to embark on the development of plans that advocate for the protection of the rich agricultural land, conservation of the environmentally sensitive areas, urban containment as well as promotion of industrial developments. It aims at coming up with compact cities developed under the urban boundaries and cities/towns that observe smart and green urban growth towards the promotion of a healthy, aesthetic, and sustainable development that can bring about posterity, livability, and efficiency.

## **Homa Bay County Integrated Development Plan 2018-2022**

The Homa Bay County Integrated Development Plan (CIDP) 2018-2022 is the county's second-produced CIDP plan and aims to provide an effective performance framework as well as direction for development projects over a five-year period. The policy was informed by eight key pillars which were envisioned by the governor's manifesto some of them include trans-formative governance, food security, infrastructural growth and development, provision of clean potable water, exploitation of natural resources, provision of clean potable water, and provision of quality education.

## **Constitution of Kenya 2010**

This is Kenya's highest statute and it serves as the basis for all planning initiatives there. Additionally, it grants authority to oversee and regulate various land-based activities to various national and local government organizations.

Article 42 of Kenya's Bill of Rights, which deals with concerns related to urban development, states that every citizen has the right to a healthy and safe environment. Every citizen is also guaranteed a right to the best attainable standard of health, access to suitable housing, fair standards of sanitary conditions, and enough access to clean and safe water under Article 43. These key issues being experienced in an urban setup are what planning tries to address in ensuring sustainable development.

Under Chapter 5 of Article 61, which separates land into three main categories: public lands, community lands, and private lands, the people of Kenya as a whole as a country, as communities, and as individuals are given ownership of property. According to Article 60, all land in Kenya must be held, utilized, and managed in a manner that is just, efficient, beneficial, and long-lasting. This necessitates planning-related actions. According to Article 66, the state has the power to impose limitations on the use of any land for purposes of land-use planning, community safety, civil order, or defense.

Under Article 67(2a) of the Constitution, the National Land Commission was founded and given the ability to manage public land on behalf of the national and county governments. This was done to protect the management and use of public land. In accordance with Article 67(2h), the authority

is also mandated to oversee and monitor all national land use planning. The parliament is empowered to establish laws under Article 68(c) that specify the minimum and maximum acreage that can be held by private property, as well as the procedures for changing a property's classification.

### **Physical and Land Use Planning Act 2019**

This piece of legislation lays out guidelines for the development, use, regulation, and planning of land for a variety of objectives. It provides guidelines for creating development plans for zoning, urban renewal or redevelopment, directing and coordinating infrastructure development, regulating land use and land development, and providing the framework for coordinating numerous sectoral agencies. In order to address the difficulties associated with planning for physical and land use development in metropolitan areas, it is important to construct the National Physical and Land Use Development Plan, which will include the policies, instruments, and measures required. The legislation advocates for orderly physical and land use growth, protection and preservation of the environment, and promoting of public safety and health.

### **Urban Areas and Cities Act 2011**

The Act vests management responsibility for the town in a five-member committee that will be chosen by the governor in accordance with Kenyan Constitutional Article 184. Under the Amendment Bill of 2017, the Act gives the criteria for classifying urban areas in terms of City, Municipality, and a Town whose differences are based on the population coverage, availability of the development plan, presence of infrastructural facilities, and the other essential services which can be found within the urban setup. The Act empowers all municipal and urban area integrated development plans to coordinate with the county government's development plans and goals.

### **County Government Act 2012**

The county governments have been given the authority to carry out the planning duties at the county level, drawing on Chapter Eleven of Kenya's 2010 constitution. According to Part XI section 103(c) of the Act, the county planning department's goal is to facilitate the creation of a well-balanced settlement system that ensures the efficient use of limited land, water, as well as other resources for economic, social, ecological, and other purposes throughout the county. The

act gives authority to the county government to develop the county spatial plan which shall provide guidance and indicate where public and private land development and infrastructure investment can take place. The plan must also outline the desired and undesirable uses of space in a specific location, the urban margins of the municipalities under its authority, and strategies for resolving rural-urban interface issues.

### **National Land Commission Act 2012**

Article 67(2) of Kenya's 2010 Constitution established the National Land Commission, which is in charge of administering public lands for the benefit of the national and local governments. The commission also oversees and monitors land use planning across the nation. With the approval of the federal and local governments, the commission may also alienate public land. The Act calls for the formation of offices at the county and sub-county levels to carry out the aforementioned duty and guarantee effective land management and use.

### **2.7 Information Gap**

From the theoretical analysis of urban sprawl, it is evident that many scholars worldwide have tried to justify various effects that come along with the sprawl. Many developed countries have highlighted how the sprawl affects the pattern of development from the core of the town to its peripheries. However, it is evident that the driving force of sprawl within the developed countries is different from what is being experienced in the developing countries. Most research that has been done highlights how the external forces contribute to the sprawl in African major urban centers. However, my analysis fails to establish the research that explains how sprawl influences the form and pattern of the urban centers. With the current dispensation that advocates for the devolved governance in Kenya, this research finds it important to analyze how the morphological pattern/form of development of an urban area/ county headquarters (Homa Bay Town) changes over time as a result of sprawl.



## 2.8 Conceptual Framework

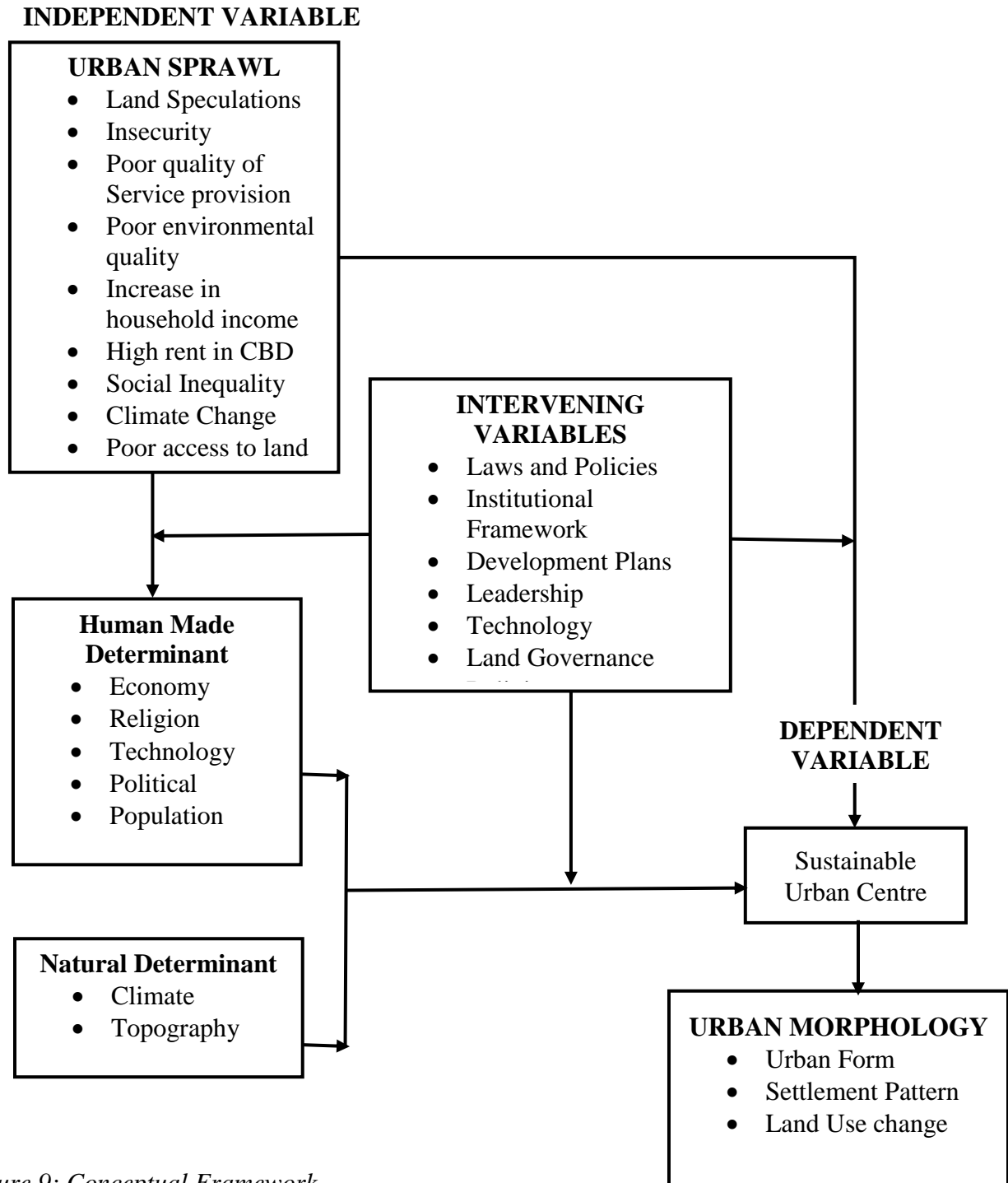


Figure 9: Conceptual Framework

## CHAPTER THREE

### RESEARCH METHODOLOGY

#### 3.1 Research Design

Since the study does not involve any experiment, the research applied the non-experimental design method whereas the cross-sectional study design method was applied toward the collection of one-time data through household and key informant interviews.

#### 3.2 Target Population

The target population for this research included all the households at the peripheries of Homa Bay town within 1.5km buffer off Homa Bay town boundary guided by the satellite imagery and Kenya National Bureau of Statistics (KNBS) 2019 census data; the Environment officer; the director in charge of Homa Bay county planning; the Homa Bay County chief officer Lands; the local administration represented by the area Chief; the head of the Beach Management Unit; Business enterprises; Agricultural officer; transportation officer; officer at the Waste Management Unit; and water officer.

#### 3.3 Sample Size

The sample size for this study was deduced from the households within the 1.5km buffer distance of the town boundary. Due to the narrow shape of the Homa Bay town boundary, the spread of the town happens in the neighboring sub-locations of Arujo and Asego. The total household population size for the two sub-locations is 10,234 people (Arujo 7,064 and Asego 3,170) (KNBS, 2019). Due to time and budget constraints as well as the replication of responses, a study sample that is representative of the target population was drawn based on the formulae by Yamane (1967:886;Tepping, 2014) from the total number of households within Arujo and Asego sub-locations. In this case, the sample size was determined by formulae:

$$n = \frac{N}{1 + N(e)^2}$$

Where n is the sample size, N is the Household size, and e is the level of precision.

$$n = 10234/1 + 10234(0.05)^2 = 384.9 \text{ (Approx 385 Households)}$$

To have a fair representative sample size, the sample size was determined with a confidence level of 0.05 significance level.

Due to constraints related to time, budget, COVID 19 disease outbreak, and replication of the responses, the sample size was reduced to **100 households**. The number of households per sub-location was balanced using the population ratio formulae as shown below.

$$\text{Arujo: } 7064/10234 \times 100 = 69 \text{ households}$$

$$\text{Asego: } 3170/10234 \times 100 = 31 \text{ households.}$$

### **3.4. Sampling Method**

Both probability and non-probability sampling methods were adopted in this research and since the research involved the selection of households at the peripheries of the town, a stratified random sampling method was applied with the strata being the sprawled areas within the 1.5km distance into Arujo and Asego sub-locations. A simple random sampling procedure was thereafter applied while conducting the household interviews. Since the key informants within the study area were already identified, the study also adopted the purposive sampling method procedure in attaining the necessary data and information from the relevant national and county government officers.

### **3.5. Sampling Frame**

The sample frame for this study was a list of all the households within a 1.5km buffer of the Homa Bay town boundary. This buffer distance was arrived at after observing and measuring the highest sprawl distance in Homa Bay town from the year 2021 satellite imagery. These households were within Arujo and Asego sub-locations.

### **3.6. Data Types and Sources**

The study adopted the use of primary and secondary data types both spatial and non-spatial. The spatial primary data involved the first-hand point data picked on available features and facilities

within the study area using the handheld GPS equipment while the secondary spatial data involved the use of remote sensing satellite imageries, existing development plans, and topographical maps.

The non-spatial primary data type included both qualitative and quantitative data collected from interviews and ground observation while the non-spatial secondary data type included data on literature that was retrieved from existing records, books, and journals.

### **3.7. Data Collection**

The data collection techniques which were applied in this study included: Interviews; Instrument administration; observation, GPS point pickings, and studying of the available artifacts in the collection of both spatial and non-spatial primary and secondary data.

#### **3.7.1 Primary Data Collection**

- a) **Interviews:** To get relevant information from the target population, interviews using a questionnaire to the households and a key informant guide to the key informants were conducted. An audio recorder was also relevant in capturing the conversations from the key informants.
- b) **Observation:** The observation guide tool was essential in the collection and capturing of relevant features. The use of cameras and video photography was instrumental in recording the observed data.
- c) **Survey:** To capture relevant physical and land use features that informed mapping, the use of a handheld Global Positioning System (GPS) was applied.

#### **3.7.2 Secondary Data Collection**

The non-spatial data informing this study was obtained from reports which exist in libraries and online sources. Other data were obtained from county existing records; documents and reports; as well as books and journals.

The secondary spatial mapping data informing the change over time was obtained from online sources (high-resolution satellite imageries). These images were preferred due to better visualization and produced more accurate results which made it easy to identify and interpret different classes/ land cover patterns within the study area. The existing development plan,

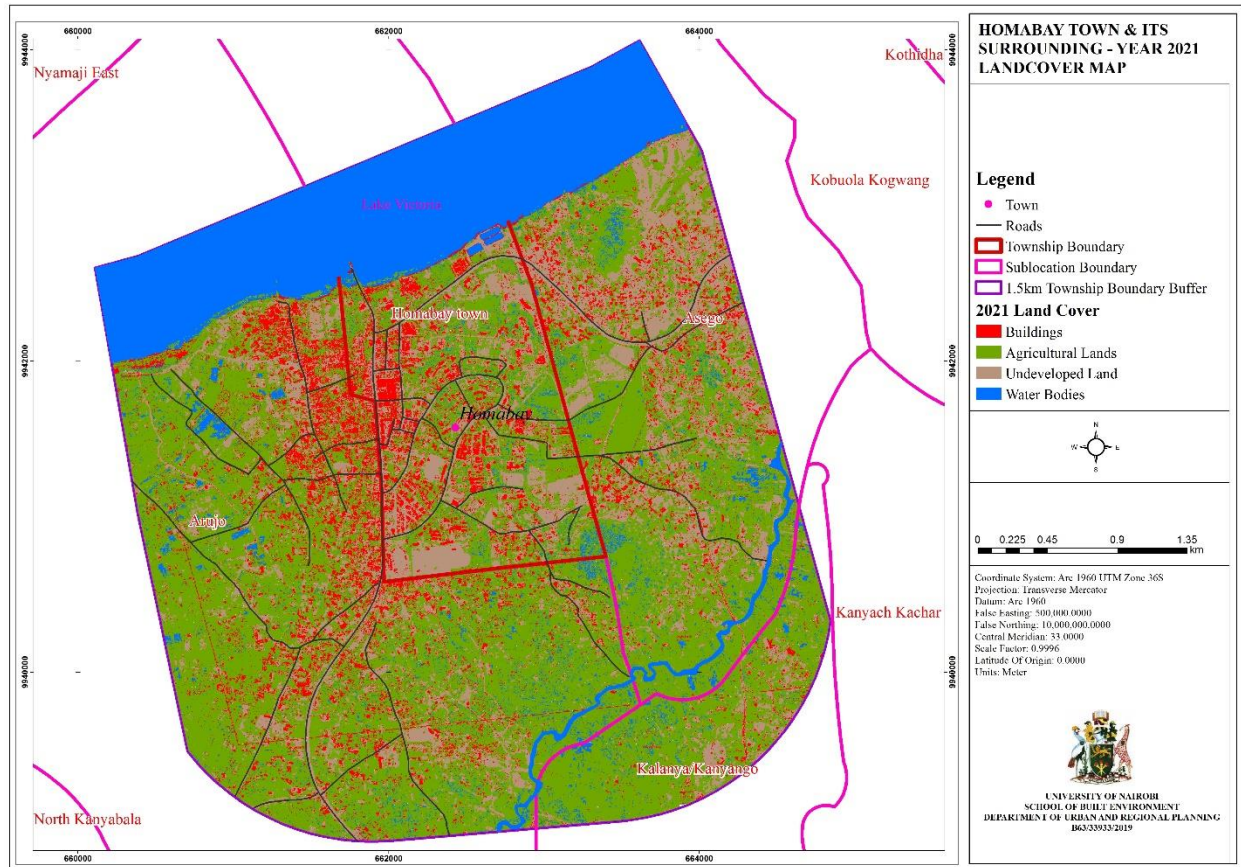
preliminary index Diagrams (PIDs), and topographical maps for Homa Bay town were also obtained from the county planning and survey offices.

### **3.7.3 Data Processing and Analysis**

Data pre-processing was done using various approaches depending on the nature and type of data collected. Quantitative information obtained through the usage of the questionnaire was coded and stored into a database to serve as the primary non-spatial data. the IBM SPSS statistics 23 software for analysis while the qualitative data was coded and categorized in form of various themes relevant to the study objective. It was very necessary to use Microsoft Excel to create graphs and charts. Additionally, Microsoft Word was utilized to compile the data obtained from the Key Informants.

The primary spatial data which were collected by the use of GPS equipment was downloaded using the Expert GPS software and projected into Arc 1960 datum after importation into the Arc GIS software. The Arc Map platform was also necessary for the importation and analysis of the high-resolution satellite imageries. The study used the supervised classification method, in which a large number of "sample sites" were generally acquired by vectoring the raster scene and spectral signatures for distinct land uses in specific areas were created. These sample sites were categorized into Built-up areas, Water bodies, Undeveloped, and agricultural use after which supervised classification was done. This process was repeated for all the images of the years 2005, 2009, 2014, and 2021. The method for carrying out the classification was straightforward: given prior knowledge of the objects present in the picture, identify conventional classes (actual and familiar) or meaningful classes, assign them category names, and then carry out the classification.

Map 1 represents an analyzed graphical view of the year 2021 satellite image under supervised classification.



Map 1: Image under Supervised Classification

### 3.7.4 Accuracy Assessment

This process involved the application of a common error matrix tool in Arc GIS to assess the accuracy and compare pixels or polygons in a classified image against the ground reference data. This action involved comparing each categorized pixel to the actual land cover conditions discovered from their matching ground truth data. In the study, the pixels were chosen throughout the study area (image) after which ground truth data was used to compare with the classified map which matched. The ground truth points, which represented different land uses, were transformed into a raster file, which was then compared to the classified image and accuracy was evaluated using the combine tool. Arc GIS tool allows for an automated accuracy assessment for each supervised classification but due to some technical restrictions, all the accuracy assessment was completed in Microsoft Excel.

The overall classification accuracy was calculated using simply counting the total number of pixels and dividing it by the number of pixels that have been classified in both the ground and satellite imagery.

Table 1, 2, 3, and 4 represents the confusion matrix analysis of the estimated number of pixels for the years 2004, 2009, 2014, and 2021.

*Table 1: Confusion Matrix of the estimated Total Number of Pixels for the year 2005*

		Ground Truth				No. of Classified Pixels
		Built Up Areas	Agricultural Lands	Vacant Land	Water Bodies	
Classified In Image As	<b>2005</b> Built Up Areas	29	1	9	0	39
	Agricultural Lands	0	29	4	1	34
	Vacant Land	1	0	13	4	18
	Water Bodies	0	0	4	25	29
	<b>No. of Ground Truth Pixels</b>	<b>30</b>	<b>30</b>	<b>30</b>	<b>30</b>	<b>120</b>

**Overall Accuracy 80%**

*Table 2: Confusion Matrix of the estimated Total Number of Pixels for the year 2009*

		Ground Truth				No. of Classified Pixels
		Built Up Areas	Agricultural Lands	Vacant Land	Water Bodies	
Classified In Image As	<b>2009</b> Built Up Areas	28	0	3	0	31
	Agricultural Lands	0	29	1	4	34

	Vacant Land	2	0	26	0	28
	Water Bodies	0	1	0	26	27
	<b>No. of Ground Truth Pixels</b>	<b>30</b>	<b>30</b>	<b>30</b>	<b>30</b>	<b>120</b>

**Overall Accuracy 91%**

*Table 3: Confusion Matrix of the estimated Total Number of Pixels for the year 2014*

	2014	Ground Truth				No. of Classified Pixels
		Built Up Areas	Agricultural Lands	Vacant Land	Water Bodies	
Classified In Image As	Built Up Areas	27	0	4	2	33
	Agricultural Lands	0	27	0	1	28
	Vacant Land	1	3	26	2	32
	Water Bodies	2	0	0	25	27
	<b>No. of Ground Truth Pixels</b>	<b>30</b>	<b>30</b>	<b>30</b>	<b>30</b>	<b>120</b>

**Overall Accuracy 87.5%**

*Table 4: Confusion Matrix of the estimated Total Number of Pixels for the year 2021*

	2021	Ground Truth				No. of Classified Pixels
		Built Up Areas	Agricultural Lands	Vacant Land	Water Bodies	
	Built Up Areas	28	0	3	1	32



Classified In Image As	Agricultural Lands	0	26	0	3	29
	Vacant Land	2	2	27	0	31
	Water Bodies	0	2	0	26	28
	<b>No. of Ground Truth Pixels</b>	<b>30</b>	<b>30</b>	<b>30</b>	<b>30</b>	<b>120</b>

**Overall Accuracy 89.2%**

The categorization accuracy averages for the years 2005, 2009, 2014, and 2021 were over 86%. For the years 2005, 2009, 2014, and 2021, there was a significant and nearly perfect agreement between the classified image and the ground truth data.

### **3.7.5 Data Interpretation and Presentation**

Different data types collected and analyzed were presented in various forms. The statistical information was presented in charts, graphs, and statistical tables to ease the interpretation while the qualitative data was presented in form of narratives and photo illustrations. The spatial data sets were presented in forms of maps with their analysis figures represented in the form of tables and graphs.

### 3.7.6 Data Need Matrix

	<b>Objective</b>	<b>Data Needed</b>	<b>Data Types/Form</b>	<b>Data Sources</b>	<b>Data Collection Method</b>	<b>Data Instruments</b>
1.	<b>To establish the driving factors influencing the sprawl of Homa Bay</b>	<ul style="list-style-type: none"> <li>• Drivers of Urban Sprawl</li> </ul>	<ul style="list-style-type: none"> <li>• Qualitative</li> <li>• Quantitative</li> <li>Both Primary &amp; Secondary</li> </ul>	<ul style="list-style-type: none"> <li>• County Physical planning department</li> <li>• Secondary data sources.</li> <li>• Households</li> <li>• Informants</li> </ul>	<ul style="list-style-type: none"> <li>• Interviews</li> <li>• Reports</li> <li>• Secondary Sources</li> </ul>	<ul style="list-style-type: none"> <li>• Questionnaire</li> <li>• Key Informant guide</li> <li>• Observation form</li> </ul>
2.	<b>To analyze the morphological pattern of growth of Homa Bay town overtime</b>	<ul style="list-style-type: none"> <li>• Statistical Data</li> <li>• Development plans.</li> <li>• High resolution satellite Imagery</li> <li>• Photographs</li> </ul>	<ul style="list-style-type: none"> <li>• Qualitative data</li> <li>• Quantitative data (population of sprawl)</li> </ul>	<ul style="list-style-type: none"> <li>• Physical Planning Department</li> <li>• KNBS</li> <li>• Museums</li> <li>• Computer databank</li> </ul>	<ul style="list-style-type: none"> <li>• Interviews</li> <li>• Reports</li> <li>• Observation</li> <li>• Secondary Sources</li> <li>• Institutional Records</li> </ul>	<ul style="list-style-type: none"> <li>• Observation form</li> <li>• Photography/Camera</li> <li>• Online sources</li> <li>• Arc GIS software</li> </ul>
3.	<b>To investigate how sprawl has impacted on the morphology of Homa Bay Town</b>	<ul style="list-style-type: none"> <li>• Social effect</li> <li>• Environmental effect</li> <li>• Economic effects</li> <li>• Infrastructure</li> </ul>	<ul style="list-style-type: none"> <li>• Qualitative data</li> <li>• Quantitative data</li> </ul>	<ul style="list-style-type: none"> <li>• County Physical planning office.</li> <li>• Environment officers</li> <li>• BMUs Officers</li> <li>• Agricultural officers</li> <li>• Business men</li> <li>• Households</li> </ul>	<ul style="list-style-type: none"> <li>• Interviews</li> <li>• Observation</li> <li>• Review of Secondary data</li> </ul>	<ul style="list-style-type: none"> <li>• Key Informant guide</li> <li>• House hold Questionnaire</li> <li>• Camera</li> </ul>
4.	<b>To propose possible planning interventions towards control of urban sprawl</b>	How planning can be applied to contain urban sprawl	<ul style="list-style-type: none"> <li>• Qualitative data</li> </ul>	<ul style="list-style-type: none"> <li>• Informants</li> <li>• Secondary Sources</li> </ul>	<ul style="list-style-type: none"> <li>• Interview</li> <li>• Document review</li> </ul>	<ul style="list-style-type: none"> <li>• Key Informant guide</li> <li>• Household Questionnaires</li> </ul>

Table 5: Illustration of the Data Need Matrix

## **CHAPTER FOUR:**

### **BACKGROUND OF THE STUDY AREA**

#### **4.1. Introduction**

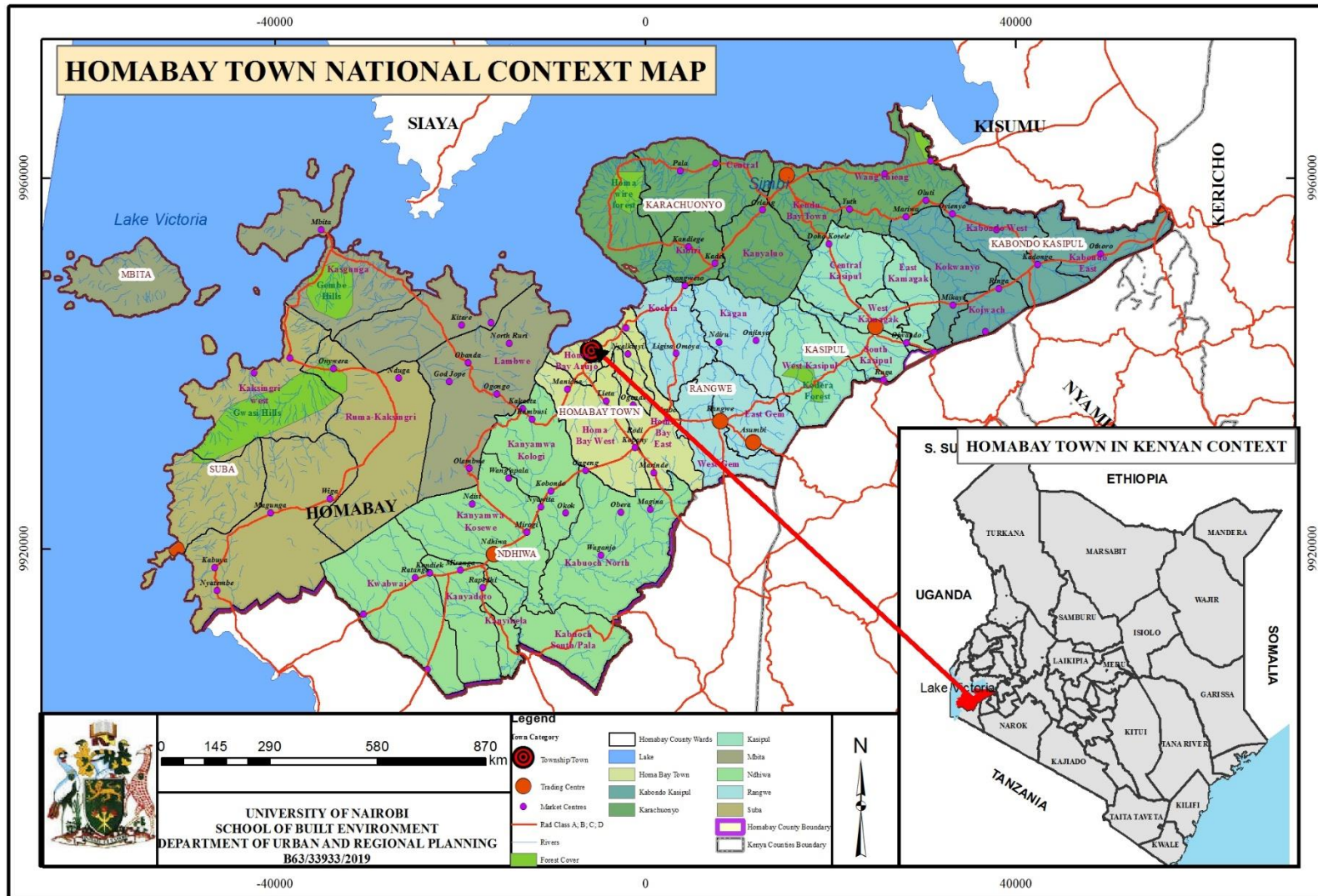
In the first half of the 20th century, "Chich Onuno," a seaside market, was the forerunner of Homa Bay Town (Onuno Market). The colonial administration changed its name to Homa Bay in 1925 due to its location overlooking the Huma Hills in West Karachuonyo, Rachuonyo Sub County. The term "Huma" was difficult for the British to pronounce, so they mispronounced it as "Homa," which became the name of the center. The name has nothing to do with "homa," a term used by the Luo people to refer to malaria, which is prevalent in the regions near Lake Victoria.

The Homa Bay Urban Council (HBUC) was founded in 1974 and then advanced to the level of a town council in 1987 and a council in 1991. The MoHB was later chosen as the administrative center of the South Nyanza District, which included the former Kuria District, Migori District, Rongo District, Rachuonyo District, Homa Bay District, and Suba District. This was done because the MoHB had access to water and had well-drained sites, among other things. Additionally, it served as a commercial hub where Africans predominated the weekly market and Indian merchants the daily market.

#### **4.2. Geographic Location**

##### **4.2.1 National Context**

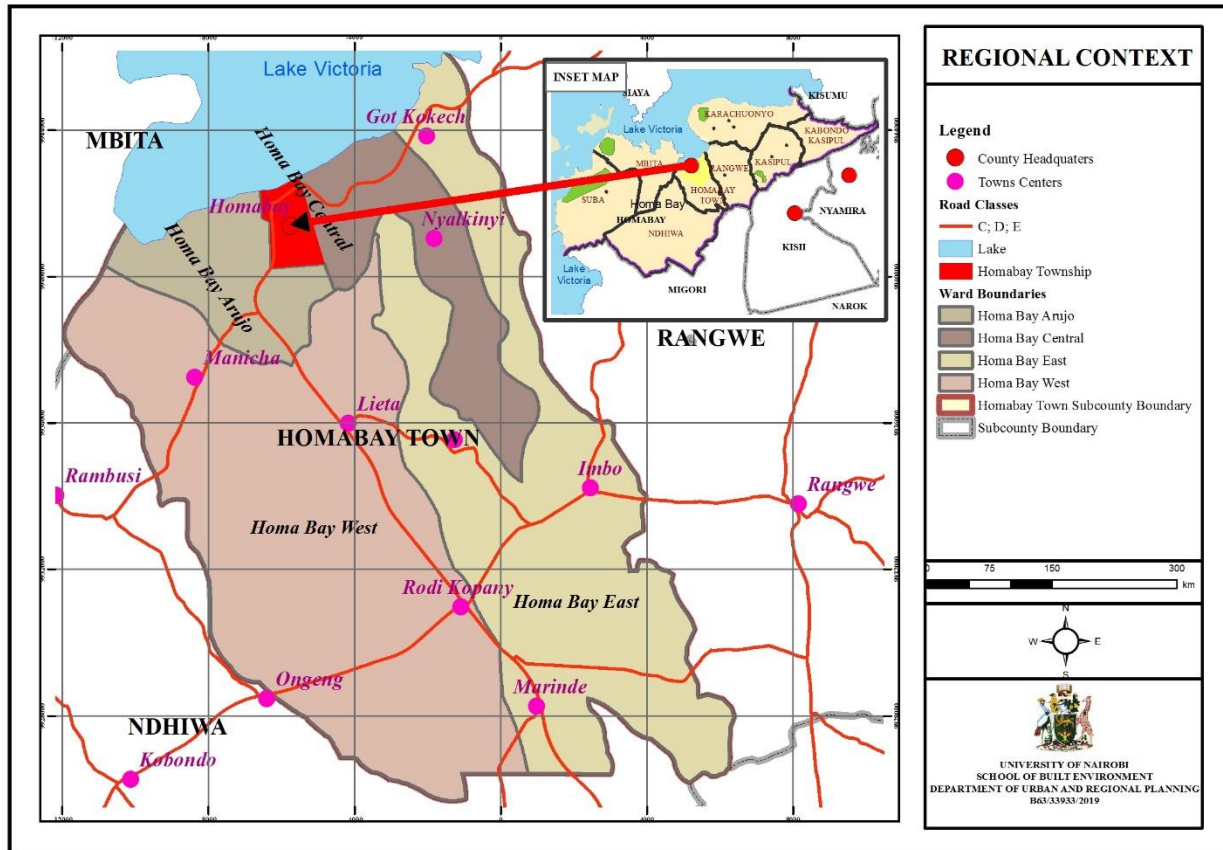
Homa Bay town is located within Homa Bay County which lies between latitudes 0°15 South and 0° 52 South and between longitudes 34° East and 35° East. The county covers an estimated area of 4,267.1 km<sup>2</sup>, 2,696km<sup>2</sup> being the area covered by the land mass and 1,227 km<sup>2</sup> covered by the largest freshwater lake in Africa Lake Victoria. The county is bordered to the north by the counties of Kisumu and Siaya, to the east by the counties of Kisii and Nyamira, to the south by the county of Migori, and to the west by the country of Uganda. The county headquarters which is Homa Bay town is located approximately 420km from the city of Nairobi.



Map 2: National Context Map

### 4.2.2 Regional Context

Homa Bay town is the county headquarters of Homa Bay County and it is located within the Municipality of Homa Bay. The Town is located approximately 130km south of the city of Kisumu and is interconnected with other parts of the country through C20 Homa Bay-Rongo road, C19 Homa Bay- Kisumu road as well as other road networks. Homa Bay Town is located inside Asego Division, which is divided into three administrative sub-locations: Asego, Township, and Arujo. Politically, it falls in Homa Bay town Sub County which has four administrative wards namely: Homa Bay West, Homa Bay East, Homa Bay Arujo, and Homa Bay Central.

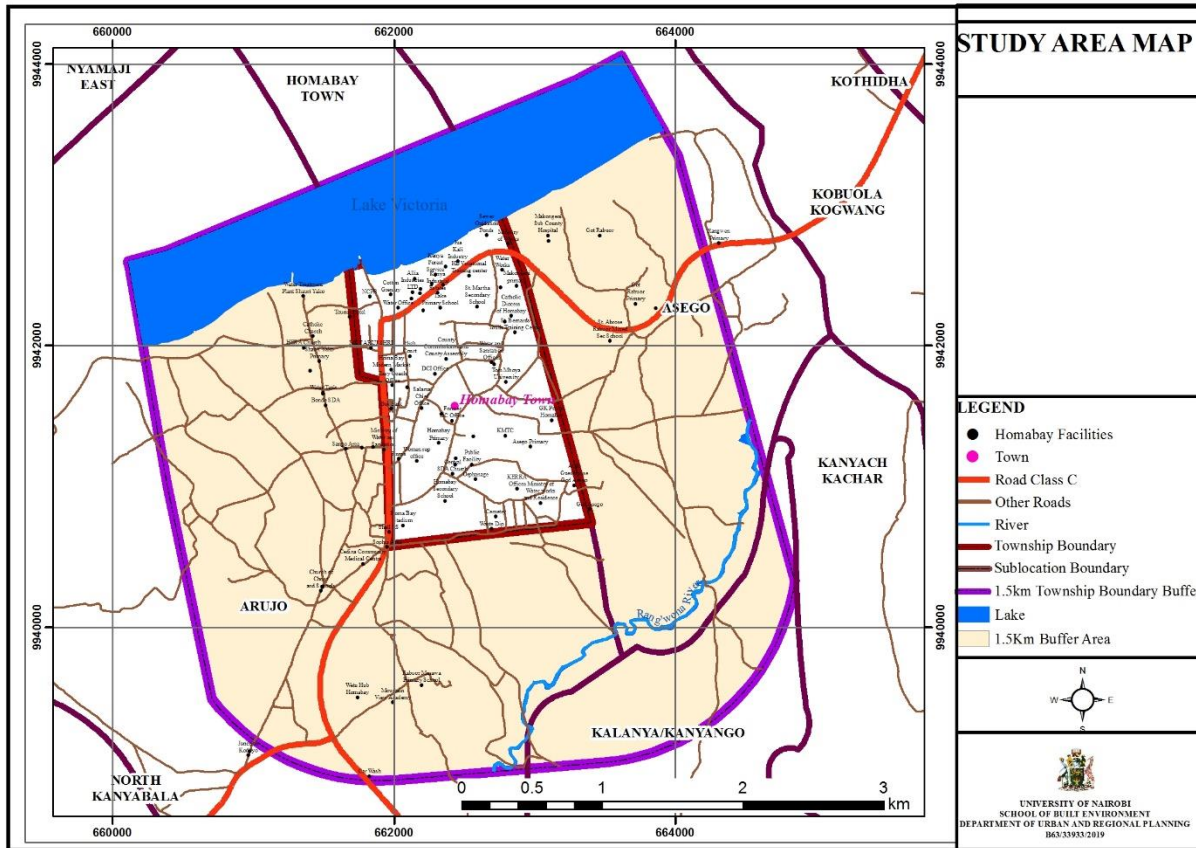


Map 3: Regional Context Map

### 4.2.3 Local Context

Locally, the study area is situated within the Homa Bay Municipality which covers 29km<sup>2</sup> with 9km<sup>2</sup> being the town. The CBD region is under the leasehold tenure which falls within Homa Bay

Town sub-location which covers approximately 4.998km<sup>2</sup>, 2.6km<sup>2</sup> being land mass and 2.4 being water. The Town neighbors Asego and Arujo sub locations to the east and west respectively.



Map 4: Local Context

### 4.3. Demographic Dynamics

#### 4.3.1 Population Size

According to the KNBS (2019) census, Homa Bay town is defined by two sub-locations namely Asego and Homa Bay Township. These areas hold a population of 12,241 and 7,856 respectively totaling 20,097 people with Asego having 6,011 males and 6,299 females while Homa Bay town holds 3,696 males and 4,160 females. As compared to the previous population census carried out in the previous years, the population statistics have been on the increase from 9,025 to 12,536 to 16,048 to 20,097 for the periods 1989, 1999, 2009, and 2019 respectively. This increase is said to be influenced by the high fertility rates, low acceptance of family planning, and decrease in mortality rates (UN-HABITAT, 2010).

### 4.3.2 Structure and Composition

From the 2019 population and housing census, it is reported that the population within the Homa Bay sub county is dominated by young people of age between ten to forty years (KNBS, 2019).

### 4.3.3 Population Density

According to the 2019 population and housing census, 20,097 people lived within 8.2 square kilometers. In comparison to the county's overall population density of 359 persons per square kilometer, this equated to a population density of almost 2450 people per square kilometer, which is exceptionally high (KNBS, 2019).

### 4.3.4 Population Distribution

In 2009, the municipality of Homa Bay had 28,361 (47.39%) people living within the core-urban setup, 30,575 (51.09%) living in the Peri-urban areas while 908 (1.15%) living within the rural setup. These statistical changes are a result of the urbanization effect. (KNBS, 2010).

### 4.3.5 Household size

The average household size of the population within the town has been four people per household as shown in *table 6* below.

<b>YEAR</b>	<b>POPULATION</b>	<b>HOUSEHOLD</b>	<b>AVERAGE HH</b>
1989	9025	2111	4
1999	12536	2984	4
2009	16048	3857	4
2019	20097	5247	4

*Table 6: Household size*

#### 4.3.6 Dependency Ratio

This is referred to as the population who is not currently employed. It covers those aged 65 and older as well as youngsters between the ages of 0 and 14. *Table 7* below illustrates how the dependency ratio has been in the previous years of the population census.

Age group	%1989	%1999	%2009	%2019
0-14	49	47	46	41.8
15-64	46	48	50.4	55
65 and over	3	3.3	3.7	3.2

*Table 7: Homa Bay Town Dependency Ratio*

#### 4.3.7 Migration Trends

The net migration trend of the town stands at 12.2% with the males constituting 7.9% of the migrating population while that females being 4.3%. The town's urban population has been growing at a pace of 11.5% annually. Due to the advantageous economic conditions in terms of job and business prospects that arise from the built infrastructures and the existence of the purchasing power originating from the salaried workers, the male does migrate from the bordering counties into the township. The female population also moving to the town in pursuit of work, education, and marriage.

This migration pattern has put pressure on already-existing infrastructure, including schools, housing for both commercial and residential reasons, and retail mall locations. Additionally, there is a sizable daily commuter influx into the town from the nearby rural areas and counties, where people travel to work and do business every day.



## **4.4. Climatic and Physiographic Features**

### **4.4.1 Rainfall**

Homa Bay town experiences two main rainy seasons. While the short rains occur between August and December, the long rains occur between February and March. The annual rainfall patterns range from 250 to 700mm. These rains together with the nature of the soil define the activities of small-scale farmers around the township and municipality at large. With the township experiencing lower rains, it attracts the growth of crops such as cassava, millet, and sunflowers.

### **4.4.2 Soil and Geology**

The type of soil found within the township area is black cotton soil which makes farming activities difficult during heavy rains periods. Alluvial soils, which are primarily sandy loam that is well drained and suitable for the production of cotton, sunflower, maize, beans, cowpeas, and vegetables, dominate the Lake Victoria shoreline. Sugar canes and potatoes are as well potential crops that can be planted in the area. The township is surrounded by a variety of rocks, including granite, tuff sandstone, agglomerates, and conglomerates, all of which are used in the construction sector.

### **4.4.3 Temperature**

With an average range of 17.1° to 34.8° centigrade, the temperature in the town varies with height and tends to rise nearer to the lake. The hottest months are December and March, while the coldest months are April and November. The maximum temperatures are experienced in February.

### **4.4.4 Relief**

Homa Bay Township is located at the shores of Lake Victoria with an elevation height ranging between 1143 meters to 1120 meters above sea level. The township region is made up of a number of hills, including Got Rabuor and Got Asego, with a gently undulating topography that flattens down around Lake Victoria. With the exception of locations like Got Rabuor, Arujo, and sections of Sofia, which drain water into Arujo stream, which further drains into Lake Victoria, the majority of the township's lands drain water into Lake Victoria.

#### **4.4.5 Vegetation**

The majority of the township's vegetation, with the exception of the steep regions with rock outcrops, is acacia forest and bushland, which grows over the area's wide black cotton soil. Additionally, there is no diversity of native tree species. For environmental preservation, a lot of trees are cultivated in urban and per urban regions. Along with the grass in the open fields, homesteads, and compounds, crops also count as part of the vegetation. Jacaranda trees are also planted for aesthetic purposes.

### **4.5. Socio-economic/Cultural Profile**

#### **4.5.1 Natural Resources**

As its primary natural resources, land and water benefit Homa Bay town. The township's location at the mouth of Lake Victoria's bay makes it a valuable land resource since it prevents flooding and other natural disasters linked to huge bodies of water. This land acts as a good starting point for the construction of industries and houses. Due to its location, the township gains since it acts as the gateway to the vast tourist attraction sites such as the islands of Mfangano and Rusinga, as well as to Ruma National Park which are very key to the improvement of the economy of the town and the county as a whole.

The population can profit from the water resources, which include the wealthy Lake Victoria, in terms of water provision. Due to its status as the second-largest freshwater lake in the world, its variety of aquatic life, and its natural beauty, the lake has the potential to be a popular tourist destination.

#### **4.5.2 Economic Activities**

##### **a) Fishing**

One of the top high-ranking sources of income in the township is fishing in the lake. Fishing is the action of capturing fish from a lake using nets, hooks, and lines while operating an oar-powered boat, a sailboat, or a motorboat. The majority of the time, intermediaries who service a variety of trades and industries buy these catches. Additionally, these collected fish are sold to nearby towns

and cities like Kisii and Nairobi before being processed and sent to nations in Europe. Along the lake, fishing also draws businesses including hotels, cafes, and shops that repair watercraft engines.

#### **b) Formal and Informal Industries**

Homa Bay town also has formal and informal industries. The formal industries follow the law, and the fiscal and licensing systems of the government control their operations. These businesses do function within the scope of fish processing, byproducts of fish processing, boat building, and repairs to fishing gear. The fishing industry within the township is which produces Nile perch fillets for exports which a major seller due to its high relative weight is resulting in high returns because its sales are based on kilograms. Nile perch as well produces fish oil which when processed is used as medicine and as a dietary supplement.

The town's unofficial industries take the shape of Jua Kali, which are directly connected to the industrial, building and construction, and agricultural sectors for the supply and demand of their raw materials and final goods. These informal industries create self-employment opportunities for the women groups, youth groups, and self-help groups as well as for individuals who are not employed. These unofficial businesses include carpentry, auto repair, tailoring and dressmaking, radio repair, plumbing, hair salons and saloons, cobblers, watch repair, second-hand clothing dealers, timber sales, metal fabrication, charcoal merchants, newspapers, and food vendors.

#### **c) Formal and Informal Commercial Activities**

The township has also formal commercial activities which take place on various scales. These activities include retail trading which is characterized by the availability of shops that are located throughout the municipality but concentrated within the CBD. There is also wholesale retail trading within the CBD which denotes the high-caliber shops with large capital input which allows for bulk purchases. Within the township, there are commercial banks including ABSA Bank, Commercial Bank of Kenya, Equity Bank Cooperative Bank, and other financial institutions like M-PESA service, which enables mobile money transfer.

There are also other informal commercial activities comprising unregistered traders including Hawkers, found within the busy centers such as the bus stations; Unlawful traders, consist of commercial businesses which are not recognized by law such as illicit brewers and unlicensed

shops which deal with legal items; The primary Municipal Market is one of three open-air marketplaces in the township, along with Sofia and Soko Mjinga. The ordinary traders that operate merely basic stalls and offer both food and non-food things like apparel and kitchenware are the target market for these marketplaces. Cattle auctioning is also another informal commercial activity happening within the area involving the selling and buying of domesticated animals.

#### **d) Agricultural Activities**

The major agricultural activities taking place within the township and in the peripheral areas are mainly crop farming and livestock keeping. Most often farmed crops include maize, millet, sorghum, and peace. Small-scale subsistence farming is done with these crops, but a sizable amount is sold to make money. Cotton is the main cash crop that thrives in the region. Due to the black cotton soil's unsuitability for cultivation, conventional farming practices, insufficient rainfall, and loss of soil fertility, this industry suffers difficulties.

Cattle, sheep, goats, and poultry are among the animals kept for livestock rearing, which is complicated by the recurring presence of tsetse flies, the recurrence of diseases like Magana, low-quality livestock breeds, and poorly managed markets that lead to overexploitation by intermediaries.

#### **e) Tourism**

Tourism within Homa Bay town has been contributed by the availability of several attraction sites within the county such as: Lake Victoria; sightseeing resources like the hills; culture of the residents; availability of wildlife like crocodiles and hippos; availability of Ruma National Park; Availability of Bala Tedo Hot Springs in Karachuonyo; Hippo Station is present on Lake Victoria, gold is accessible in Kitere, Rongo Sub-County, Macalder Mines are accessible in Nyatike, and limestone is accessible in Karachuonyo Sub-County. These resources that are available within and outside the township area can be used as possible tools for the development of the tourism industry within the township.

## **4.6. Social Infrastructure**

### **4.6.1 Educational Facilities**

Numerous state and private educational institutions, including primary and secondary schools, youth polytechnics, medical training colleges, and institutions for early childhood educators, are located in the town.

### **4.6.2 Religious Facilities**

The town hosts several religious facilities for the faithful such as mosques and churches.

### **4.6.3 Health Facilities**

Health care services run by the GoK, the private sector, and non-governmental organizations are concentrated heavily in the township region (NGOs). These facilities include clinics, health centers, dispensaries, hospitals, maternity homes, and nursing homes. There is one county referral hospital with other health centers managed by the Catholic and Anglican Churches.

## **4.7. Social Facilities**

### **4.7.1 Library Facility**

There is only one library in Homa Bay Township, and it serves both elementary and high school students.

### **4.7.2 Market and Shopping Centres**

The town has one permanent market inside the CBD, although there are other markets that operate every evening in estates including Makongeni, Sofia, Rabuor, and Asego. The majority of commercial malls are found along Rongo-Homa Bay Road, where the Indian Dukawalas who settled there when the colonial administration gazetted the trading areas built the shops dating back to the pre-independence eras.

### **4.7.3 Recreational Facilities**

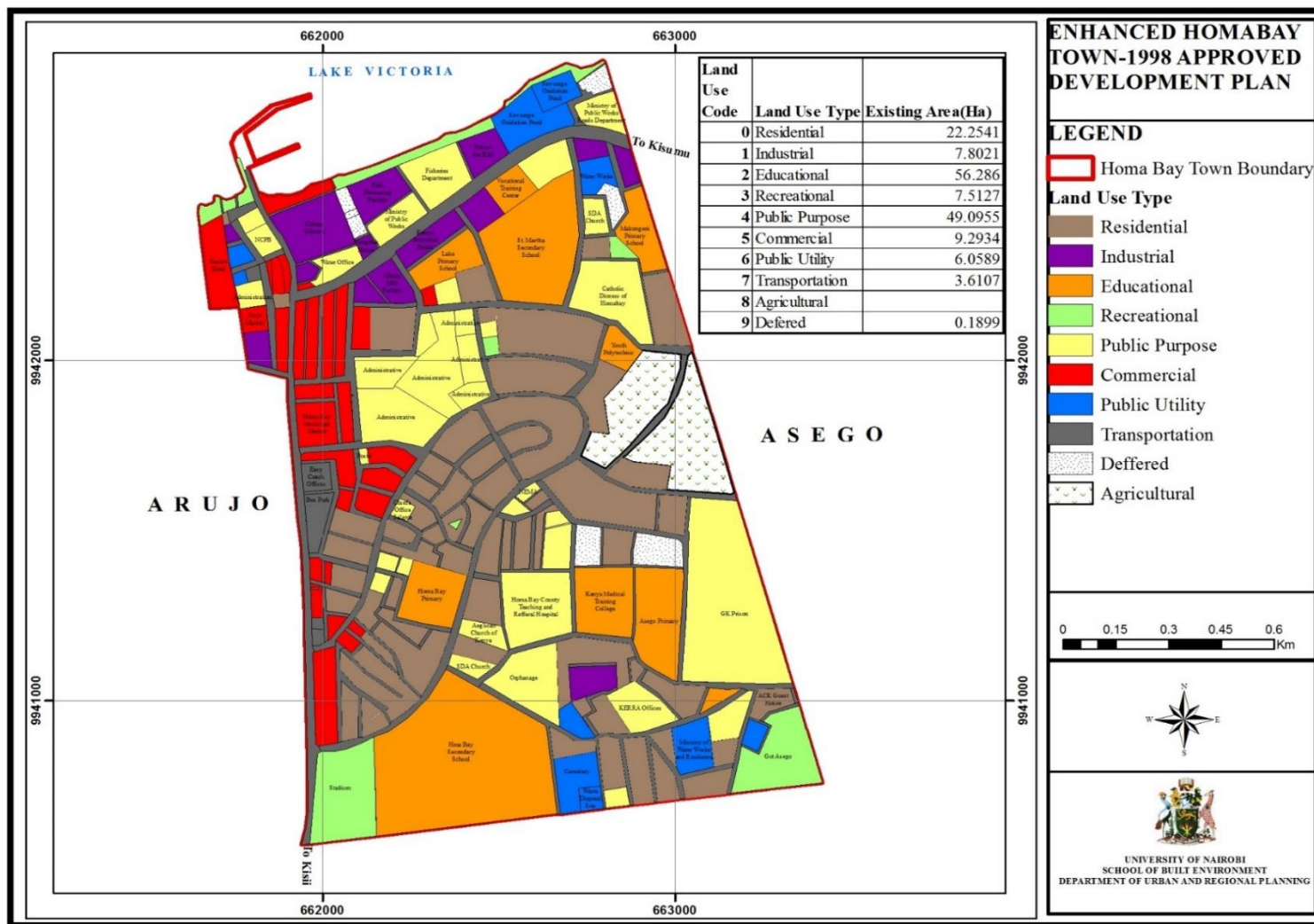
The township has a number of recreational amenities, including open fields and beaches that are frequently used for sports. The Ruma National Reserve serves as a recreation area as well. A stadium and a children's park are also present inside the municipality.

### **4.7.4 Civic Administration**

The township of Homa Bay contains a number of government buildings. The Homa Bay Law courts, the County Government offices, the police station, an Administration Police Unit, a correctional Center (prison), and the headquarters of the Independent Electoral and Boundaries Commission are a few examples of these.

### **4.7.5 Public Facilities**

The community has a single general post office that provides a range of services, including banking, mail management, and an ICT center open to the public. There is also a Huduma Centre located next to the Homa Bay Law Courts which helps toward the provision of various government services. The town has no Christian cemetery since most Christian faithful do bury their loved ones in their ancestral homes. However, there is one Muslim community cemetery with the Hindus cremating their dead in the neighboring counties such as Kisii and Kisumu. Map 5 represents an enhanced land use map for Homa Bay town.



Map 5: Land Use Map

Source: Homa Bay County Physical Planning Office and Satellite imagery

## **4.8. Physical Infrastructure**

### **4.8.1 Transportation**

Transport networks act as the major linkage to various sectors of the economy. The movement of people and goods needs to be conducted efficiently through a transport network for the improvement of the economy of an urban center. The county has a total of approximately 645km both classified and unclassified road networks all affecting the operations within the township (UN-HABITAT, 2010). These roads include the Homa Bay - Rongo, Homa Bay - Kendu Bay, and Homa Bay - Mbita road all tarmacked. While the roadways connecting the township with the residential estates have earth/gravel surfaces, some of them becoming impassable during heavy rains, the roads serving the CBD are also tarmacked.

While the primary terminal facility is a hard-surfaced, paved bus station, persons and products are picked up or delivered at the town's existing modest bus or matatu stops. Along the Rongo - Homa Bay - Kendu Bay highways, particularly, some vehicles are parked on the roadside pavement and footpaths, which causes significant traffic congestion in the CBD.

The air strip which serves the township and the municipality is located in Kabunde area 8km southeast of the Homa Bay town. This facility makes it easier for visitors to go reach the county's Ruma Game Reserve, Simbi Nyaima, Rusinga Island, and Mfangano Island by plane from Nairobi, the Maasai Mara, and other popular tourist destinations.

Homa Bay town also connects to other counties and the neighboring countries through Lake Victoria. Homa Bay and adjacent lakeside locations are connected by waterways using boats and canoes via routes like Homa Bay to Kisumu, Homa Bay to Kendu Bay, Homa Bay to Mfangano Island, and Homa Bay to Kampala, Uganda.

### **4.8.2 Energy and Power Supply**

The primary energy sources are electricity, fossil fuels, and fuel wood, which are mostly utilized for transportation, industrial production, lighting, and cooking. KPLC is the supplier of the electricity which is used in the entire Homa Bay County.



### **4.8.3 Water Supply**

Rivers and Lake Victoria are the main sources of water in the study area, and the municipality's two pump sets, with capacities of 1,500 m<sup>3</sup>/day for the old pump and 2000 m<sup>3</sup>/day for the new pump, respectively, are located to the south. (UN-HABITAT, 2010). There are also two water treatment plants at Asego being supplied by the new water pump while another one is located near Makongeni estate being supplied by the old pump. Apart from the piped water, there is also huge reliance on the roof catchments as the source of water. Other sources of water include water pans, boreholes, and shallow wells.

## **4.9. Sanitation**

### **4.9.1 Sewer Systems**

The research done by the UN-HABITAT in 2010 has indicated that the level of sewer connection within the municipal area was very low with less than 10% of the municipal area being serviced by the sewer system. The high sewer hookup fees and the division of labor between the MoHB, which is in charge of sewage, and the National Water Conservation and Pipeline Corporation, which is in charge of water delivery, are cited as the causes of these issues. The sewer system also faces challenges in terms of blockage due to the inadequacy of the water supply. Homa Bay town has one sewerage treatment plant which receives liquid wastes for treatment and further discharges its water to the environment.



Figure 10: *Homa Bay Sewer Treatment Plant.*

*Source: Survey 2021*

#### **4.9.2 Septic Tanks and Soak Pits**

Septic tanks and soak pits are the primary methods used by most residential complexes and institutions to manage liquid waste.

#### **4.9.3 Pit Latrines**

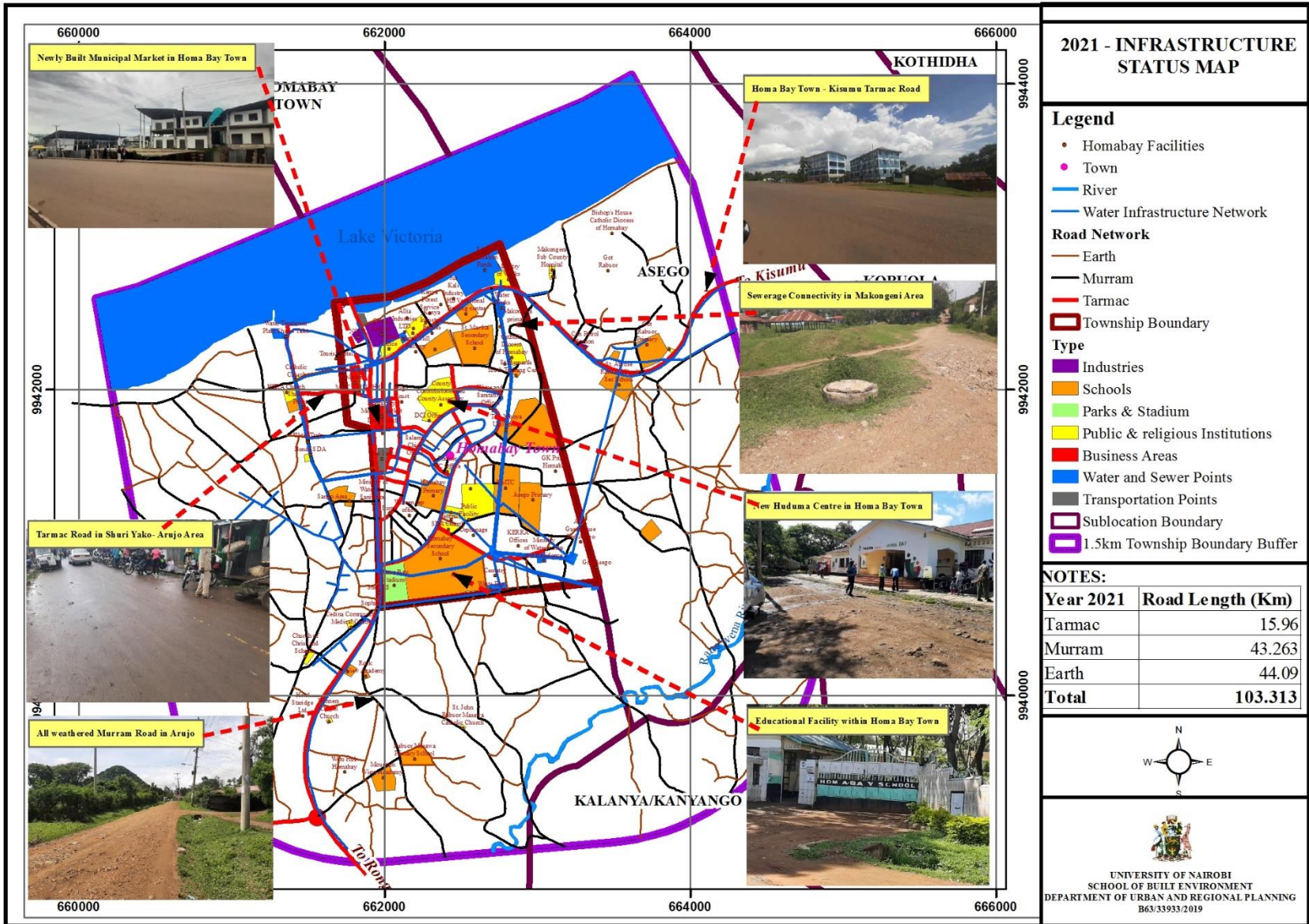
The most common waste disposal method within the town is majorly by the use of Pit latrines. The absence of an adequate water supply has led to this. While some communities prefer to bury them and dig new ones, others treat and exhaust the filled-up pit latrines.

#### **4.9.4 Storm Water Drainage**

There is no extensive storm water drainage infrastructure in the town. The township does, however, have primary and secondary networks for managing storm-water. The town and the entire municipality are drained by the primary drainage system, which uses natural streams and valleys, while the secondary drainage system uses man-made drainage systems.

#### **4.9.5 Solid Waste Collection Systems**

The main source of solid waste within the township is from the residential, commercial, industrial, and institutional developments. The amount of waste is anticipated to rise along with the population growth in metropolitan regions. When it comes to business and home garbage storage, there is low availability of bins and other storage facilities. The Homa Bay county government is in charge of rubbish collection and disposal. The current garbage disposal facility is situated next to the cemetery and Homa Bay High School at the base of Asego Hill.



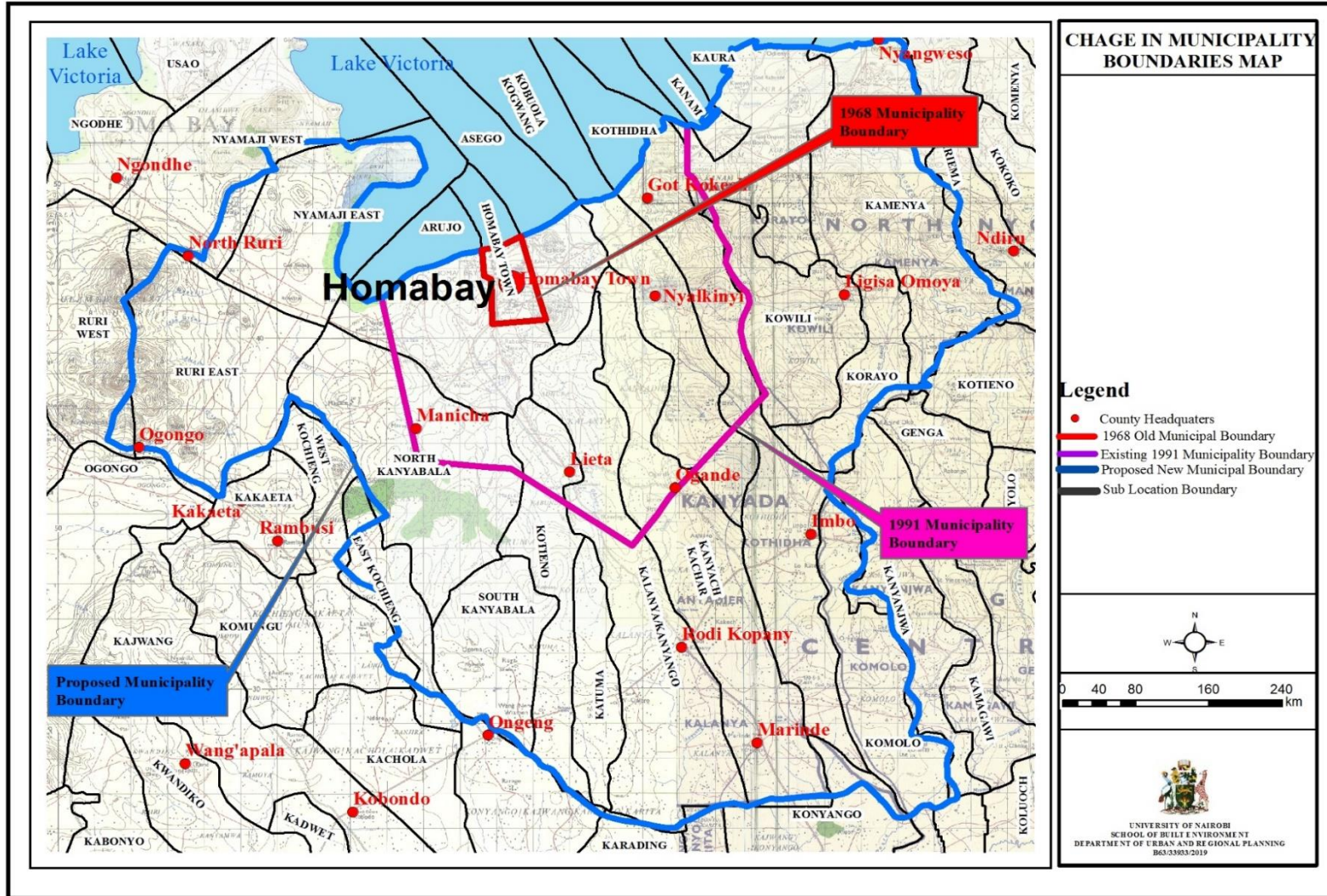
Map 6: Homa Bay Town Physical Infrastructure Map

#### **4.9.6 Planning of Homa Bay Town Boundary**

The MoHB covers approximately 29km<sup>2</sup> out of which 9km<sup>2</sup> falls within the town while the rest covers the Peri-Urban settlements. The land in the peri-urban areas is freehold, whilst the CBD is under leasehold tenure. The initial town boundary was planned in the year 1968 occupying an area of 9km<sup>2</sup>. Although this design was later amended in 1998, the town's boundary extent remained unchanged. The Strategic Urban Development Plan, which encompassed a wider geographical scope and used the current town border as its baseline, was created in 2010 by UN Habitat in collaboration with the Physical Planning Department and the previous municipal council of Homa Bay. Homa County has never created a County Spatial Plan to guide its expansion, despite the 2010 Kenyan constitution's requirement that counties do so after every five years. Thirteen years have passed since the new constitution was enacted.

Historically, in 1991, Homa Bay town became a Town Council with the former municipality boundary of 1968 being expanded from 8 km<sup>2</sup> to 29 km<sup>2</sup> after which it was upgraded into a municipality. The 1991 municipality boundary stretched to Kabunde area to the south, Kaduogo market to the west, Ngegu to the East, and the lake to the north. This boundary which is used currently covers sub-locations of Arujo; Homa Bay Township; Asego; Kabuola Kogwang; Kalanya Kanyango; Katuma and Kothidha sublocations. This boundary is illustrated under tier 2 in map 7. (Kenya R. o., 2013).

In the year 2020, the county government of Homa Bay embarked on a program aimed at expanding the town boundary. This program was started after the gazettelement of the service charter allowing for the expansion of six key urban centers within Homa Bay County. The AD-Hoc team was set up to review the existing boundary in which they came up with a proposal under tire 3 in *map 7* which is pending approval by the National government. The proposed municipal boundary aims to cover sub-locations of: Ruri East; Kochieng East; Konyango; Kachwanya; Kamenya; Kowili; Korayo; Kanam; Kaura; Arujo; Homa Bay Township; Asego; Kothidha; Kanyach Kachar; Kobwola-Kogwang; Kalanya Kanyango; Katuma; South Kalanyabala; North Kanyabala; Kotieno and Komolo.



Map 7: Homa Bay Town Boundaries

Source: Homa Bay County Physical Planning Office

## CHAPTER FIVE

### FINDINGS OF THE STUDY

#### 5.0 Introduction

This section provides the primary findings from the study's objectives, as determined by the fieldwork done in the study area. Data was collected from the existing map galleries, key informants, residents, businessmen, developers, and other key stakeholders who regularly depend on the town services. As a result, the major issues that this chapter will be based on are the analysis of how Homa Bay town has grown over time, major factors contributing to various morphological growth patterns, and how the sprawling effect has impacted morphological development. The key areas of analysis include morphological development, population, land ownership, tenure, and technology. These issues cut across various land use problems arising from the sprawling effect.

#### 5.1 Structure and growth of Homa Bay Town overtime.

On the mapping of the structure and pattern of growth of Homa bay town, this study focused on analyzing how the change in terms of development has occurred over time on land. The mapping extent focused on the 1.5-kilometer buffer around the existing 9km<sup>2</sup> Homa bay town boundary being the further extent within which most sprawling effects have been experienced as of the year 2021. The aerial maps showing the land use land cover spatial extent were generated to qualify the extent of the sprawling effect. With these data, four major land use parameters namely the built-up residential areas, agriculture, water body, and the hinterlands/ bare lands were analyzed. Homa Bay town lies within Homa Bay ward and its neighbors Arujo ward to the left and Asego ward to the right. Due to its narrow administrative shape and large water mass area of the town, a sprawling effect occurs towards the two neighboring sub-locations of Arujo and Asego with the township area undergoing densification effects as shown in maps 10 and 11.

Town densification and expanded periphery growth have seen the expansion of the built-up areas taking up the agricultural and undeveloped lands. These can be seen in the sequence of aerial maps which have been analyzed to show how these changes have been occurring from the year 2005 to 2021. This time series epoch was influenced by the availability of high-resolution images from the United States Geological Survey (USGS) data acquisition platform, and land use change analysis

before and after the promulgation of the Kenya Constitution 2010. As depicted from the aerial imagery analysis, Homa Bay town has undergone infill, expansion, and outlying (linear and clustered) types of morphological growth patterns.

The mapping analysis illustrates that the pronounced growth outside the township boundary mainly happens along the infrastructural corridors (Linear) with the Arujo area and the hilly/mountainous landscapes such as Got Asego and Got Rabuor attracting clustered, scattered, and radial growth patterns. Further to these attractive areas, scattered growth is also seen coming up within the undeveloped and agricultural lands. These mainly explain the common trend of growth in Kenya where many people prefer to settle along the transportation channels which facilitates easy access to various services and high land areas with cool temperatures and also serves as suitable grazing zones.

Figure 11, 12 and 13 show the pictorial representation of the pattern of growth within and at the outskirts of the town Centre.



*Figure 12: Clustered Morphological Pattern around Got Rabuor*



*Figure 11: Linear growth pattern along C20 Homa Bay-Rongo road*

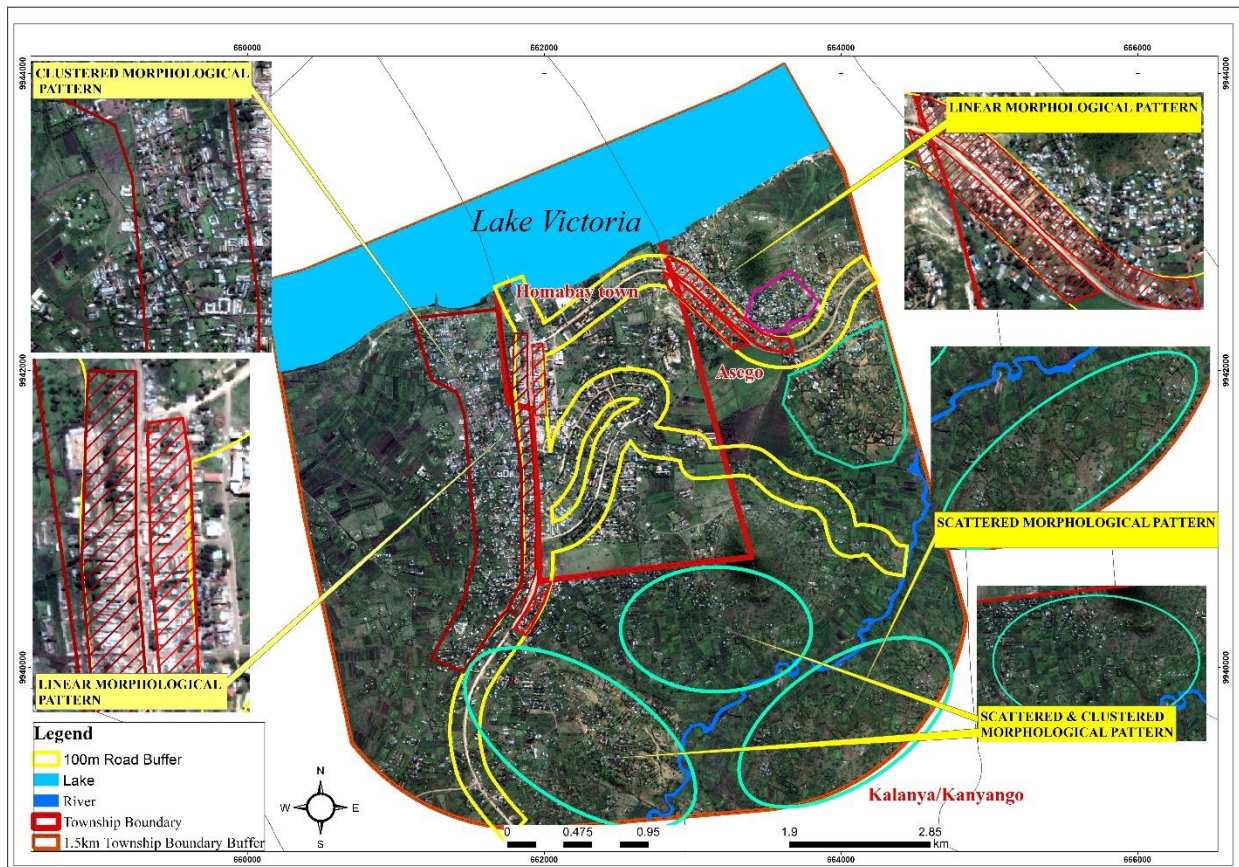


*Source: Survey 2021*

*Figure 13: Scattered Morphological Pattern in Asego*

## 5.2 Land Use/ Land Cover Change Analysis.

**2005 Land Use growth pattern** Map 8 represents the spatial coverage of the built-up areas, agricultural lands, undeveloped lands, and water bodies' land cover parameters for the year 2005. The linear development analysis was based on the 100m buffer along the major roads within the township area and its surrounding which was arrived at after examination of the linear pattern of the town as of the base year 2005. The map shows that there were significant linear shape development patterns along class C20 Homa bay- Rongo Road and class C19 Homa bay – Kisumu road. Urban sprawl was assessed by taking a closer look at the changes in the built-up area in the region and the form of growth it takes. Developing clustered development pattern is being witnessed at the back of linear plots in Arujo and Makongeni areas with scattered developments seen coming up around Got Asego and Got Rabuor areas.

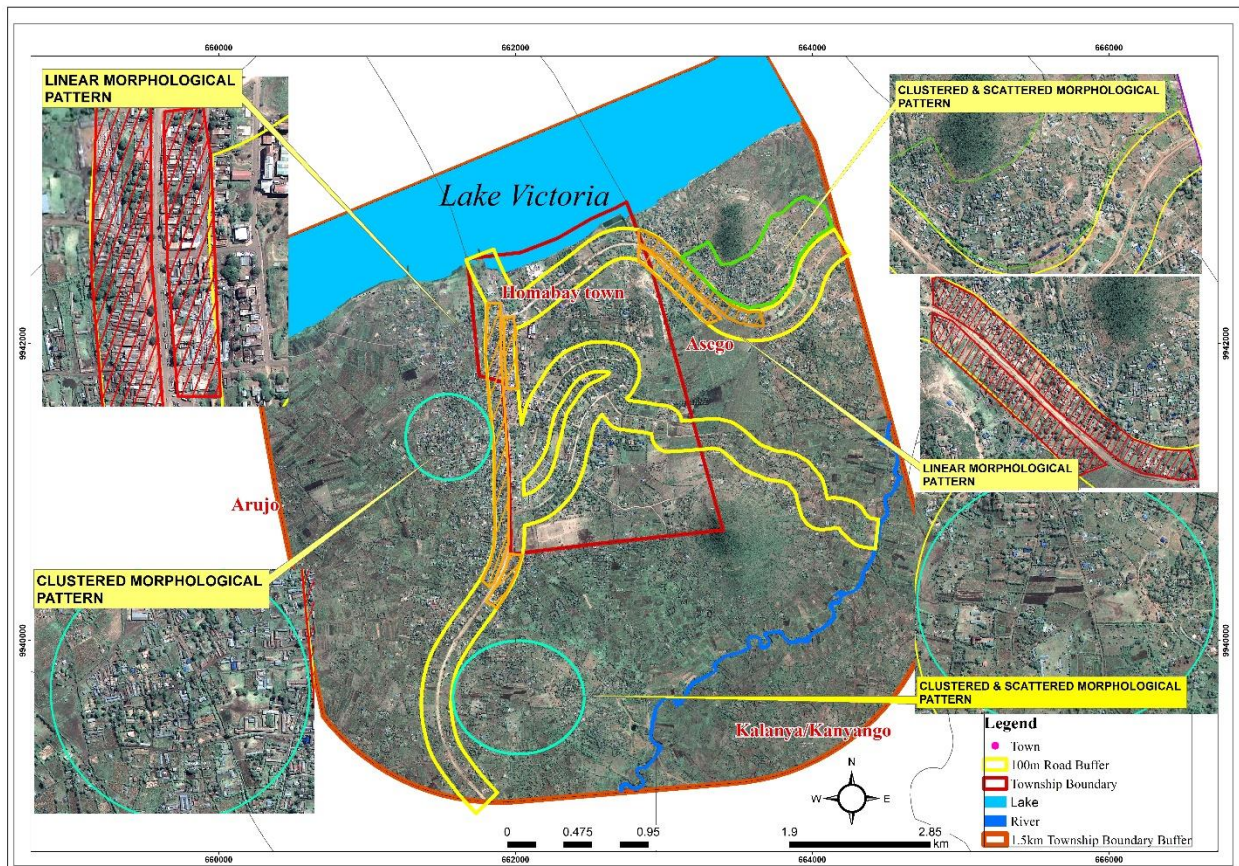


Map 8: Growth pattern in year 2005



## 2009 Land Use growth pattern

Map 9 shows the extent of the four land cover parameters as of the year 2009. It is from this map that we can clearly depict how the built-up area has been growing as compared to the map for the year 2005 in map 8. The map shows developing linear and scattered settlements at various points within the two wards. During this time, the area was characterized by poor and un-tarmacked road networks which affected the rate of growth within the area. In Arujo and Asego sub-locations, the built-up areas have increased and consequently, there is an experienced reduction in agricultural and undeveloped land use. More infill built-up change is being experienced within the township area.

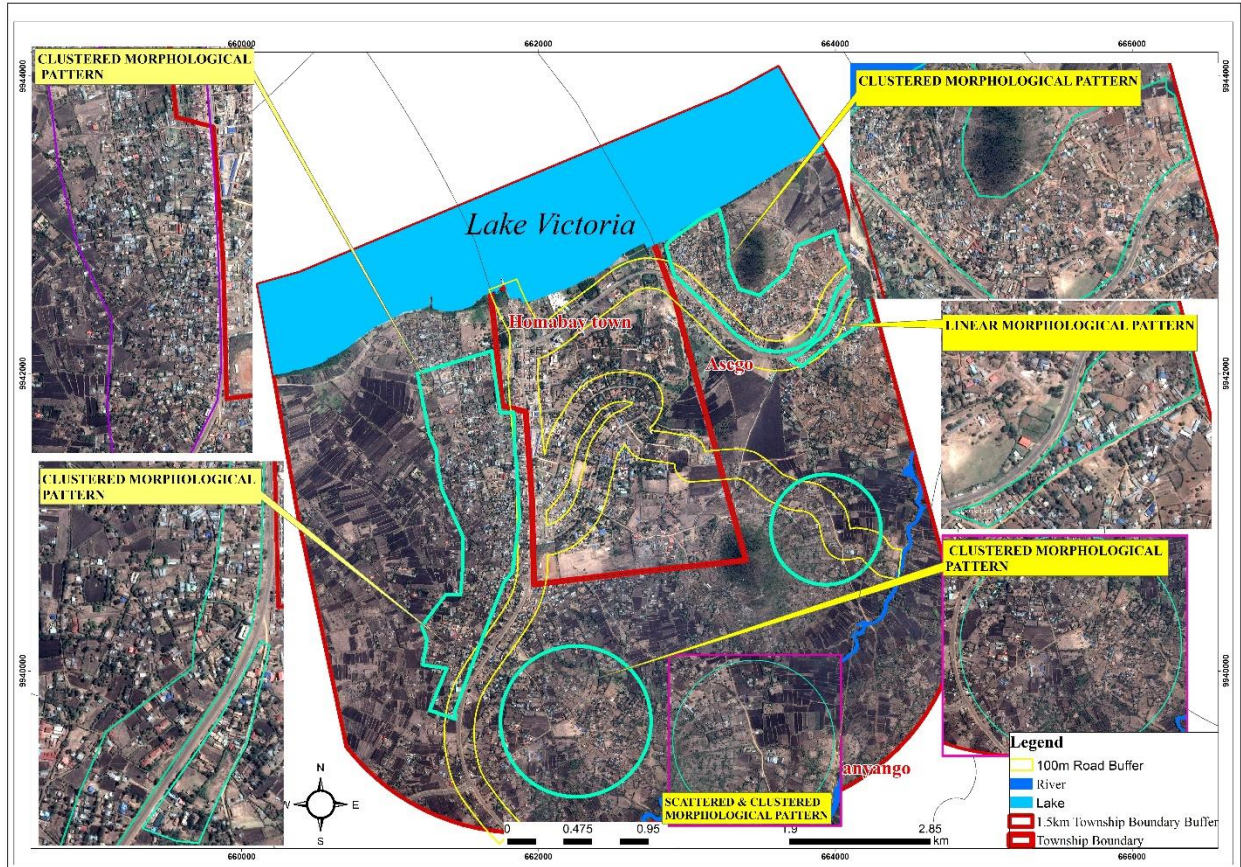


Map 9: Growth pattern in year 2009

## 2014 Land Use growth pattern

In map 10, the aerial image background depicts some spatial built-up changes where more linear and clustered developments are being witnessed as compared to the previous years. Infill

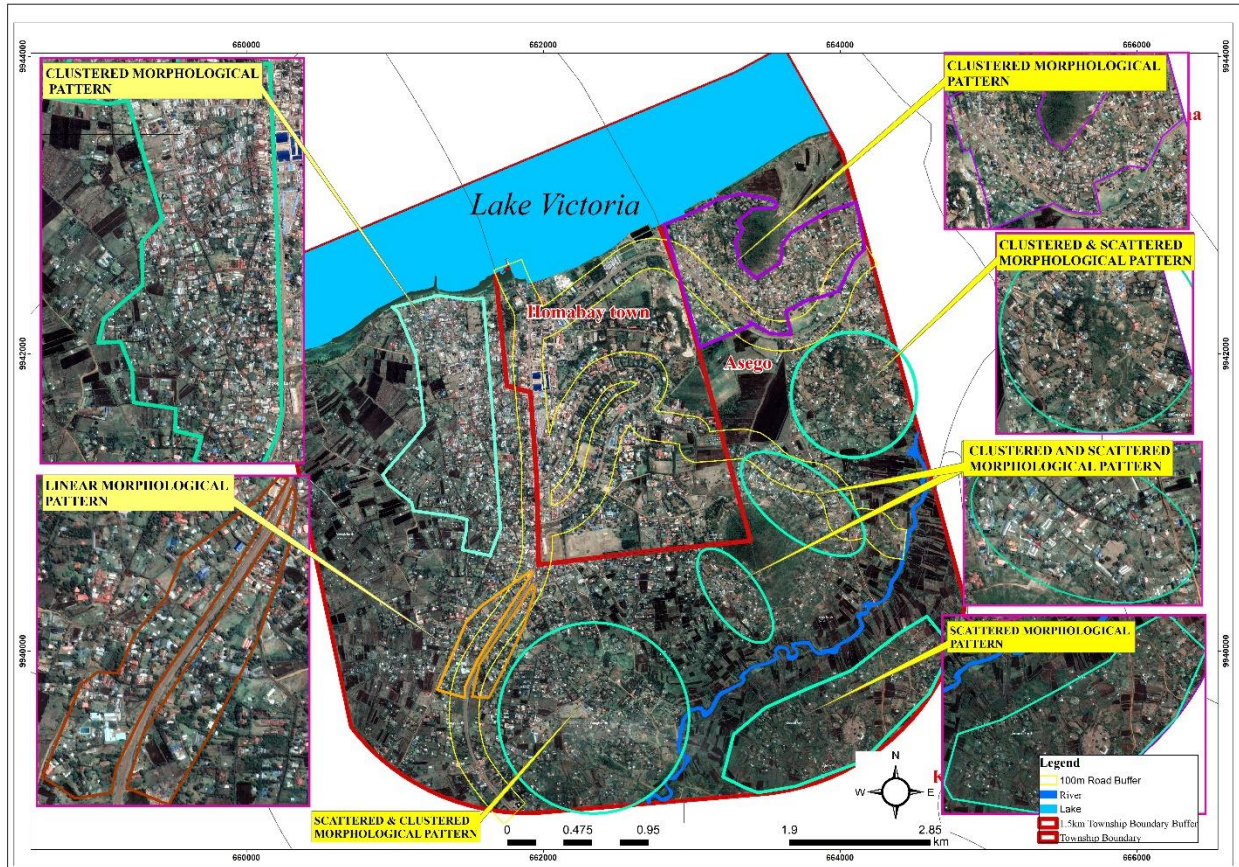
concentrated development change is being experienced within the town center. At the town outskirts, the linear growth pattern happens along transport links while clustered sprawling effect occurs behind the linear settlement.



*Map 10: Growth pattern in year 2014*

### 5.2.4 2021 Land Use growth pattern

*Map 11* shows how urban sprawl has occurred in the area as of the year 2021. Urban growth has occurred so significantly that many of the clustered settlements are almost joining. There are also massive linear patterns along the C19 Homa Bay - Rongo road and C20 Homa Bay – Kisumu road. A keen look at the zoomed-in area of the town shows an inward expansion of linear settlement. This is evident by the increasing number of housing units within the 100m buffer from the major transport links.



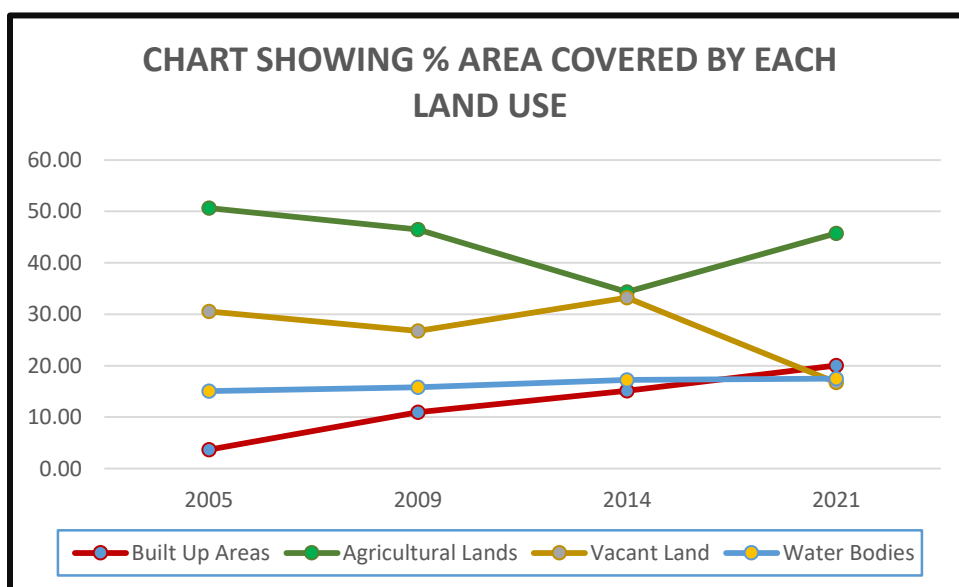
*Map 11: Growth pattern in year 2021*

The area classified under built up in the year 2005 portrayed a scattered and linear morphological growth as opposed to the year 2021 where the same areas can be seen to have adopted the clustered morphological pattern. As analyzed from maps, it is clear that much of the initial development around the town is associated with the main road network. The clustered shape of the built-up areas can also be associated with the influence of favorable landscape features and fishing activities taking place at the shore of Lake Victoria. There is also a radial morphological pattern that is being seen to happen around got Asego and Got Rabuur.

## Land Use Land Cover change analysis

AREA OF LAND USE LAND COVER CHANGE ANALYSIS								
Year of Study/Area	2005 (km2)	% of Total	2009 (km2)	% of Total	2014 (km2)	% of Total	2021 (km2)	% of Total
Built Up Areas	0.65	3.70	1.92	10.93	2.66	15.15	3.52	20.05
Agricultural Lands	8.89	50.63	8.16	46.47	6.03	34.34	8.03	45.73
Vacant Land	5.37	30.58	4.7	26.77	5.84	33.26	2.94	16.74
Water Bodies	2.65	15.09	2.78	15.83	3.03	17.26	3.07	17.48
<b>Total Area</b>	<b>17.56</b>	<b>100.00</b>	<b>17.56</b>	<b>100.00</b>	<b>17.56</b>	<b>100.00</b>	<b>17.56</b>	<b>100.00</b>

Table 8: Land Use cover change analysis



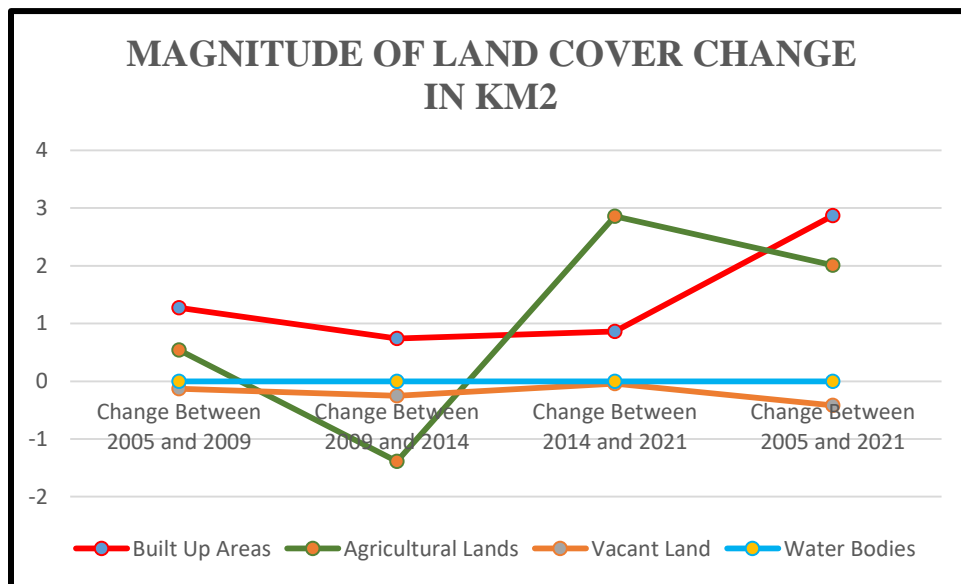
Graph 1: % Land Use Cover Analysis

Table 8 and Graph 1 above shows the area covered by each of the land use covers from the year 2005 to 2021. Over these years, the built-up area has grown from 3.7% to 20.05% while Agricultural land has reduced from 50.63% to 45.73%. The bare/ vacant land has also reduced from 30.58% to 16.74% while the water bodies have increased from 15.09% to 17.48% explaining the increase in water levels of Lake Victoria associated with the frequent rainy seasons within the western region and the neighboring countries of Uganda and Tanzania. Between the years 2009 to 2021, there has been an alternation of agricultural and vacant land use while the built-up areas

continue to increase. According to the county agricultural officer, these changes have been a result of the experienced change in climate over time. He explains that the bare lands become useful during rainy seasons and hence converted to agricultural use. *Table 9* illustrates the rate and magnitude of change in terms of area coverage in (km<sup>2</sup>) from the year 2005 to the year 2021.

Year of Study/Area	Area Change Between 2005 and 2009(km <sup>2</sup> )	Area Change Between 2009 and 2014	Change Between 2014 and 2021	Change Between 2005 and 2021
Built Up Areas	1.27	0.74	0.86	2.87
Agricultural Lands	-0.73	-2.13	2	-0.86
Vacant Land	-0.67	1.14	-2.9	-2.43
Water Bodies	0.13	0.25	0.04	0.42

*Table 9: Rate and Magnitude of change*



*Graph 2: Magnitude of land cover change (km<sup>2</sup>)*

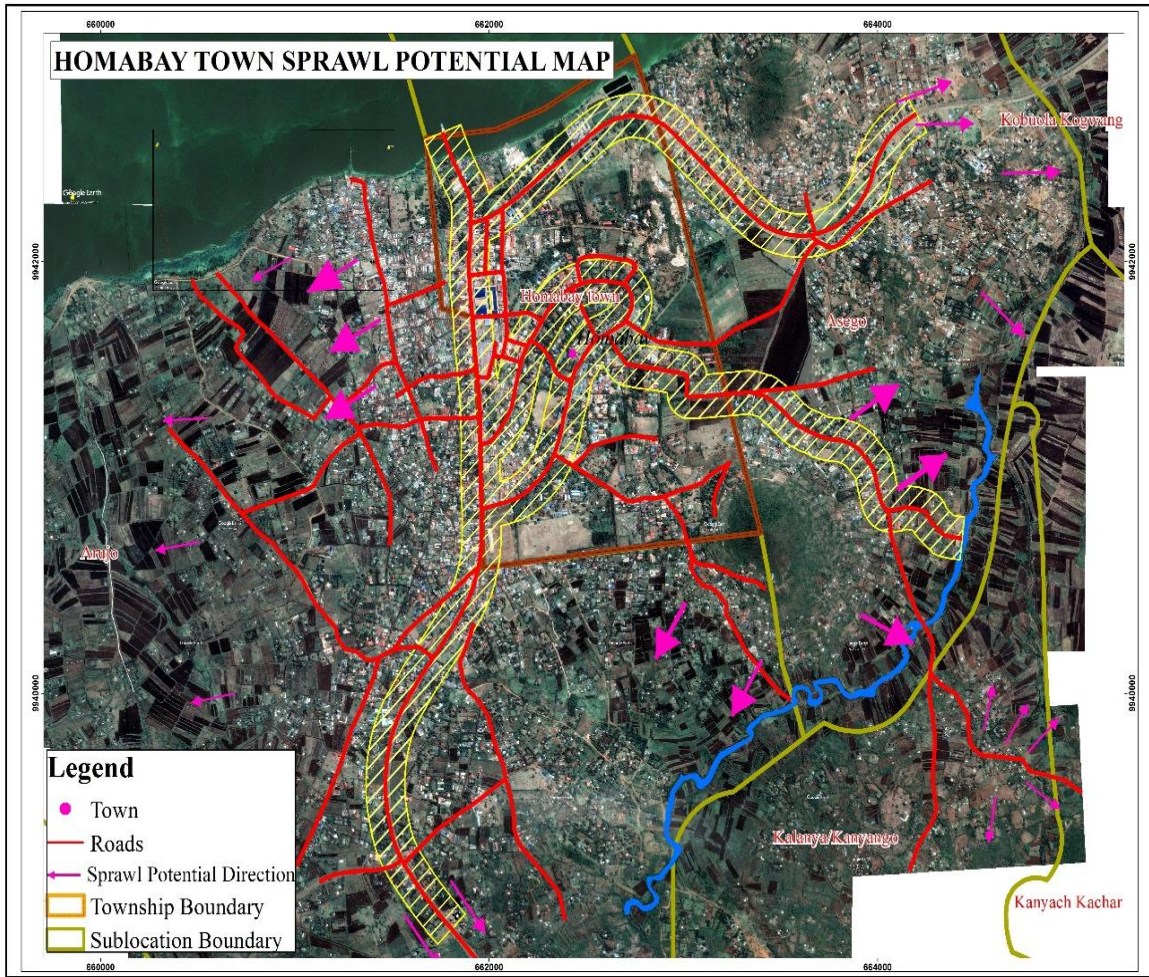
### Urban Sprawl

Urban sprawl in Homa Bay was assessed by taking a closer look at the changes in the built-up area in the region and the form it takes. Map 8 clearly shows the spatial extent of the built-up areas as of the year 2005 were scattered and linear morphological patterns were coming up. In 2009 and 2014 a more concentrated form of sprawl in the Arujo and Asego area specifically Makongeni was

witnessed. This was contributed by the improvement of infrastructural facilities such as the C19 Homa Bay – Rongo road and C20 Homa Bay-Kisumu road. There was an appearing radial sprawl pattern around got Asego and got Rabuor areas associated with the population growth. In 2021, a more informal clustered sprawling pattern occurred in the Arujo area. A concentrated radial sprawl pattern was witnessed around Got Asego and Got Rabuor areas. The linear sprawl pattern took shape along the major roads moving from Homa Bay town to Rongo area and from Makongeni area towards Kendu Bay.

From the change analysis, the percentage of undeveloped land to urban ground cover changed over time between the periods 2005 to 2021. A great deal of change provided a strong chance that a substantial amount of urbanization in Homa Bay Town would occur over time. By overlaying the road data, it was easy to visualize clearly the pattern of line sprawl taking place over time. The scattered pattern of sprawl also appeared to be somewhat disconnected from other areas of existing or new urban growth. Cluster patterns of sprawl appeared to be part of the existing built-up land within the Arujo and Makongeni areas. This pattern also appears to grow out of what was once a scattered morphological pattern of development in some areas.

However, the pattern of sprawl represented in this research is not exclusive to built-up area changes. Population density is also important in showing where urban land density has increased over the period. In this case, there is an increase in population densities of the urban land in the west of Homa Bay town (Arujo) and on the northeastern sides of Asego. From these facts and analysis, the sprawling effects in Homa Bay town will continue to be felt due to the increased rate of urbanization. Map 12 illustrates the future direction along which the growth pattern is expected to follow



Map 12: Sprawl Potential Map

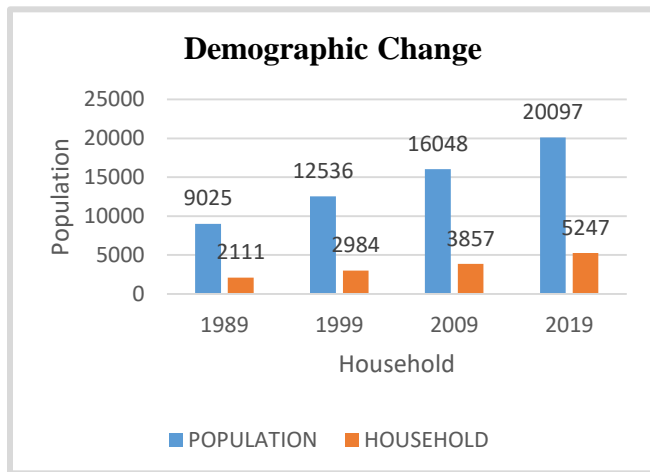
### 5.3 Drivers of Urban Sprawl

#### Demography

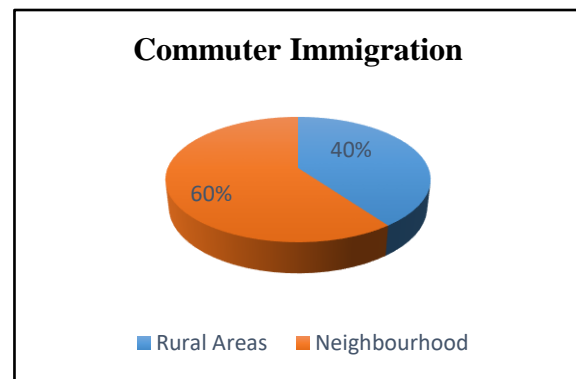
According to the Kenya Census report of 2020, the population within Homa Bay municipality increased from 28,361 to 44,949 between census periods 2009 to 2019. This change has actually been experienced in the sub-locations of Arujo and Asego which forms the Homa Bay Central Ward. With the increase in urban population and low mortality rate, this population figure is expected to increase further. The report also records an increased migration trend within and out of these sub-locations between the two census periods. The 2019 census report registered an increment in migration trend by 12.2% of which 7.9% were male and 4.3% were female. Homa Bay County Chief Officer in charge of Lands explains that the several activities happening within

Homa Bay town attract a greater population from the villages who come to settle in areas surrounding the town. He also explains that arising job opportunities; marriages; good business opportunities; search for better health care, and better educational facilities which are never guaranteed within the village setup are some of the major attractions in the town center.

The field survey also noted that the town experiences daily commuter in-migration where people from neighboring rural areas and surrounding towns and counties travel daily to work and with some transacting the business within the town center. As illustrated in Graphs 3 and 4, the survey revealed that among the daily in-migrants who work in town, 40% come from the rural areas while 60% comes from the neighboring towns and counties of Rodi, Kochia, Suba, Awendo, Gem, and Migori County.



Graph 3: Demographic Change over years



Graph 4: Daily In-Migrant Origin

There is a close relationship between urban growth and demographic changes. Homa Bay town being Homa Bay County's headquarter has attracted a high population due to its urban development capacity. The town also hosts other good institutions such as Kenya Medical Training College (KMTC), Homa Bay County Referral Hospital, Tom Mboya University, other tertiary colleges, and government institutions that provide relevant government services to the local residents who are either within or out of the county.

The town also hosts formal fishing industries which operate within the framework of fish processing, the byproduct of fish processing, boat building, and fishing gear repairs. There is also an agro-based industry that acts as a ginnery for cotton. The informal industry sector also known



as *Jua Kali* has a direct linkage with agriculture, and building/ construction and attracts artisans, women groups, youth groups, and self-help groups. This sector lies in its ability to generate employment for the incoming population by the use of available resources and adoption of the new technologies. Other features within the town center that attract the population include the availability of sports facilities(Homa Bay stadium), Municipal Market, cultural center, library services, transport sector as well as Lake Victoria which allows for cross border trading, transportation, and offshore fishing activities.

From the field study, it was evident that urbanization continues to take place within the neighboring sub counties of Arujo and Asego which have registered an increased population since the year 2009 due to the available dependable services within Homa Bay town. Arujo and Asego areas have registered a clustered morphological pattern of growth characterized by informal houses. According to the County Physical Planner, these houses are majorly occupied by people who depend on informal businesses and the fishing industry as their main source of livelihood and have no ability to commute for longer distances while carrying out their daily operations. Field observation revealed that most of these informal houses are found along the beach fronts, especially in Makongeni (Asego) and Sofia (Arujo).

## **Economy**

The presence of Lake Victoria within the study area makes fishing one of the main income-generating activities. The industry attracts a high population from rural and other areas since it provides employment to the youth and women. The economic performance of this industry is attributed to the availability of equipment and materials such as boats, nets, baits, lamps, hooks and lines, and floaters which are used by the fishermen who go into the waters to catch fish. According to the chairman of Homa Bay County Beach Management Units (BMUs), the fishing industry forms the backbone of Homa Bay County's economy and contributes to 0.5% of Kenya's overall GDP. He explains that this economic influence witnessed within Homa Bay town is a result of the presence of five beach landing sites within the town out of the 147 which exist in the entire county. These sites include Kanaga, Angalo, Kaginga, Lella, and Achich in which major activities such as fishing, fish processing, trading, and fish transport take place.

The fishing sector supports over 80,000 livelihoods employing over 10, 000 fishermen and fish mongers who come from within and out of the town. The industry has over 2,500 boat owners and over 30, 000 daily fish traders who buy and sell the fish in and out to the neighboring towns. These traders come from Kisii County, Rongo, Rodi, Lambwe, and Oyugis. Fish that come from the lake is sold for direct eating or for processing and some are exported to other towns and European countries. The industry produces Nile perch fillets which are exported with the remaining skeleton of the fish known as 'mgongo wazi' being sold to the locals. Other species which are also exported include tilapia and *dagaa*. The field survey revealed that over 25% of the working population who live in town outskirts depend on the fishing industry as the main source of their daily livelihoods.

Apart from the fishing industry, the artisan (*Jua Kali*) sector also provides employment to the population who live at the periphery of the town. This sector has a high linkage with the agricultural, building & construction, and industrial sectors for the supply of both input and finished products. The field survey established that out of the population living on the outskirts of the town, 8.8% get their daily earnings from artisan activities such as carpentry, radio repair, plumbing, saloon, tailoring and dressmaking, plumbing, cobblers, watch repair, selling of second-hand clothes, metal fabrication, selling of newspapers and food vending.



Figure 15: Jua kali Artisan



Figure 15: Fish Mongering along Lake Victoria

Source: Survey 2021

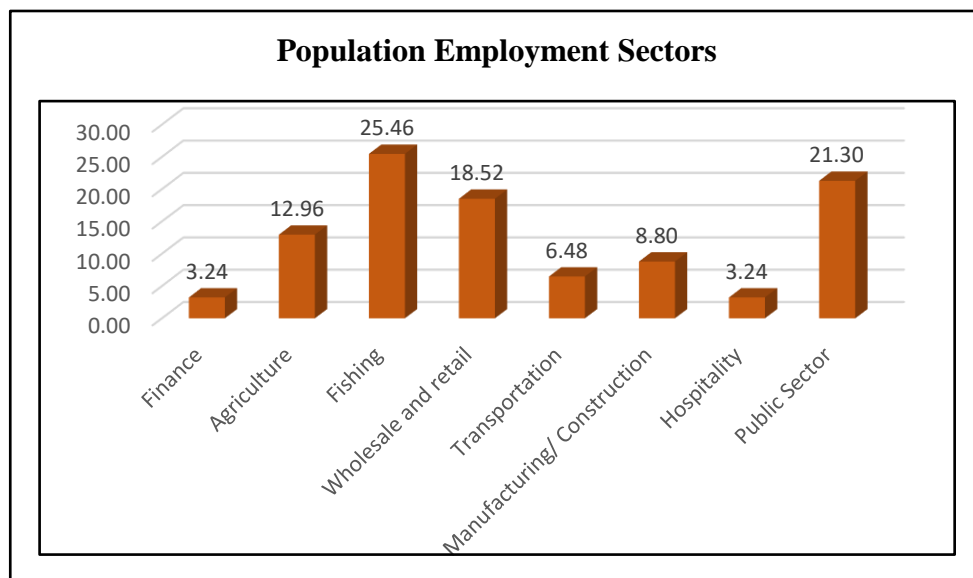
The study also found out that 18% of the same population living out of the town are involved in commercial trading activities such as wholesale and retail trading. The retail trading activities within the study area are evident in the presence of established retail shops located within and out of the town. These shops are known for selling general domestic items; hardware products; and building and construction items. The presence of high caliber commercial shops termed as

wholesale with large capital inputs also allows for high supply and bulk purchase of commodities to the retailers and individuals who live within and on the outskirts of the town.

The study area also experiences hawking activities that happen within the busy nodes of Homa Bay town bus station, Soko Mjinga Market, and Municipal market which provides room for selling of farm products and cattle auctions during the market days.

The banking and financial sector within Homa Bay town employs over 3% of the outskirts population. The study area hosts several financial institutions such as the Absa Bank, Post Bank, Cooperative Bank, Equity Bank, and the Kenya Commercial Bank. The availability of M-PESA shops within the town and at the estates also facilitates mobile money transfer services making transactions within and out of the town easier.

The hospitality sector also attracts the in-migrants due to the presence of tourism resources such as the Homa Bay tourists Hotel and Ruma National Park. The survey found that the tourism sector employs about 3.24% of the population living out of the town. This is being attributed to the presence of aquatic resources, sightseeing resources like Got Rabuor and Got Asego hills, the Luo culture, and the presence of wildlife such as the crocodiles and hippos found in Lake Victoria. Graph 5 illustrates how different economic sectors employ the town outskirts population.

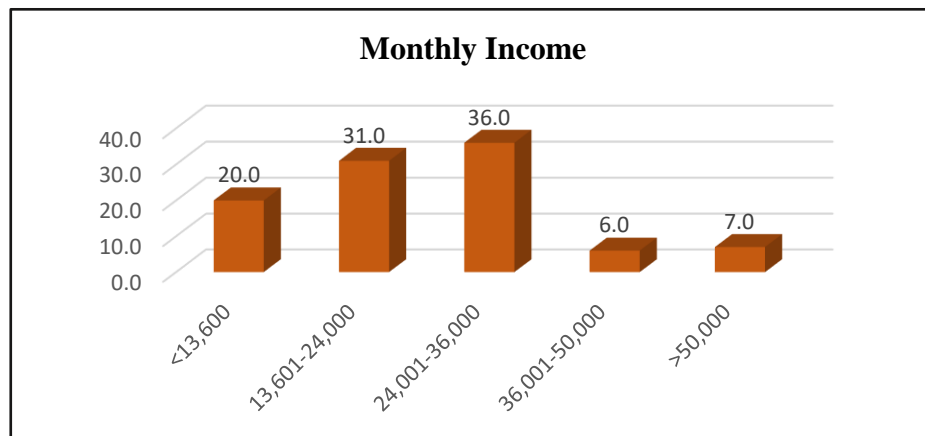


Graph 5: Employment Sector Analysis

Source: Survey 2021

With the growing economy of Homa Bay town, a different class of people who earn different salary rates opts to settle at various locations within the municipality. According to Homa Bay County CEC Lands, the middle-income population category who earn a monthly income of between Ksh 23,671-Ksh 119,000 are the ones who prefer settling at the peripheries of the urban settlement. He argues that most of them do not want to pay for rent within the CBD hence build their homes and commute daily to work while others venture into commercial activities and real estate developments.

The field survey also revealed that over 49% of the people who live at the periphery of the town earn a salary of more than Ksh. 24000. 20% of these residents earn a monthly salary which is below Ksh. 13,600 with their residential houses characterized by poorly serviced neighborhoods with semi-permanent housing structures made of mud, iron sheets, and wattle. This category of people forms a highly concentrated settlement pattern witnessed in estates such as Shauri Yako, Sofia both in Arujo ward and lower parts of Makongeni in Asego ward. The high-income earners live in single detached or semi-detached two or three bed-room bungalows while other areas contain few massionates built of bricks and mortar with iron sheet roofing. This kind of population is found in areas of Milimani, Mbita Junction, Got Rabuor, and Got Asego area. Graph 6 illustrates the % monthly income rate of the population living at the periphery of the town.



*Graph 6: Monthly Income Analysis*

## **Development of social and physical Infrastructure**

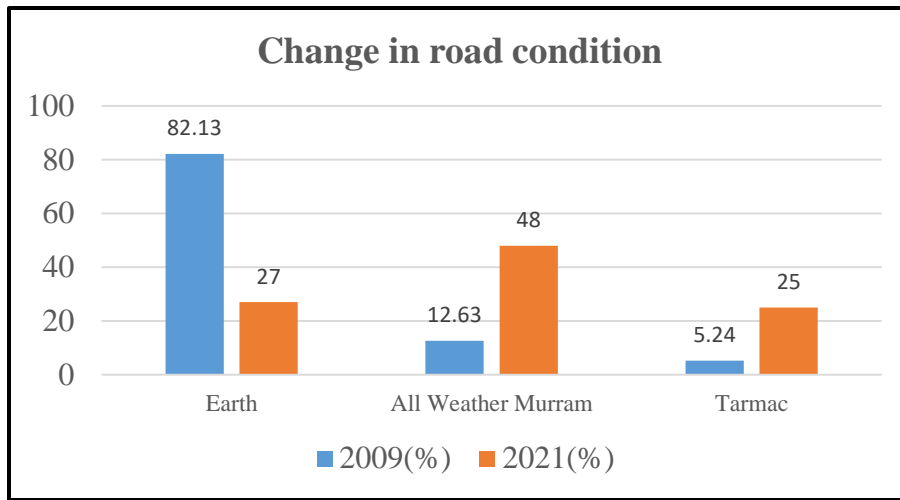
Homa Bay town has experienced key improvements in infrastructural developments over the past few years on areas. These are in sectors such as road and water transportation, solid and liquid waste management, electricity provision, and street lighting. As a contributor toward urban sprawl, the development and use of these infrastructural projects have attracted a number of the population who live within and on the outskirts of the town as shown in graphs 6&7 illustrating the transport modes' dependency and public utility connectivity respectively.

According to Homa Bay County transportation officer, the construction and improvement of the transport networks such as the C19 Homa Bay- Rongo road and C20 Homa Bay Kisumu road have improved the movement of passengers and residents from within and out of the county. These roads have also enabled easy transit of people from Nairobi, Kisii, and Migori counties, Rachuonyo, Rongo, Rodi, Mbita, and Suba sub counties. Homa Bay town also has a bus terminus which is a major transit node and a gateway to Mbita point, Kisumu, Kisii, and Migori counties. The roads within the CBD area are paved with walking pavements in good condition while most of the roads connecting the residential areas at the periphery of the town are characterized by all weathered murrum and earth murrum.

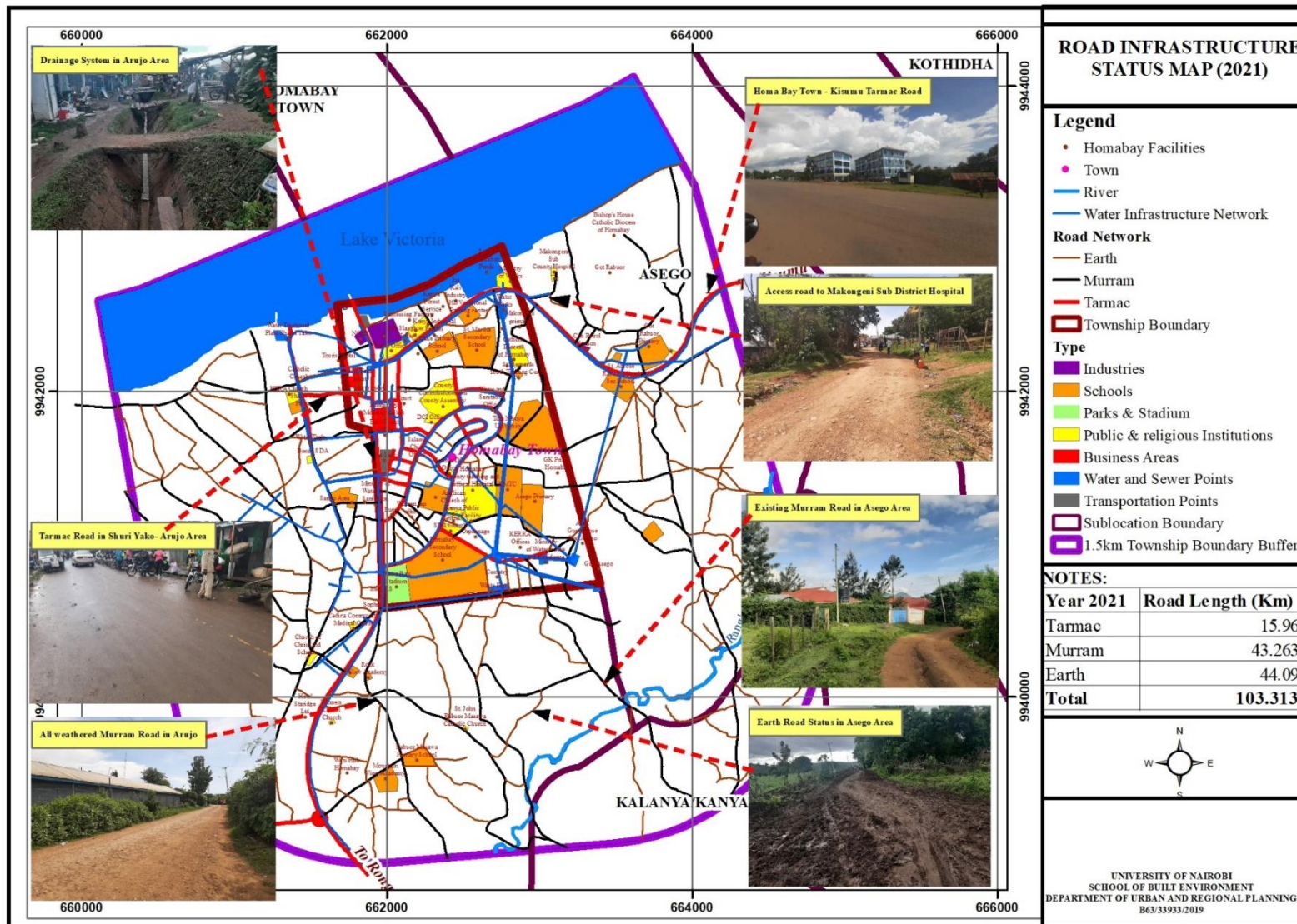
The field survey found out that some of the interior rural areas are being serviced by earth roads with some residents complaining of the roads being impassable sometimes during the rainy seasons. Along major roads, the CBD is served by surface drains and sewer manholes with street lighting installed. The CBD is also served by the Air transport witnessed by the existence of Kabunde airstrip in Lieta area which is 8KM from the CBD. The County transport officers explain that this airstrip facilitates air travel for tourists traveling to and from Nairobi, Maasai Mara, and other tourist attraction sites such as Ruma Game reserve, Simbi Nyaima, Rusinga Island, and Mfangano Island. *Map 13* indicates that 15.45% of the study area is covered by tarmac roads, 41.188% covered by all weathered earth roads while 42.68% is murrum earth roads.

This is a major improvement as compared to the year 2009 which registered 5.24%, 12.634%, and 82.125% of tarmac, all weathered murrum road and murrum earth road respectively as also illustrated in *map 14* The field survey also found out that 25% of people living at the outskirts of the town can easily access the tarmac roads, 48% can easily access all weathered murrum roads

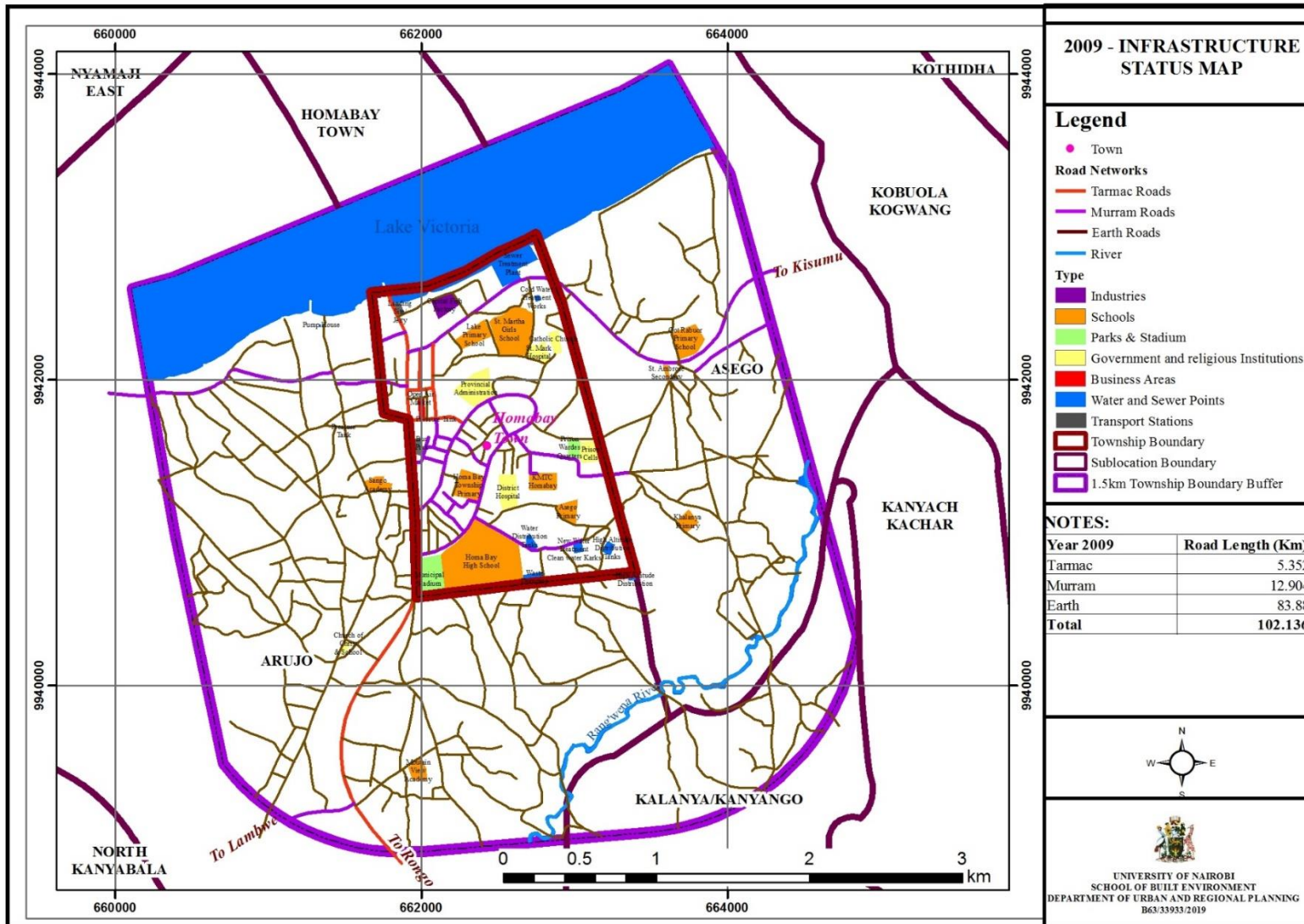
while 27% can access murrum earth roads. Graph 7 illustrates the change analysis between years 2009 to 2021.



*Graph 7: Road Condition Analysis*



Map 13: Road Infrastructure Map (2021)



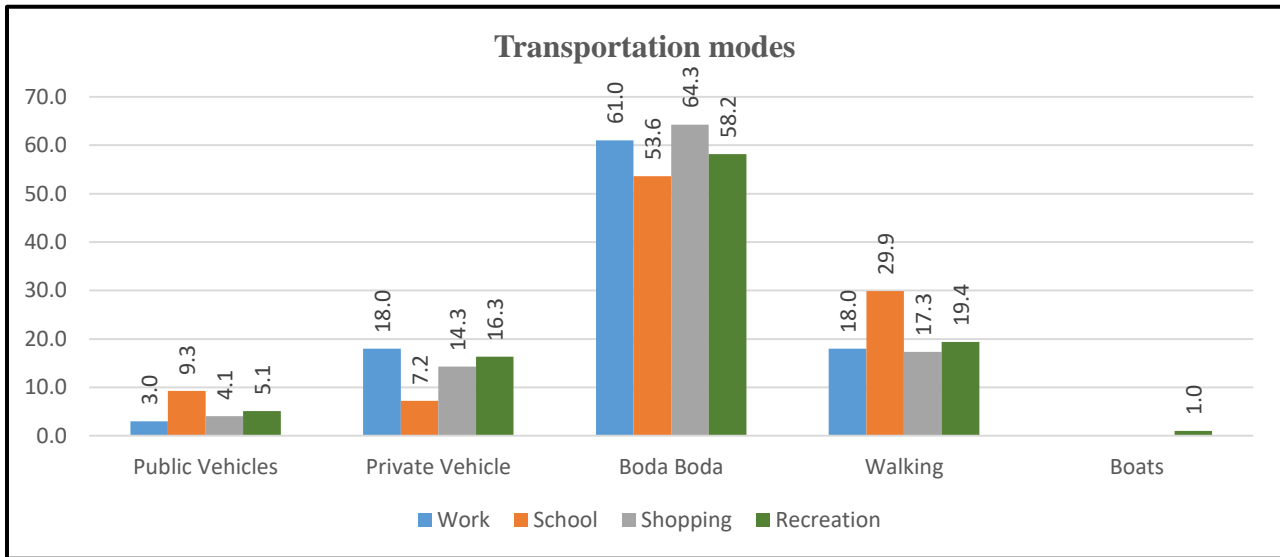
Map 14: Road Infrastructure Map (2009)



The transport officer, also explains that the increase in the number of motorbikes (*boda boda*) and taxis being witnessed within the township areas has facilitated the easy daily movement of people from their residential houses at the peripheries into the CBD. The use of motorcycles has also enhanced easy accessibility into the rural areas where the road conditions are not favorable. The use of these motorbikes has also led to a reduction in time of travel and this has helped in the timely good delivery of the perishable agricultural produce.

According to the field survey, people living within the outskirts of the town do depend widely on the available transportation modes to access various services. The survey revealed that out of the population going daily to work, 3 % use public vehicles, 18 % use private vehicles, 61% use motorbikes, and 18% walk daily to work.

Out of the school-going population, 9% use public vehicles, 7% use private vehicles, 52% motorbikes, while 29% access educational facilities by walking. This field survey also noted that 4% of the population at the periphery use public vehicles to go shopping, 14% use private vehicles, 63% motorbikes (*boda boda*) and 17% prefer walking. For recreational purposes, 5% use public transport, 16% private vehicles, 57% motorbikes, 1% boat riding while 19% prefer walking. According to the transport officer, small boats and canoes found along the beaches support linkages between Homa Bay and other lakeshore destinations such as Kisumu, Kendu Bay, Mfangano Island, and Kampala Uganda. He however explains that this sector currently experiences challenges arising from the increasing level of water hyacinth which brings about difficulties in navigation. *Graph 8* illustrates the (%) use of various transportation modes in accessing services.



Graph 8: Analysis on Modes of Transportation

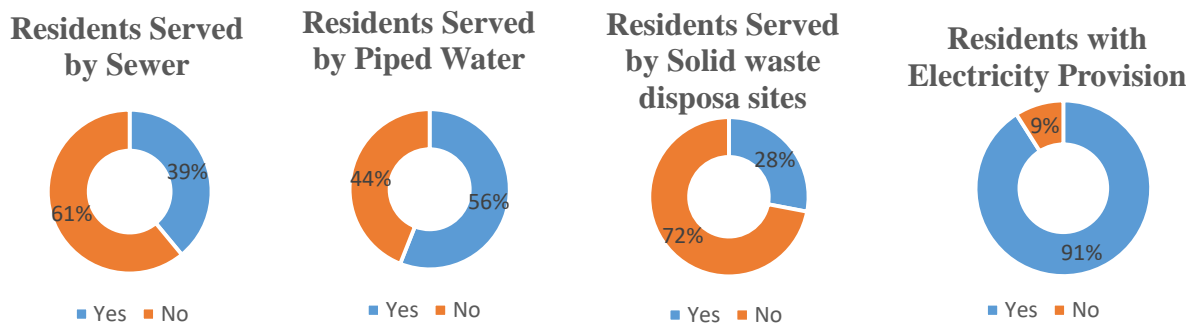
The field survey found that some parts of the town periphery are well served by piped water, sewerage systems, and electricity connection. As illustrated in graph 7, 39% of residential areas are connected with sewer lines, 56% are served by piped water, and 91% are connected by electricity. Field observation established that many households which are not connected to piped water systems depend on rainwater, water boozers, or shallow wells for regular water supply. It was also observed that the town outskirts environment is cleaner than the inner CBD due to few human activities taking place in the outskirts.

The environment officer notes that this kind of environment attracts residents from the inner town to the outskirts increasing the rate of sprawl. The field data analysis established that only 28% of the residents living on the outskirts of the town have access to waste disposal sites. Others do burn, bury or dispose of the solid waste into waste tips which are later collected by the county government officials. According to the county environment officer, the county government of Homa Bay has employed over 200 youths through the Kazi Kwa Vijana Program who manage solid wastes and perform regular cleanup exercises within and on the outskirts of the town.

The town also hosts a Decentralized Treatment Facility (DFT) under the management of Homa Bay Water and Sewerage Company (HOMAWASCO). This facility accumulates all the sewer wastes from areas with sewerage connectivity, and treats the waste, before getting them released into the environment through Lake Victoria. As a means of managing solid wastes, the county

environment officer explains that the Luo culture plays a major role in decentralizing residents from the inner city. He notes that the Luo culture encourages burying of the dead in the villages as opposed to the existing cemetery which exists within the town center. In a situation where the breadwinner dies, most of their dependents prefer moving out of town to go settle on land where their loved ones have been buried and where their daily life expenditure will be cheaper.

The study also established that the availability of essential public utilities in the town center and its peripheries has attracted residents into these areas leading to the increased level of sprawl. *Graph 9* represents the level of accessibility to a public utility in percentage (%) at the town peripheries.



*Graph 9: Analysis of public utility availability in (%)*

The survey also found out that 97% of people living in town outskirts have access to health facilities, 97% easily can access religious institutions, 91% open-air markets, 59% can access police posts, and 64% easily access the bus parks. However, these residents still depend on and can access other major facilities in the town centers such as the Homa Bay stadium which is still under renovation, the social hall, municipal market, Homa Bay County Referral Hospital, Huduma Center, and other government offices among others. Map 15 illustrates the distribution of these facilities within the study area.



Figure 16: Facilities at the Central Business District

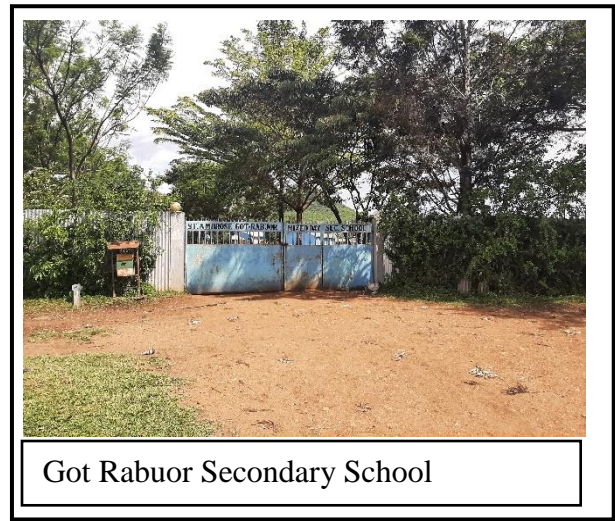
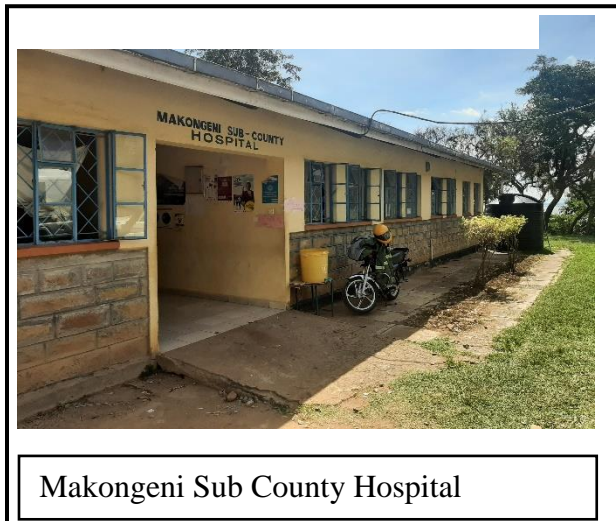
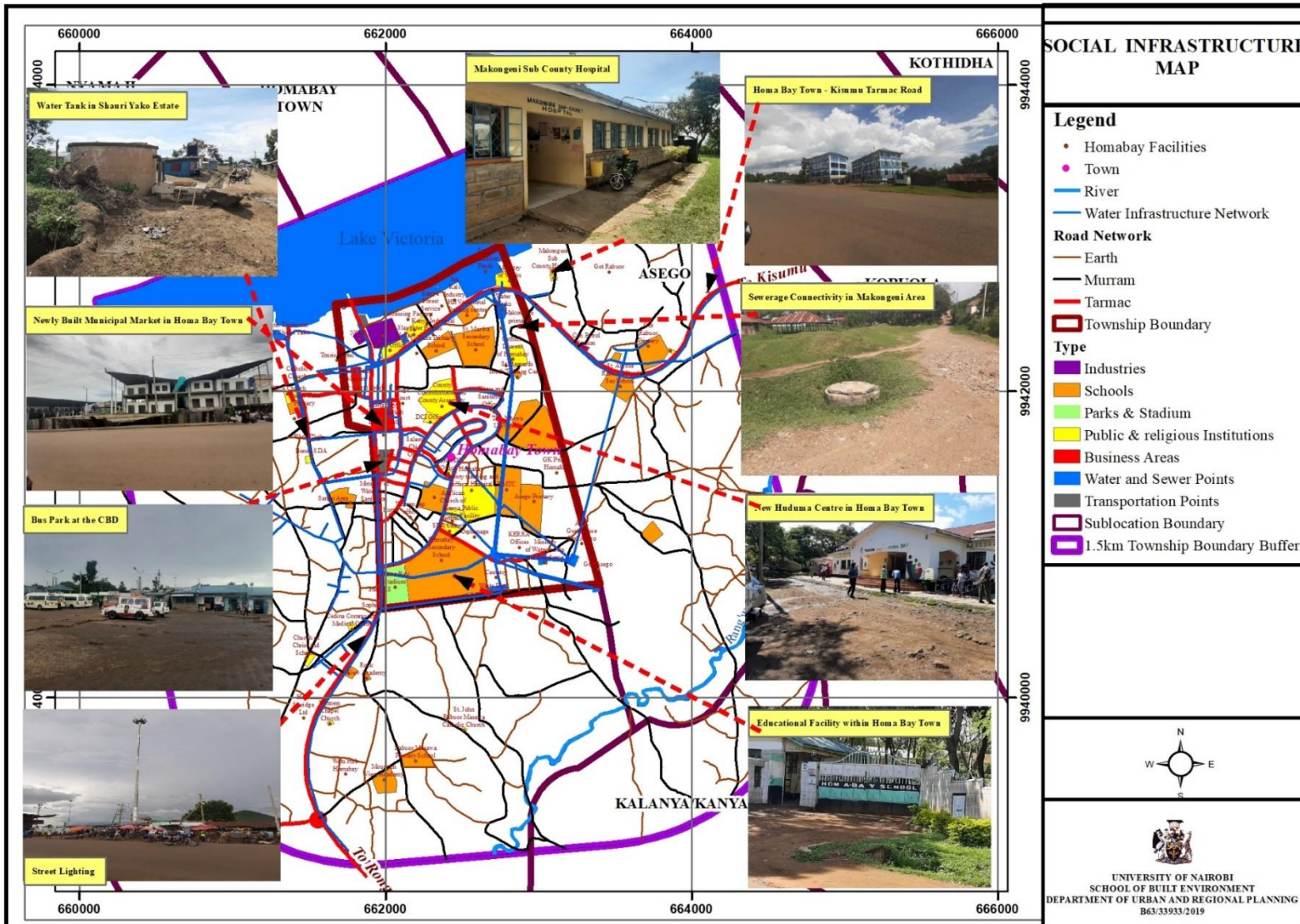


Figure 17: Public Facilities at the town periphery

Source: Survey 2021

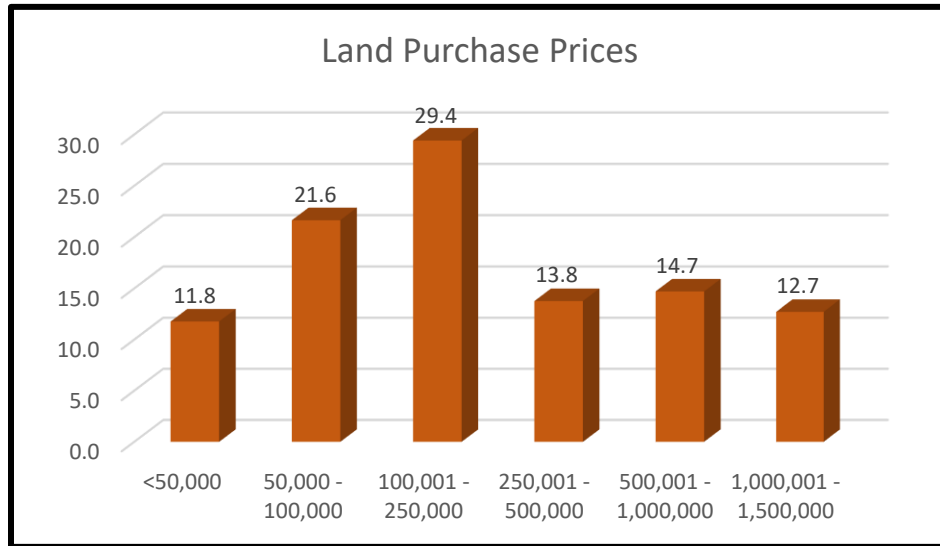


Map 15: Social Infrastructure Map

## **Land Speculations**

As a key driver of urban sprawl, the purchase of land based on speculations has been considered to be a key influence on the growth of Homa Bay Town. The county director of physical planning argues that as a result of the devolved system of governance within the Kenyan governance system, there is an unwillingness of selling land by people who own land within the towns to investors due to land prize speculations. He argues that those willing to sell their land do so at inflated prices which are influenced by improved infrastructure facilities within the town center. Secondly, land in Homa Bay County is being sold on the willing buyer willing seller process and due to this, investors and developers opt to go buy land at the peripheries where there is goodwill, land prices appear to be cheaper than the ones at the town center and land is on freehold tenure, making the sprawl to occur.

According to Homa Bay county Chief Officer Lands, a 50x100 acre commercial piece of land within the town on leasehold tenure goes for approx. Ksh. 2.5 million as opposed to freehold residential land at the periphery which is estimated to be between Ksh. 800, 000 -1,500,000. He explains that this difference is due to the availability of public facilities which are found within the town center and not in the town peripheries. The survey also found out that among the people living in the town outskirts, 48% acquired land through purchase while 52% acquired it through inheritance. Among the people who purchased, 29% bought at a price of between 100,000-250,000, 21% purchased at a price between 50,000-100,000, 12% purchased below 50,000, 14% at a price ranging between 250,000-500,000, 15% between 500,000-1,000,000 while the remaining 13% purchased at a prize between 1,000,000-1,500,000. The analysis clearly illustrates that the land along the outskirts of the town is a bit affordable to the investors as compared to the ones within the CBD because of the differences in land prices.



*Graph 10: Land Prices Analysis*

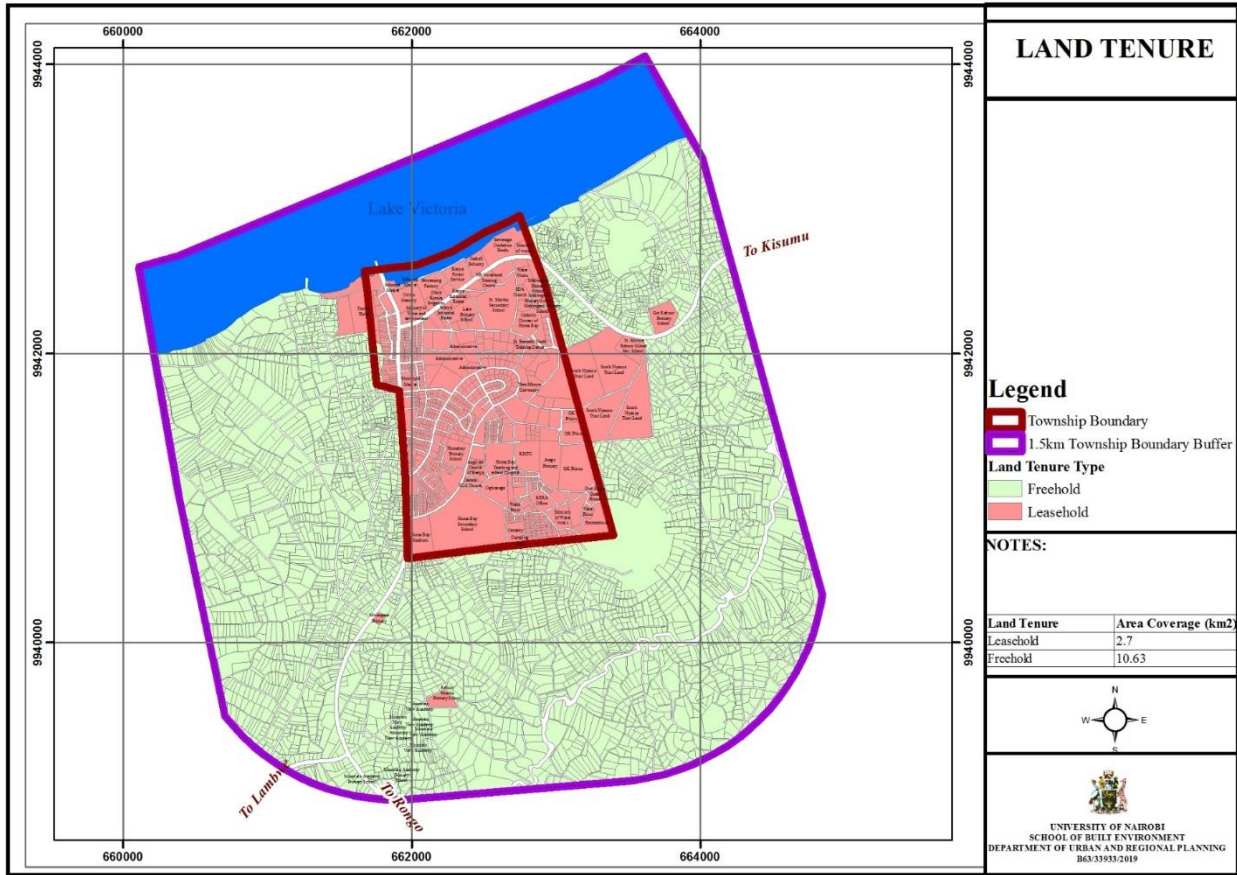
Consequently, other than the plot owners, the low rental charges of houses within the periphery of the town influence residents to move from the town center. According to the County Chief Officer in charge of Lands, the housing units within the periphery of the town attract the middle-income earners who run away from the noisy town environment and are capable of commuting daily to work within the CBD. There are also private developers who purchase land and develop commercial structures along major roads influencing the upcoming new small market centers. The field survey found that the lowest housing unit at the town periphery goes for Ksh. 1,800 every month with the maximum going for Ksh. 10,000. A figure which is totally lower as compared to the rental charges of houses found within the CBD charged at Ksh. 5000 for a bed sitter and Ksh 15,000 for a two bedroom house.

It was also noted that privately owned housing units are more expensive compared to the government-owned housing units existing within the town center. According to the housing officer from the Ministry of Housing, rental prices for government-owned housing units within the CBD go at Ksh. 600, Ksh. 1000, Ksh. 2500 and Ksh. 500 for bed sitter, one bedroom, two bedroom, and single units respectively. She also explains despite these housing units being reserved for civil servants only, they are few in number and cannot accommodate all the government employees. Being the case, several officers of the government prefer staying in the town outskirts where the rental charges are cheaper and accommodative.

## **Land ownership and Land Tenure System**

Homa Bay town and its peripheries have a combination of land tenures that offer both opportunities and constraints when it comes to development. Land within the CBD is majorly owned by either the national or county government and is under leasehold tenure while land at the peripheries is privately owned under freehold tenure. As a contributor to sprawl, the Chief Officer of Lands for Homa Bay County argues that due to the different tenure systems, developments within the CBD area are easily controlled as compared to freehold land at the peripheries. He explains that the development of land within the CBD is easily managed under the watch of national and county government officials who ensure that the existing County Development Plan is properly implemented. However, this is contrary to the town periphery areas where the development of freehold land is under the watch of the developer since there is no existing plan for the town peripheries. Existing records spatial record from the county planning records indicates that 20% of the land within the study area is under leasehold tenure while 79.74 is under freehold tenure. *Map 16* Illustrates the land tenure system within the planning area.





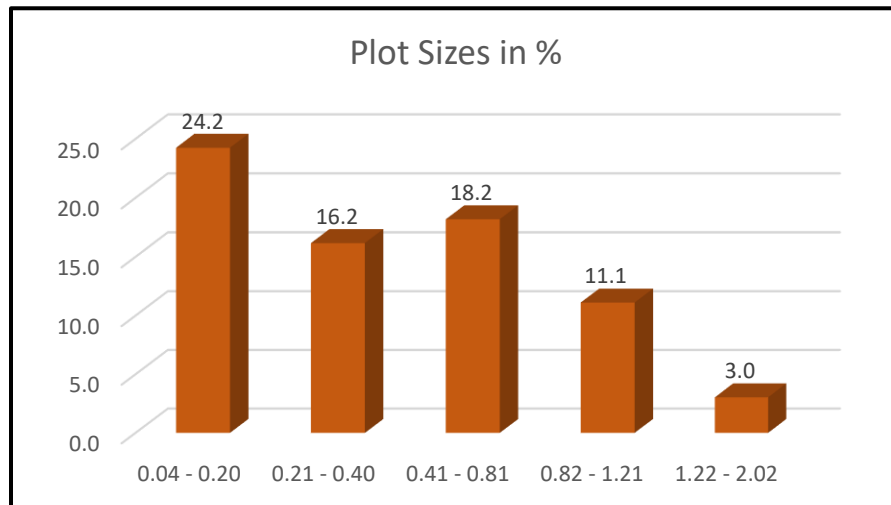
Map 16: Land Tenure Map

### Informal Land Delivery Systems

Homa Bay towns lack a comprehensive Local Physical Development Plan to guide and control development at the town peripheries. Chief Officer Lands explains that currently, the development application process for Homa Bay County is sent to the Director of Physical planning under the National government, where the plans get circulated to various government departments for approvals before being submitted to the County Executive Committee member (CEC) for adoption and implementation. He argues that this process is contrary to sections 41, 46, and 47 of the Physical Land Use and Physical Planning Act of 2019 which gives the county government powers to initiate planning, prepare and gazette plans and through the office of the governor approve the plans. It also gives authority to the CEC powers to chair all land development approval meetings within the county which seek approvals.

As the County Director of Physical Planning explains, the unavailability of a comprehensive development plan and a GIS-based County Spatial Plan to guide developments at the town periphery have posed a lot of threats to the available agricultural land. She explains that since the land at the periphery is under freehold tenure, they are being sold on a willing buyer willing seller basis. This has led to the increased rate of subdivision onto the agricultural land.

The periphery area like Makongeni, Shauri Yako, and Sophia area have experienced this major challenge where a lot of land along the transportation links has been subdivided into 50ft x 100ft plots. The survey revealed the minimum parcel size at the peripheries of the town range between 0.04-0.20 hectares while the maximum range is between 1.22-2.02 hectares with most of them being under the agricultural use as indicated in map 16. *Graph 11* illustrates the overall land size coverage at the peripheries in percentages.



*Graph 11: Periphery Plot Sizes Analysis*

According to Chief Officer Lands, the county land board plays an important role in trying to control the minimum parcel sizes and their accessibility to the transportation networks. However, this has been a challenge since the demand for agricultural freehold land has become high contributing to sprawl. He argues that the process of carrying out a transaction on freehold land at the peripheries is easier since it is sold based on the willing buyer/willing seller. He explains that the increasing informal land transactions and subdivisions on the agricultural lands are influenced

by the weak regulatory systems which allow for the formalization of the transaction in later years by the Land Control Boards as is provided under Article 6 of the Land Control Act (Cap. 302). On the contrary, there is a controlled transaction on leasehold land since the leaseholder is required to obtain consent from the government land officers before the implementation of any transaction. In this case, the lessee may represent a proposal on subdivision to various authorities before its actual implementation on the ground.

### **Political and regulatory framework**

It is a requirement by The Kenya Constitution 2010 for all the counties to develop a GIS-based County Spatial Plan that will provide a proper framework for the county's development agenda. Currently, Homa Bay County lacks the County Spatial Plan (CSP) which can be used as a tool to evaluate the county's physical, infrastructural, and human resources developments within the county. As a result, development control has become a major challenge due to the lack of proper framework or strategies to guide developments.

According to the County Chief officer Lands, Homa Bay town uses the 1998 development plan (DP) as a tool to control development within the CBD. This plan is the second one since the development of an earlier version in the year 1970. However, he argues that this plan is outdated and its implementation does not control how development takes place at the periphery of the town since the town has outgrown the initially planned area. Due to this, the unplanned sprawling effect is being experienced at the peripheries due to a lack of control measures to guide outskirts developments. The absence of spatial planning tools to has resulted in operation difficulties for the county officers since they lack reference tools to allow them to make proper development decisions.

Homa Bay town has not planned for land banks to facilitate future government/ county developments. This factor has been contributed by the fact that most of the land at the peripheries of the town is on freehold tenure and the process of its acquisition depends on the willing seller. Since there is no policy guiding the development and purchase of vacant lands at the peripheries, some people who own land in the prime areas such as market centers and along the transport links do not develop for the prospect of higher prices in the future. As a result, developers who cannot

afford to buy in these prime areas opt for interior areas where land can be purchased at cheaper prices hence contributing to sprawl.

Chief Officer Lands also argues that most of the laws governing the development of land within the county are general and therefore put a need for customization to control developments. There are also some implementation difficulties of existing laws in terms of approvals. For example, the Physical Land Use and Physical Planning Act (2019) bestows powers to the CEC lands for the approval of the Part Development Plans (PDPs) a policy that is yet to be implemented since most of the PDP approvals still depend on approvals from the National government director in charge of Physical Planning

According to the Director of Physical planning, Homa Bay County also faces challenges in terms of implementation of the development control measures due to poor funding from the national government. These factor has also contributed to understaffing of the planning officers who can play a role in approving the development plan and ensuring its proper implementation.

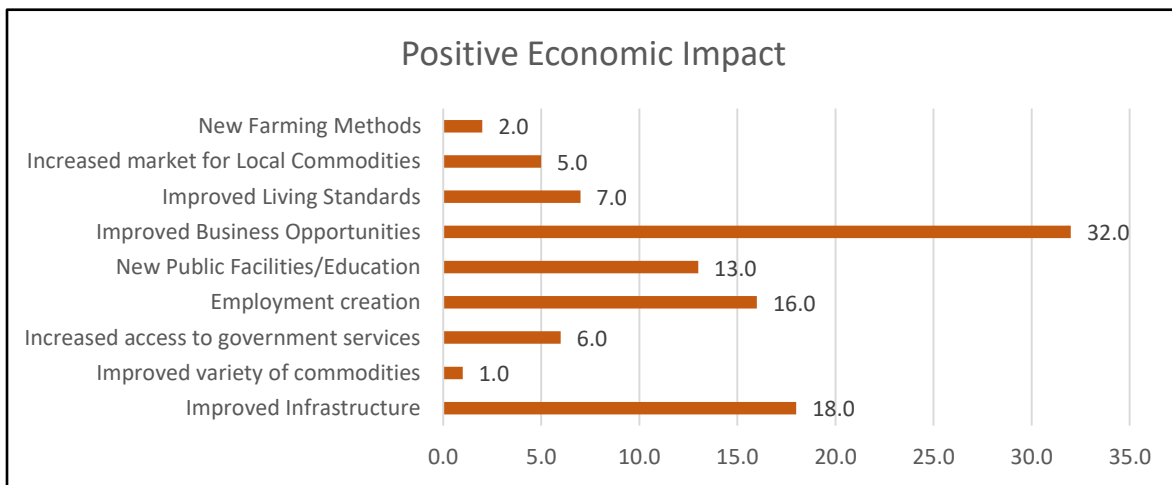
#### **5.4 Effects of Urban Sprawl on Urban Morphology.**

##### **Economic Impact**

The growth of Homa Bay town has both positive and negative economic effects. With several models discussed explaining how various underlying forces contribute to urban sprawl, the increase in population, increased income rate, and fall in the rate of commuting have contributed to the expansion of the towns and urban centers. The field study found out that major economic activities in Homa Bay town are shifting from primarily agricultural activities to secondary activities such as commercial, industrial, and built-up residential estates. According to the County of director planning, economic activities have influenced the morphological shape and pattern of growth of the town. She explains that commercial activities within the study areas influence the linear morphological pattern of development. Businesses are being established along the transportation corridors with residential housing units coming up behind the commercial linear establishment. Despite giving accessibility to the developments along with the main travel links, she explains that this system of development has led to marginalization and deterioration of the quality of life within the interior areas. This has also led to a longitudinal stretch of the town into areas where there are no plans.

The availability of L. Victoria within the planning area has contributed positively to the economic improvement of the study area through fishing. According to the chairman Beach Management Unit, this sector supports the livelihood of over 80,000 people living within the entire county with over 10,000 fishermen employed directly from the sector. The increase in urban population has also increased the labor force that facilitates the trading activities within the fishing industry. However, as the backbone of the county’s economy, this sector has been challenged by illegal fishing and fishermen, increased water hyacinth, destruction, theft of properties, human conflicts over fishing grounds, encroachment into the fish landing sites, beaches, and shoreline due to increased demand of land, human-wildlife conflicts as well as lake pollution.

The field survey noted that other economic activities which support the livelihoods of the incoming population and the economy of the study area include; tourism, retail, wholesale trading, artisan (*Jua kali*) industries, hawking, banking, and transport and agriculture. As a result of urbanization, the survey interviews revealed that compared to the earlier years before devolution, the residents at the periphery of the town have experienced major improvement in infrastructure developments, new business opportunities, new farming methods, increased markets for the local products, improved standards of living, improved business opportunities, access to new public institutions, increased employment rates and increased product varieties. Based on the field survey interview, graph 12 below highlights how urban sprawl has positively impacted the economy of Homa Bay town in terms of percentages (%).

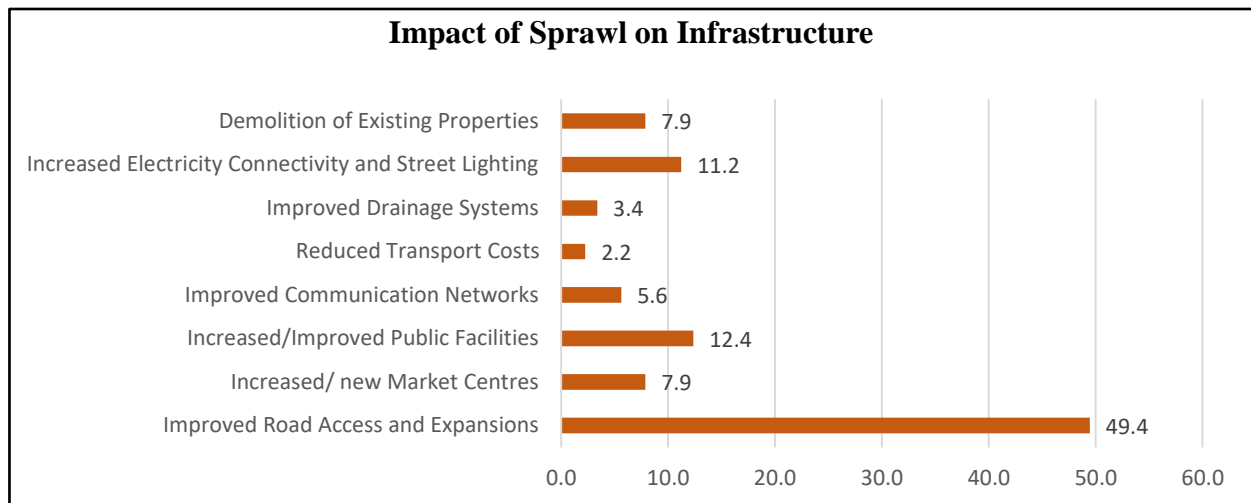


*Graph 12: Sprawl Economic Impact Analysis*

According to field survey data, over 18% of the residents at the town periphery believed that the improvement of infrastructure facilities within their neighborhood has contributed to increased outskirts developments. This was evident since the planning area supports various modes of transport such as water transport facilitated by the availability of boats and canoes, air transport supported by the availability of Kabunde air strip 2km away from the town Centre and road transport facilitated by the availability of motor vehicles and *boda bodas*.

According to the field survey, 49.4% of the respondents believed that increased development within the periphery of the town has resulted in improvement of the existing interior roads allowing easy accessibility; 7.9% believed that these roads have resulted in new markets; 11.2% explained that the level of electricity connections and street lighting has increased; 12.4% believed that improved level of accessibility has resulted into increase in the number of various public facilities; 5.6% suggested that there is improved communication network connectivity, 3.4% said that the drainage system has improved while 2.2 % were for the opinion that there is reduced cost in transport commuting charges. Graph 13 illustrates in percentages the impact of sprawl on infrastructure facilities within the study area.

The sprawl of Homa Bay town has impacted negatively on the agricultural land use activities with the growth and productivity of famous cash crops such as maize, kales, watermelon, onions, ground nuts beans, and cotton being affected. According to the county agricultural officer, the improvement of infrastructural development has attracted more people from the town centers into the agricultural freehold land at the peripheries. An action that has resulted in increased subdivisions and scattered morphological growth patterns at the own outskirts.



*Graph 13: Impact of Urban Sprawl on Infrastructure*

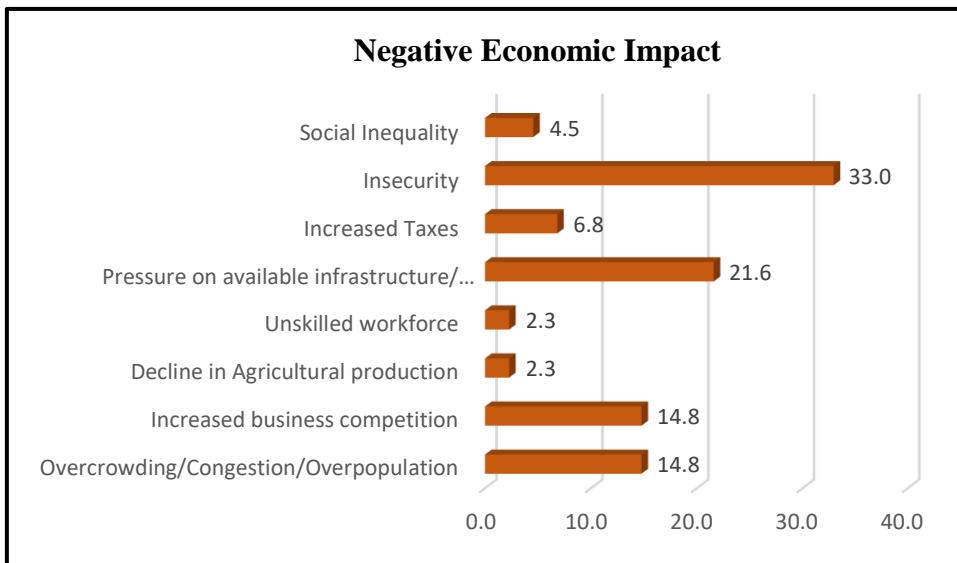
The field survey interview with the agricultural officer also revealed that the urbanization process has provided ready markets for the agricultural products; increased opportunities for employment; cultural changes which allow for diverse agricultural thinking; and technological improvements such as the introduction of the greenhouses.

The interview also found out that agricultural productivity within the study area has reduced due to the less acreage unit area influenced by increased subdivisions of the agricultural land for other uses. According to the land cover change analysis (Table 8), the agricultural and unused land within the town and its periphery have reduced from 50.63% to 45.63% for agricultural land and 30.58% to 16.74% for unused land between the years 2005 and 2021 respectively. The agricultural officer explains that this change has been influenced by the affordability of land on the outskirts where land owners subdivide and sell their agricultural lands due to increased demand for housing. As a result of the land transactions, the study area has witnessed increased cases of squatter settlement since some of the land owners sold their land and due to lack of planning, the money was used carelessly.

The agricultural officer also explains that the study area has also recorded less agricultural productivity over the past few years due to the shift of personnel from the agricultural sector to other sectors such as transportation is believed to provide quick economic benefits. He also notes that the large parcels of land which were previously used for grazing reduced in size due to

increased land subdivision. This has challenged grazing activities within the neighborhoods since there are not enough space and food for the cattle.

Other than the above, the field survey found out that the sprawl of Homa Bay town has resulted in pressure on the available infrastructure facilities such as roads, electricity consumption, and available water facilities; overcrowding and congestions in market places and other public areas; increased taxation rate on the local products and services; increased insecurity; Increased business competition leading to the introduction of surplus goods; decline in agricultural productivity, and increase in the number of unskilled workforces. The field survey analysis is illustrated in graph 14 below.



*Graph 14: Negative Economic Impact*

### **Social-Cultural Impact**

The sprawl of Homa Bay town has impacted the social and cultural lives of the residents both positively and negatively. With the increase in urban population over the years, the study found that there has been an increase in social facilities within and at the peripheries of the town center. As an important tool for the social development of any community, the spread of population and development at the peripheries of the town has resulted in an increase in the number of education facilities providing room for increased knowledge; hospitals, and dispensaries which allows for a healthy and productive environment; religious institutions, which has been evident by the



availability of several churches and mosques which provide spiritual nourishment to the residents; Markets, major one still under construction at the CBD while satellite markets are found in Makongeni, Sofia, Rabuor and Asego estates.

As explained by the county physical planner, the study also noted that most of the land that had been set aside for diverse recreational activities existing within the town has been grabbed resulting in a lack of playing grounds for the children. The available recreational facilities such as bars and restaurants only accommodate the adults while neglecting activities and fun days that can be attended by the whole family. Initially, families used to tour and visit the beaches and participate in boat rides but now such activities have reduced due to the increased water hyacinth contributed by the increased rate of water pollution.

The survey revealed that as a result of sprawl, the town has experienced some social changes witnessed by the increased number of school dropouts, where students leave school to engage in business activities such as fishing, fish mongering, and *boda boda* riding. Increased urbanization into remote areas has also resulted in increased insecurity. The field survey found that people living within the agricultural lands are at threat of theft of agricultural produce, livestock, and poultry.

Homa Bay town has also experienced an increased rate of immoral behaviors such as prostitution which arises from the increased urban population and adoption of different cultures that has resulted in increased diseases such as HIV/ AIDs as well as other related diseases. According to the County Integrated Development Plan 2018-2022, the HIV prevalence rate in the study area is 4.5 times higher than the average national prevalence which is 26%. This means among 100 persons, 26 persons are infected. A number that calls for more sensitization and awareness programs to prevent the prevalence that affects the productive population.

As a result of urbanization, residents living within the town and its peripheries have witnessed a change in lifestyle where commodities have become more expensive due to the increased level of demand. This has been evident in the price of fish, despite the study area bordering L. Victoria; Increased prices of fuel leading to an increase in transport charges; increase in the price of basic agricultural products such as tomatoes and onions, influenced by the conversion of agricultural lands into residential or commercial use. As the chairman Beach Management Unit explains, the increase in sprawl has contributed to increased cases of family breakups. He reveals that most

people working within the fishing sector focus much on their businesses and forget about their families. For instance, the fishermen do spend many days on the lake doing fishing without attending to their families. Consequently, the 'fish for sex' immoral behaviors along the shore of the lake have resulted in divorce cases as well as death among family members.

An increase in the rate of urban population has also resulted in a change in the cultural lifestyle of people. According to field data analysis, 1.6% of the respondents believed that the increased urbanization rate has led to an increase in corruption cases within the town, 25% believed that the culture of the residents has changed; 18.8% believed that there is a reduction in the level of security, 12.5% argued that the study area has experienced an increase in the level of drug abuse; 1.6% increase in disease outbreak; 9.4% were for the opinion that migration of non-residents into the study area has increased while 3.1% believed that continuous urbanization has contributed to the witnessed cases of family break-ups.

### **Technological Impact**

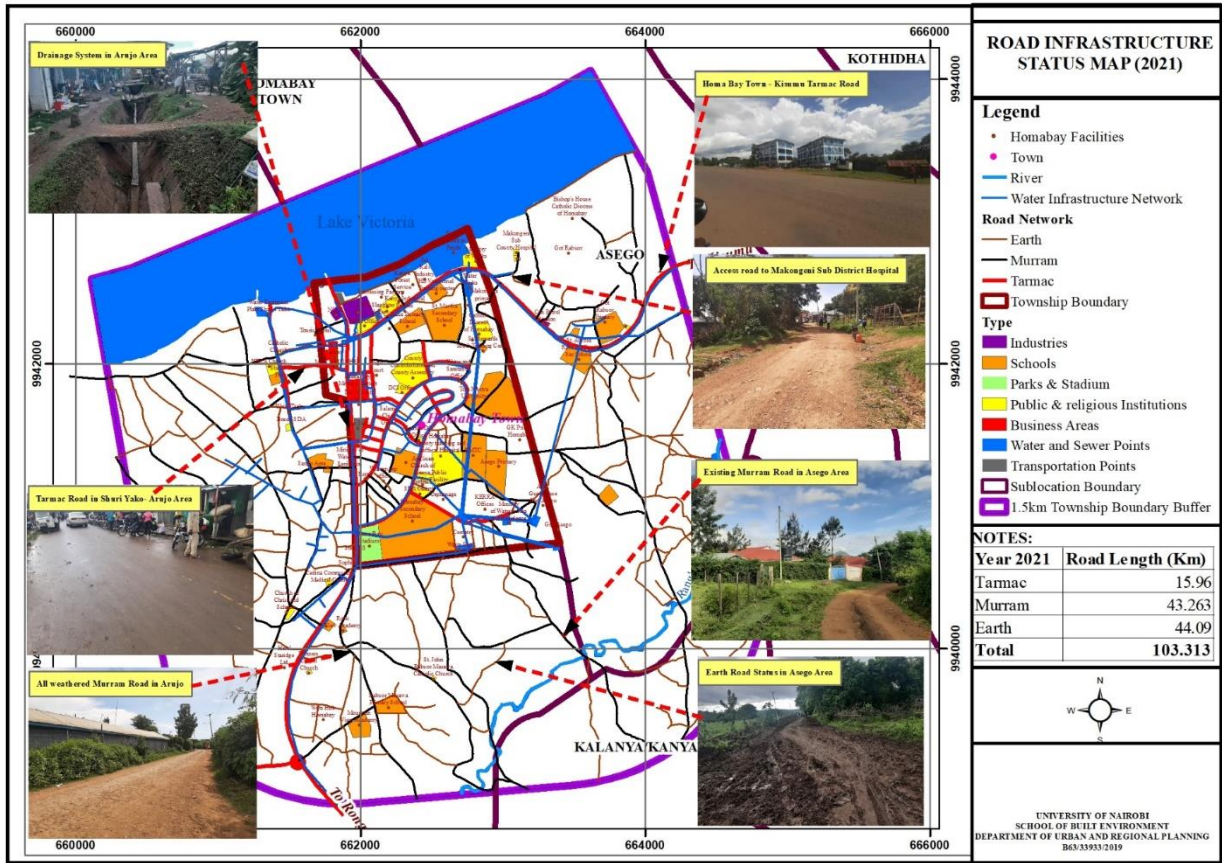
Urbanization within Homa Bay town has resulted in the improved technological development of the area. As a means of devolving government services and enhancing service delivery to residents within the counties, the national government in the implementation of Kenya Vision 2030 embarked on the establishment of the Huduma Centers in all the 47 counties of Kenya through the Huduma Kenya Programme. Homa Bay town being the County headquarters was listed as one of the towns to benefit from this flagship project. The field survey found that the town has already established the Huduma Centre facility which technologically links several government services from different government departments under one roof. With this ability, this facility has attracted several county residents who could regularly travel to the capital of Nairobi to look for various government services.

The field survey noted that some of the national and county government services being offered in Homa Bay Huduma Centre include: membership and replacement of the National Social Security Fund (NSSF); membership registration, amendment, and replacement of the National Health Insurance Fund (NHIF) card; Kenya Revenue Authority (KRA) registration and PIN collection; Issuance of building permits and Compliance certificates through the National Construction Authority (NCA); application, issuance, and replacement of birth and death certificates;

application to electricity connections; registration of businesses and companies; voter registrations; application for good conduct and police abstract; application for land searches, a land title deed, processing of subdivisions, change of user and renewal of lease; renewal of driving license; Issuance of business permits; and payment of land Rent and Rates

The County Integrated Development plan notes that the availability of mobile phone-based short message services, increased availability of email facilities, other electronic media, and curio services have also improved the level of communication within the study area. The report explains that the study area enjoys mobile phone penetration of 85.6% with network services such as Safaricom, Telecom, and Airtel readily available in the area.

As the level of technology improves in the study area, the survey noted that fields of employment such as business retail and wholesale trading, petrol stations, banks, and small business enterprises depend on technological equipment such as computers, mobile phones, and PDQ machines for easy operations. The availability of M-Pesa services has also ensured an easy flow of cash and transactions within the study area. The availability of motor vehicles and motorcycle operations has also reduced the time of travel from one location to another. This has also been facilitated by the introduction of mapping and navigation software in the vehicles well as the improvement of the available roads at the peripheries into bitumen and all-weather murrum standards as illustrated in Map 17.



Map 17: Infrastructure Map

Figure 18 represents the pictorial view of the ICT service delivery center (Huduma center) along with *boda boda* operational activity which is found within the study area.



Figure 18: Technological Facilities in Homa Bay Town

Source: Survey 2021

## Environmental Impact

The growth of Homa Bay town has negatively affected the environment in various ways. According to the Director of National Environment Management Authority (NEMA) Homa Bay, the increased rate of urbanization in the town has affected the environmentally sensitive areas such as the Lake, Hills/ Parks, and Rivers. There has been outgrowing human activities and encroachment into the river and lake riparian reserves leading to the disappearance of aquatic animals such as fish, and *dagaa* affected by the increased human activities. The lake has also been affected by on-site and off-site forms of pollution resulting from the Agro chemicals/ fertilizers; water hyacinth menace; direct draining of sewer into the lake; car washing in town and at the lake off shores; cloth washing and bathing in the lake; and release of untreated agro-based industrial liquid wastes into the rivers flowing into the lake. He argues that these forms of pollution have resulted in the change in the PH value of the lake making it difficult for the survival of the aquatic animals. *Figure 19* shows how pollution is happening along the shores of L. Victoria as a result of increased urbanization.



*Figure 19: Environmental Impact of Sprawl*

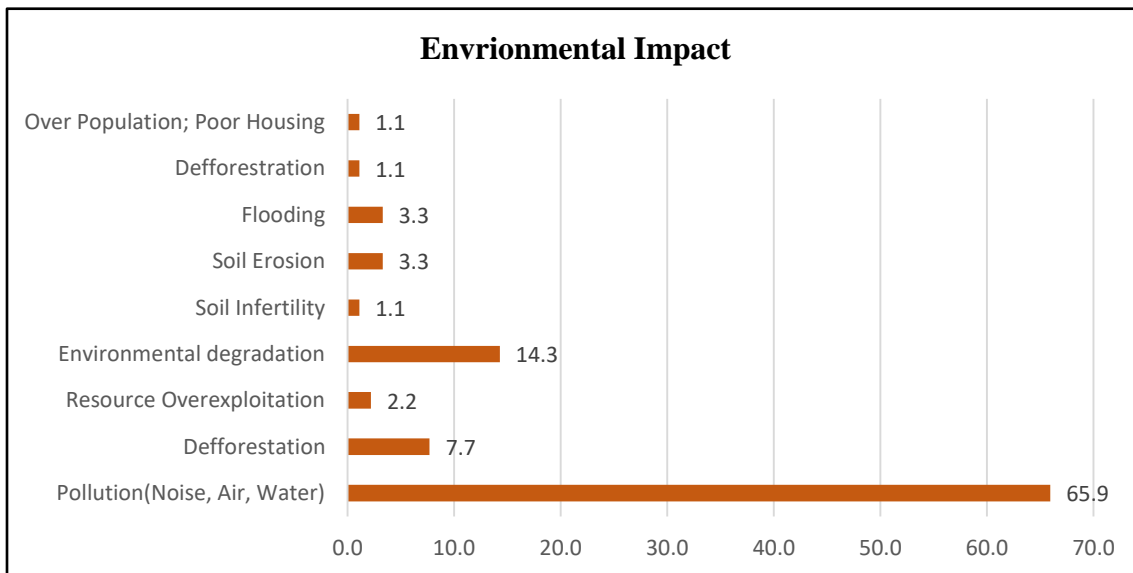


*Source: Survey 2021*

As a result of the increased urban population, people have encroached into the river riparian reserves interfering with the catchment areas and leading to flooding downstream during the rainy seasons. The rivers such as *R. Awach* among others are under threat from illegal sand harvesting activities. Director NEMA also notes that many youthful residents depend on sand harvesting activity as a means of supporting their daily livelihood. Due to the increased population which

comes with a demand for spaces for settlement, the ecologically sensitive areas which act as tourists' attraction sites such as Got Rabuor have been affected by the increased rate of degradation. The trees are cut for charcoal and the hilly areas are transformed into quarry sites to provide building and construction materials.

Air and noise pollution are also environmental problems witnessed within the study area. From the field study, 66% of the respondents believed that the increased rate of urbanization has resulted in water, air, and noise pollution. An interview with the NEMA director highlighted that notable air challenges and problems affecting the area include specks of dust arising from constructions, quarry sites; exhaust fumes from vehicles, motorbikes, and milling machines; the stench from fish such as *mgongo wazi*; burning of wastes such as polythene bags and car tires; and smoking in public places. Noise pollution is a major challenge that arises from the existence of a busy bus park in the middle of the town, increased *Jua Kali* activities, music stores, and nightclubs as well as the existence of churches. Graph 13 presented below illustrates in percentage the environmental threats caused by the increased rate of urbanization within the study area.



Graph 15: Environmental Impact Analysis

Source: Survey 2021

#### **5.4 Discussion of the results.**

From the foregoing discussions, it is evident that the amount of developed urban land within Homa Bay town and its peripheries increased from 2005 to 2021. An analysis of the reclassified images and maps together with calculations of land use changes confirmed the percentage increase in the amount of land under urban use as the agricultural and vacant lands diminish. In 2005 the urban land constituted 3.7% of the study area. In 2009, urban land constituted approximately 10.93% of the study area. In 2014, this value increased to approximately 15.15% of the study area while in 2021 the figure increased further to 20.05% of the land within the study area. The initial review of land use /land cover maps and the fact that urban land increased by approximately 16.35% over the last ten 16-year period, confirmed that urban sprawl had occurred. Further, the urban sprawl subsequently influenced the morphology pattern of Homa Bay Town.

The maps generated from the satellite data collected depict the linear morphological type of developments taking place along major transportation corridors. However, there are more clustered morphological patterns behind the linear developments in areas of Arujo, Sophia, and Makongeni estates. The radial type of morphology is noticeable around the mountainous zones of Got Asego and Got Rabuor. Within the interiors of the urban settlement, scattered morphological patterns have come up. This has been contributed by the closeness of available services such as market centers, health centers, and new infrastructure developments. In conclusion, it was important for this research to apply the use of GIS and Remote Sensing Techniques in the mapping of the extent of urban sprawl and the morphological pattern of growth over the last sixteen years.

Analyzing the urban sprawl and morphological pattern in this study made it necessary to assess the causes and effects of urban sprawl in Homa Bay town. Quantitative survey analysis revealed that urban sprawl is majorly caused by the increase in the urban population of the town which arises from the improved urban opportunities. As justified under the National Evolution Theory, the improved economic activities in Homa Bay town have resulted in the improvement of the transportation routes connecting Homa Bay town with Kisumu City, Kisii town, and other satellite towns like Rongo and Kendu Bay. This has led to the development of residential settlements at the peripheries of the town or along the transport network informing new morphological patterns of development.

The study also found that due to the high land prices at the town centers, the developers opt to move and invest in the periphery areas such as Rodi, Sophia, and Makongeni areas. Consequently, the quantitative analysis of this study confirms William Alonso's Bid Rent Theory where the rental prices at the CBD are higher than at the peripheries, making people rent in the outskirts of the town while depending on daily service provisions such as employment and other key government facilities available within the town center.

Being the headquarters of the Homa Bay County, the field spatial mapping revealed that the town center hosts several public facilities such as Homa Bay County Referral Hospital, Police station, Huduma Centre, District Commissioners Office, county stadium, municipal markets, etc. Together with improved infrastructure, these services attract residents from within and in the neighborhoods. The quantitative survey also found that a good percentage of residents who live on the outskirts of the town are well connected to sewer lines and electricity whose major receiving and transmitting station is within the CBD.

Piped water also comes from the lake which is further treated and supplied to the town and its peripheries. The availability of these facilities explains Clarence Perry's neighborhood concept where common services, social activities, and facilities required in the vicinity of a dwelling unit promote the growth and well-being of the residents.

The impact of sprawl is also directly linked to urban growth problems within the town and its environs. As witnessed in the study area through observation and photography interpretation, it is possible to conclude that urban sprawl has resulted in increased pressure on the available resources such as land, lake, and infrastructure. The agricultural land has undergone several subdivisions with ecologically sensitive areas such as Got Rabuor and Got Asego undergoing degradation. Due to the increased demand for housing closer to the CBD, the town outskirts have witnessed an informal land delivery process leading to a decrease in agricultural land sizes.

The lake also experiences an increased rate of pollution with the available infrastructure undergoing destruction. The qualitative data also revealed that as a result of sprawl, there has been an increased number of insecurity cases within the town center. Flight from Blight theory justifies why problems such as crime, violence, and poor environmental quality make residents shift from the town center to go develop in its outskirts.



This study also used population density analysis and the current pattern of development to show potential areas of future sprawl and the direction. A map was generated to spatially show how this phenomenon may occur in the future. The analysis shows that future development is likely to take place in areas that have land to support population and urbanization. Land tenure also plays a big role since most of the lands at the peripheries of the town are freehold and given the ease with which it is converted to urban uses and sold on a willing buyer, willing seller basis.

From the discussions, it is evident that urban sprawl has occurred in Homa Bay town and its periphery areas with negative impacts. There is, therefore, a need to put mechanisms in place to control and forestall urban sprawl and achieve sustainable urban development. The county is yet to prepare the County Spatial Plan which can be used as a tool for controlling developments within the urban setup. Therefore this study provides various recommendations in the next chapter that can be used as a control measure for effective and sustainable urban growth.

## **CHAPTER SIX**

### **SUMMARY AND PLANNING RECOMMENDATIONS**

#### **6.1 Summary of Emerging Issues**

The investigation carried out on the subject matter revealed that the major urban sprawl challenges facing Homa Bay town result from the lack of a spatial framework for guiding development. The periphery of the town center under the freehold tenure system is not supported by commensurate development control mechanisms to guide its morphological pattern of development. As a result of inadequacy in the planning of the town, the following were the major contributors to the sprawl of Homa Bay town.

#### **The Lack of an up to date Physical Development Plan**

The sprawl of Homa Bay town to its outskirts has not been guided by any development plan. Homa Bay town has one local Physical development plan which was developed and approved in 1998. According to Chief Officer Lands, this plan is outdated and only guides developments within the town center where the parcels are under the leasehold tenure and not its periphery. This factor has contributed to haphazard and illegal building development in areas not covered by the plan; the uncoordinated morphological pattern of development; poor urban design; lack of urban aesthetics; undefined CBD without clear boundaries; no delineation of different land use zones and inadequate enforcement of the building regulations. Homa Bay County also lacks a GIS-based County Spatial Plan which can be used as a tool for providing a spatial framework to effectively anchor the County's development agenda and provide more certainty on where and how development should occur.

#### **Security of Tenure**

The land surrounding Homa Bay town is under freehold tenure which confers absolute ownership rights to the owners. Enforcement of development conditions of freehold/agricultural land is very weak in the country, a factor that favors informal urbanization hence urban sprawl. The county government also lacks land banks that can take care of the future expansion of the town.

### **Increased rate of land fragmentation and encroachment at the peripheries**

Homa Bay town has impacted the surrounding rural agricultural land causing individuals to subdivide land into smaller portions for sale and urban development. The rising land value has attracted speculations and selling of land resulting in unproductive land sizes and a subsequent decline in agricultural productivity. Land speculation encourages leapfrog development which from a planning perspective results in subdivision and reduction of agricultural lands. The increased demand for urban settlement has also resulted in encroachment into the ecologically sensitive areas and degradation of the available resources due to the increased demand for building materials.

### **Weak Institutional and Legal framework to support planning and Implementation**

The lack of CSP for Homa Bay town since the introduction of devolution has contributed to the uncoordinated morphological patterns of development within and at the periphery of the town. This has been contributed by the lack of reference tools to coordinate development. To enhance the sustainable use of land which integrates with the human needs, Article 5 of PLUPA recommends that development plans should be planned in a manner that integrates the economic, social, and environmental needs of the present and future generations. Archiving this in Homa Bay town has been difficult since the existing Development Plan which covers only the CBD is outdated.

As a measure in ensuring sustainable morphological development of Homa Bay, PLUPA ensures that the physical and land use processes take into account the new approaches of morphological development such as transit/ linear-oriented development, mixed land uses, planning for public transport and non-motorized transport, and achievement of efficient use of natural resources.

The Water Act Act 2002 and Survey Act Cap 299 also regulate the use of land along with the riparian reserves by giving a buffer distance of 30m on lakes and rivers. The Environment Management and Coordination Act also call for the protection of lakes, rivers, streams, springs, wells, and any other water sources that no person shall cultivate or undertake any development activity within the specified riparian reserves. However, implementation of these laws within the study area has not been seen. This was been witnessed by the continuous encroachment into

ecologically sensitive areas, river rimes, and lake reserves. Despite the promulgation of the new constitution, the management of this land by the National Land Commission has not been easy due to the lack of an up-to-date plan for Homa Bay Town.

## **6.2 Conclusion**

The analyzed results show that urban land use in Homa Bay town is fast growing with a disordered spatial configuration indicating a typical sprawling configuration. The uncontrolled sprawling which has been experienced over time has resulted in various morphological patterns of growth. The linear morphological pattern of development takes place along the transport networks with the radial, clustered, and leapfrog patterns taking shape around the lake/ hilly areas, informal settlements, and rural areas respectively. The spatial non-uniformity of these patterns has made servicing of Homa Bay town to be difficult and expensive. Urban sprawl has also impacted the town in both positive and negative ways. Research revealed an increased urban population has also led to poor service delivery and un-matched infrastructure provisions. There are also increased environmental challenges depicted from pollution and contamination of both surface and underground water systems.

The sprawling of towns also resulted in fragmentation of the agricultural lands, encroachment into the riparian zones, and ecologically sensitive areas. This has led to an increase in the number of informal and squatter settlements at the borders of the CBD owned by low-income earners and the loss and reduction of large parcels of land on the outskirts which were previously used for grazing. Residents who were previously employed by the agricultural sector also shifted to other employments in transportation, business, and the public sector. These factors have greatly increased food insecurity cases within the area.

Consequently, the increased fragmentation and conversion of these lands has resulted in anticipated higher returns and increased economic development contributed by the commercial and other urban land use activities undertaken. The study found that an increase in population, lack of physical development plans, land speculation, informal land delivery systems, improved infrastructure development, improved area economy, and land tenure systems acts as major drivers of urban sprawl. With proper zoning and planning regulations, the research reveals that sprawl can be planned for and managed effectively.

### **6.3 Recommendations**

**Strengthening development control:** A review of the existing Physical development plan should be done to guide growth within and at the peripheries of the town where land is under freehold tenure. The county government should ensure the plan covers the entire municipality and beyond with proper implementation and enforcement mechanisms. There is also a need for the county government to initiate the development of a GIS-based County Spatial Plan as per the requirement of the Constitution 2010. This plan will provide a framework that will allow the county to effectively anchor its agenda and guide the socio-economic pursuits of its people.

**Compulsory land acquisition on freehold for the land banking:** Since most of the land surrounding the town is under freehold tenure, there is a need for the county government to plan the acquisition of land for banking. Since the growth of the town is inevitable, land-to-land compensation should be considered as a means of creating extra land within the peripheries for the provision of essential public services.

**Implementation of various laws and policies to guide and control developments:** The county government should be able to develop and approve the physical development plans to be used as a guide for all upcoming developments in line with the statutory provisions. Proper regulations should also be put in place to operationalize the Physical and Land Use Planning Act of 2019. This Act provides for regulations that will control the use and development of land and buildings in the interest of proper and orderly development of the town. Implementation of this Act will also ensure that no development shall take place within the study area without development permission granted by the county planning department. Under the leadership of the county executive committee member, the PLUPA calls for community engagement through public participation before any development approval is made. This action will ensure a collaborated, effective and participatory implementation of the development plans.

The national government liaises with the county government in ensuring reliability and sustainability in agricultural production. The development of a zoning plan will ensure all amenities and land uses are put in the right places with easier accessibility. Establishment and implementation of policies and regulations that will make it difficult if not impossible to subdivide and convert agricultural land to other uses.

Encourage Infill and redevelopments: The study noted that Homa Bay town has several low to medium density housing schemes under the National Housing Corporation. These housing units are only given to civil servants and are characterized by low single and double dwelling units which occupy much space hosting few people. Being that housing is a major driving factor toward horizontal growth, there is a need for the government under the Big 4 agenda of “Affordable Housing” to take charge of the provision of better-designed housing units through infill and urban densification programs. Other than promoting the vertical growth of the town, this program will make it easy for the implementation authorities within the town set up to register new migrants in and out of the town and plan for them effectively.

Plan for a compact morphological pattern of growth: In line with the infill development pattern, compact developments within the study area will be favorable for containing the built-up areas by building high rise buildings, protecting agricultural and open landscapes, improvement of existing town center structures, and allow for efficient and effective utilization of the available infrastructure. This pattern will also help in improving access to public services, promote minimal use of motorized transportation, and reduce environmental air pollution.

Propose for an Urban Service Boundary (USB). Currently, the town has grown beyond the area under the physical development plan. This boundary proposal will be defined by the immediate upcoming neighboring centers of Nyalkinyi, Lela, and Lieta. Therefore, there is a need to plan for the expansion of the entire town boundary under the Urban Service Boundary. These will help in the identification and demarcation of the urban service area upon which no residential development should go beyond. This will act as a way of increasing the urban densities while reducing sprawl. The research established that there is an already established AD-Hoc team mandated to review the urban area boundaries and develop a GIS-based plan to guide developments and growth. Planning within the USB will guide the morphological pattern of development within and outside the town boundaries.

#### **6.4 Future Research**

Urban planning is concerned with the restoration of the quality of the environment, social livelihoods, economy, and aesthetic life conditions of an area. It ensures that various portions of land are properly reserved for various public uses which are necessary for the survival of any urban

population. This study noted that the land tenure system clearly defines the morphological pattern of growth and dictates the level of public service provision within an urban area. With the case study of Homa Bay town, planning for public facilities within an agricultural zone under a freehold tenure system has proven to be difficult for the local authorities. Therefore, further research explaining how freehold land tenure affects the planning of services within the peripheries of an urban setup will be necessary.

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**APPENDICES**

**Household Questionnaire**



**UNIVERSITY OF NAIROBI  
SCHOOL OF THE BUILT ENVIRONMENT  
DEPARTMENT OF URBAN AND REGIONAL PLANNING  
M.A (PLANNING)**

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**RESIDENTIAL HOUSEHOLD QUESTIONNAIRE**

**Questionnaire No:** ..... **Date of Interview:** .....

.....

**Name of Interviewer:** ..... **Ward** .....

..... **Area/Estate/Village**.....

**SECTION A: RESPONDENT PROFILE**

**1.**

a) Name of the respondent (Optional) .....

b) Age..... c) 1. Male 2. Female d) Nationality..... e)

Marital Status 1. Married 2. Divorced 3. Widow 4. Widower 5. Single

**2.**

a) Are you the house hold head? 1. Yes 2. No

b) If No, What is your relationship with the household head?

1=Spouse 4=Son in Law 7=Other (Specify)

2=Son 5=Daughter in Law

3=Daughter 6=Grandchild

**SECTION B: HOUSEHOLD INFORMATION**

**3.** a) How many members live/reside in this house? .....

b) What is the: relationship, age, sex and highest level of education attained by the members living in the house?

S/NO	1. Relationship	2.Age (yrs.)	3.Gender 1. Male 2. Female	4.Literacy Status (Read and Write) 1. Yes 2. No	5.Highest Education Level *See code below	Employment Status 1. Yes 2. No
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						

- |                            |                          |                         |
|----------------------------|--------------------------|-------------------------|
| 1. No formal Education     | 5. Completed Secondary   | 9. Completed University |
| 2. Not of school going age | 6. Not completed Sec'    | 10. Not completed Uni'  |
| 3. Completed primary       | 7. Completed College     |                         |
| 4. Not completed primary   | 8. Not completed College |                         |

**SECTION C: DRIVERS OF URBAN SPRAWL**

**Land Ownership**

4. a) Do you own the land on which you reside? (1) Yes (2) No
- b) What is the size of the land in Acres? .....
- c) If yes to **4(a)** how did you acquire the land?
- |   |                             |
|---|-----------------------------|
| 1=Inheritance                               | 4=Gift from Relative/Friend |
| 2=Buying                                    | 5=Other (Specify).....      |
| 3=Allocation by National/ county government |                             |
- d) If acquired through purchase, where did you come from? .....
- e) Which year did you settle on this land? .....
- f) What was the land mainly used for at the time you came in?
- |               |                        |
|---------------|------------------------|
| 1=Cultivation | 4=Business             |
| 2=Grazing     | 5=Other (Specify)..... |

3=Housing

e) If acquired through purchase what was the price at which you bought the land (Ksh)?

.....

f) If acquired through purchase was it as a result of subdivision? (1) Yes (2) No

g) If acquired through purchase, why choose this location?

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.....

h) If yes to **4(a)** what land ownership document(s) do you have for this land?

1=Freehold Title deed

3=Leasehold title

4= Sale agreement

2=Letter of Allotment

4=Other (Specify).....

i) If acquired through purchase, does the one who sold to you the land live around? (1) Yes (2) No

j) If No to **4(i)** what was the main reason for his/her relocation?

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**Land Development**

5. a) Do you own the house you are residing in? (1) Yes (2) No

b) If **Yes to (5a)**, did you apply for development permission to build it? (1) Yes (2) No

c) **If No to (5b)**, what was the reason for not applying?

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

d) If **YES to (5a)**. Were you a house owner or a renter before you resided here?



m) House typology and building materials (observe)

2. Typology	3. Building Materials		
	Roof	Wall	Floor
Bungalow	Tiles	Mud	Earth
Maisonette	Iron sheets	Bricks	Concrete
Row housing	Grass	Rubble stones	Tiled
Flat	Concrete	Iron sheets	Wood
Huts/traditional house	Others(specify)	Wood	Others(specify)
Others(specify)		Others(specify)	

### INCOME SECTOR

6. a) What is the occupation of household members above 18yrs?

S/NO	1. Status	Number of Members	Form 1. Formal 2. Informal	4. Sectors: <i>Use Code Below</i>
1.	Employed			
2.	Self Employed			
3.	Both employed and self- employed			
4.	Unemployed			
5.	Student			

1=Agriculture

5=Manufacturing

9=Finance & Banking

2=Fishing

6=Building & construction

10=Other Specify).....

3=Wholesale and retail

7=Hospitality& Tourism

4= Transportation

8=Public Sector

b) What is your approximate monthly income?

i. Below 13,600

ii. 13,600 – 24,000

iii. 24,000 – 36,000

iv. 36,000 – 49,000

v. 50,000 and above

**INFRASTRUCTURE SERVICES AND FACILITIES**

7. a) Is your house served by the following facilities?

	Facility/Service	YES(1) NO(2)	Main Challenge faced?	If NO, what do you use?
1.	Sewer			
2.	Piped clean drinking water			
3.	Waste Collection and disposal sites			
4.	Electricity			
5.	Other( specify)			

b) Which type of road serves your residences?

1=Tarmac/                      2=All weathered Murram                      3=Murram Earth    4=Other  
(Specify).....

c) What mode of transport do you mainly use?

1=Public vehicle (Matatu,Bus)                      3=Bodaboda                      5= Other (Specify).....  
2=Private vehicle                                      4=Boats/water transport

d) What mode of transport do you and members of your household use to undertake the following activities?

Activity	Mode(use the below codes)	Challenges	What are the possible solutions to address the challenges?
Going to work			
Going to School			
Shopping			
Other(specify):			

1=Public vehicle (Matatu,Bus)                      3=Bodaboda                      5= Other (Specify).....  
2=Private vehicle                                      4=Boats/water transport

e) Whose responsibility is it to provide and maintain infrastructure in this area?

1=National Government                                      5= Other (Specify).....  
2=County Government

f) Comment on the infrastructure coverage in this area?

.....  
.....

g) How far does your household travel to access the following facilities?

<b>Community Facility</b>	<b>Yes/No</b>	<b>If(Yes) Adequacy</b>	<b>Distance (&lt;1km, 2km, 5km, 10km &gt;10km)</b>
Health Facility			
Museums			
Sport Facilities			
Public Libraries			
Social Halls			
Parks			
Church/ Religious Institution			
Open air Market			
Bus Park			
Police Post			
Public Toilet			

h) If no to (7e) above what are the major reasons for not accessing these facilities?

<b>Community Facility</b>	<b>Reason for not accessing</b>
Health Facilities	
Museums	
Sport Facilities	
Public Libraries	
Social Halls	
Parks	
Church/ Religious institution	
Open air Market	
Bus Park	
Police Post	
Public Toilet	



8. In your opinion, what are some of the **POSITIVE ECONOMIC** impacts that the area and people experience from expansion of the town to this area? List as many impacts as possible

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.....

9. In your opinion, what are some of the negative **ECONOMIC** impacts the area and people experience from growth of the town into this area? List as many effects as possible.

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.....

10. In your opinion, what negative **SOCIAL - CULTURAL** impacts does the area and people experience as a result of growth of the town into this area? List as many effects as possible.

.....  
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.....

11. In your opinion, what negative **ENVIRONMENTAL** impacts does the area and people experience as a result of growth of the town into this area? List as many effects as possible.

.....  
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.....

12. In your opinion, how has urbanization of the area impacted on the available infrastructure?

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

**13.** Do you support the growth of town to these areas? (1) Yes (2) No

a) If **Yes in 13** above give reasons

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.....  
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.....

b) If **No in 13** above give reasons

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.....

b) If **No in (13b)** what do you think can be done to contain growth?

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

**14.** Do you have any suggestion for the future growth of the town?

**Thank You for Your Time, May God Bless You**

**Business Enterprise Questionnaire**



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**BUSINESS ENTREPRISE QUESTIONNAIRE**

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**Name of the establishment..... Date of interview.....**

**Respondent designation .....Contact of the respondent.....**

**Type of enterprise.....**

1. How long has your business been here? .....(Years)
2. Did you relocate from another place? (1) Yes (2) No
3. If Yes in (2) above, what is the reason for relocation?

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

4. Why this location and not in town?

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

5. Do you own the land you are operating in? (a) Yes (b) No

6. If Yes to (5) above what kind of document do you have?

- |                         |                          |                     |
|-------------------------|--------------------------|---------------------|
| a) =Freehold Title deed | c) =Leasehold title      | d) = Sale agreement |
| b) =Letter of Allotment | e) =Other (Specify)..... |                     |

7. If Yes to (5) did you apply for development permission before you developed your plot?

(a) Yes (b) No

8. If No to (7) above why Not?

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

9. Do you have employees? (a) Yes (b) No

10. If Yes to (9) above, do they come from the local communities? (a) Yes (b) No

11. If No to (10) above, why you have not fully drawn your workforce from the locals?

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

12. Is your premise served by the following infrastructure facilities?

	Facility/Service	YES(1) NO(2)	Main Challenge faced?	If NO, what do you use?
1.	Sewer			
2.	Piped clean drinking water			
3.	Waste Collection and disposal sites			
4.	Electricity			
5.	All weather road			

13. How has the growth of town impacted on your business?

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

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## Key Informant Guides



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**THE COUNTY DIRECTOR OF PHYSICAL PLANNING - KEY INFORMANT GUIDE**

**Name of the Respondent (Optional): ..... Date .....**

1. Please comment on the growth of Homa Bay town from inception to date, paying attentions to spatial planning.
2. How many times has the town's boundary been officially extended and why?
3. Comment on the application of development permission by developers within the peri-urban areas.
4. Explain the process of town boundary extension as it applies to Homa Bay highlighting whether such entails compulsory acquisition of private land, or whether the extension happens on public land or not, and therefore on private land.
5. Please comment on the implication of the two scenarios in (3) above on growth of the town/urbanization process.
6. Comment on the influence the land tenure systems have on the growth of Homa Bay town.
7. How would you describe the morphology Homa Bay town?
8. What factors have influenced the morphology of Homa Bay town?
9. What guides physical development within Homa Bay town?
10. What has your department put in place to contain urban sprawl?
11. The town is experiencing a lot of urban sprawl, what could be the factors responsible for this growth?
12. Comment on the form/ physical pattern of growth of Homa Bay Town.
13. What challenge is the town facing in carrying out development control?

14. How is the county government addressing the challenge of vulnerability of agricultural land use to competitive urban land uses?
15. What is the state of service provision, infrastructure and distribution of amenities in the outskirts of the town?
16. What challenges are these areas facing in terms of service, infrastructure and social amenities provision?
17. In your opinion, how do you think we can address the challenge of urban sprawl in Homa Bay Town?
18. What future plans/ interventions does your office have towards sustainable development within the peri-urban areas of Homa Bay Town?

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**CHIEF OFFICER LANDS - KEY INFORMANT GUIDE**

**Name of Respondent(optional) .....Date .....**

**Contact.....**

1. Homa Bay town is witnessing a lot of physical development especially in its outskirts, what are the motivating factors to this phenomena?
2. Comment on subdivision of land within the peri-urban areas of the town.
3. Comment on the price of land for the same use in the town and in the peri-urban zones.
4. Which class of people mostly develop within the peri-urban areas of Homa Bay Town?  
a) =High Income earners ( $\geq$ ksh120, 000)                      c) =Low Income earners ( $\leq$ 23,670)  
b) =Middle Income earners (ksh.23, 671 - ksh. 119,000)  
d) =Other (Specify).....
5. In (4) above, where do most of them come from?  
.....
6. In your opinion, what do you think is/are the motivating factor(s) for businesses and households to develop within the peri-urban regions?
7. In your opinion, are the available Kenya laws sufficient management of land within the peri-urban areas? (a) Yes (b) No if YES/NO explain.
8. In your opinion what should be done as a solution to control the sprawl being experienced in Homa Bay town?
9. What measures has the county government put in place to control physical development within Homa Bay town?
10. Are the above measures sufficient? (a) Yes (b) No
11. If No in (10) above how should they be improved?

**Thank You for Your Time, May God Bless You**



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**HOUSING OFFICER - KEY INFORMANT GUIDE**

**Name of Respondent(optional).....Date of Interview.....**

**Phone No. / Email address: .....**

1. Please comment on the distribution and form/ pattern of settlements of Homa Bay town.
2. Comment on housing demand vis-à-vis supply in the county.
3. What factors have influenced the above mentioned patterns within Homa Bay town?
4. Comment on the physical development within the peri-urban areas.
5. What challenges do people living within the peri-urban areas experience in terms service provision?
6. In your opinion, how can the above mentioned challenges be addressed?
7. Comment on the infrastructure provision within the peri-urban areas?

**Thank You for Your Time, May God Bless You**





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**WASTE MANAGEMENT UNIT - KEY INFORMANT GUIDE**

**Name of Respondent(optional).....Date of Interview.....**

**Phone No. / Email address: .....**

**WASTE MANAGEMENT**

**Liquid Waste**

- a) How is liquid waste managed in Homa Bay Town?
- b) Which agency is in charge of liquid waste management in Homa Bay Town?
- c) Are the agencies privately or publicly owned?
- d) What challenges do the County government and or Sewerage company experience when managing liquid waste within Homa Bay Town?
- e) What possible solution do you think can be applied to address the above challenges?

**Solid Waste**

- a) How is solid waste managed in Homa Bay town?
- b) Which agency is responsible for solid waste management in Homa Bay town?
- c) With the experienced urbanization Homa Bay town, what are the major challenges that the county government face towards solid waste management?
- d) What possible solution do you think can be applied to address the above challenges?
- d) With the increasing rate of urbanization, what future plans are there as a mechanism to manage solid waste?

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**ENVIRONMENTAL OFFICE- KEY INFORMANT GUIDE**

**Name of Respondent(optional).....Date of Interview.....**

**Phone No. / Email address: .....**

1. How has urban growth affected the following environmentally sensitive areas?
  - a) Lake
  - b) Hills/parks/ game reserves
  - c) Rivers
1. What are the main general environmental concerns within this area?
2. How are these concerns being addressed?
3. What existing and planned projects/programs are in place to enhance environmental management and conservation?

**Thank You for Your Time, May God Bless You**



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**WATER OFFICER KEY INFORMANT GUIDE**

**Name of Respondent.....Date of Interview.....**

**Phone No. / Email address: .....**

1. Comment on water demand in Homa Bay town and its peripheries over time since inception of the town.
2. Comment on the distribution/ coverage of piped water services within Homa Bay town and its peripheries.
3. What are the major sources of water within Homa Bay town?
4. Who is the main water service provider within and out of Homa Bay town?
5. With the increasing rate of urban growth, what challenges does Homa Bay town experience in terms of water provision?
6. In your opinion, what do you think are the possible solutions to these challenges?
7. What measures have been put in place to ensure effective water provision within Homa Bay town and its Peri-urban areas?
8. Comment on how water availability within Homa Bay influences urban growth?

**Thank You for Your Time, May God Bless You**



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**SCHOOL OF THE BUILT ENVIRONMENT**  
**DEPARTMENT OF URBAN AND REGIONAL PLANNING**  
**M.A (PLANNING)**

*Declaration: The information collected through the administration of this questionnaire is confidential and will be used for academic purposes ONLY*

**BEACH MANAGEMENT UNIT OFFICER - KEY INFORMANT GUIDE**

**Name of Respondent (optional).....Date .....**

**Phone No. / Email address: ..... Name of the BMU.....**

1. How many people are involved in fishing as their source of livelihood in Homa Bay town?
2. How many fish landing sites do you have in Homa Bay town? Name them
3. What major activities are undertaken at the beach?
4. In your opinion, what fisheries related conflicts are experienced within Homa Bay?
5. What causes these fisheries related conflicts?
6. What challenges does the fishing industry face?
7. How does your office address the above mentioned challenges?
8. Comment on employment status within the fishing industry.
9. Where do fishermen/ fish mongers come from?
10. How has fishing industry impacted the growth of Homa Bay Town?

**Thank You for Your Time, May God Bless You**



**UNIVERSITY OF NAIROBI**  
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**AGRICULTURAL OFFICER - KEY INFORMANT GUIDE**

**Name of the Respondent (specify):** ..... **Date:** .....

**Sub location:** .....

1. What are the main agricultural activities taking place within Homa Bay town and its peripheries?
2. How has growth of Homa Bay town into the farmlands affected the agricultural activities?
3. What percentage (%) of agricultural land has been transformed into other uses?
4. Comment on the subdivision of the agricultural land.
5. What challenges does the agricultural sector face as a result of growth of Homa Bay town.
6. How does your office address the above mentioned challenges?

**Thank You for Your Time, May God Bless You**

## Observation Guide



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**OBSERVATION GUIDE**

<b>Availability of various facilities along the beach</b>			
	Item	Available(Yes/No)	Comment
1	Fishing Boats		
2	Landing Sites		
3	Banda/ Fish Stalls		
4	Electricity connection		
5	Cold Storage		
6			
<b>Availability of facilities/ services within the town</b>			
1	Shops/ Business outlets		
2	Health Facilities (hierarchy)		
3	Educational Facilities		
4	Market		
5	Administrative offices		
6	Piped water		
7	Sewer system		
8	Electricity Supply		
9	Religious Facilities		
10	Residential Houses		

11	Recreational Facilities		
12	Storm water drainage		
13	Green Spaces		
<b>Availability of facilities/ services at the peripheries of the town</b>			
1	Shops/ Business outlets		
2	Health Facilities		
3	Educational Facilities		
4	Market		
5	Administrative offices		
6	Piped water		
7	Sewer system		
8	Electricity Supply		
9	Religious Facilities		
10	Residential development		
11	Recreational Facilities		
12	Agricultural Fields		
13	Road network, connectivity/ conditions		
14	Green spaces		

**Land use patterns in the Peri-urban areas,**

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**Infrastructure provision and services**

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**UNIVERSITY OF NAIROBI**  
**Department of Urban and Regional Planning**  
ADD Building, State House Road, Opposite YMCA  
P.O. BOX 30197, 00100 GPO Nairobi, KENYA  
E-Mail: [durp@uonbi.ac.ke](mailto:durp@uonbi.ac.ke) TEL: +254-20 491 3526

April 12, 2021

**TO WHOM IT MAY CONCERN**

**RE: KENNEDY OTIENO ODONGO – B63/33933/2019**

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

As part of the training, students are required to acquire experience in planning research through data collection and analysis in the field of Urban and Regional Planning.

We wish to request you to allow him to collect data from your institution/households for his Masters Project titled ***“Urban Sprawl and its impact on Morphology of Homabay Town”***.

Any assistance accorded to him will be highly appreciated.

**Dr. Fridah W. Mugo**  
**CHAIR - DEPARTMENT OF URBAN & REGIONAL PLANNING**



FM/m

ASST. CHIEF  
HIBAY TOWNSHIP  
SUB-LOCATION





REPUBLIC OF KENYA



NATIONAL COMMISSION FOR  
SCIENCE, TECHNOLOGY & INNOVATION

Ref No: 193760

Date of Issue: 26/April/2021

**RESEARCH LICENSE**



This is to Certify that Mr.. KENNEDY OTIENO ODONGO of University of Nairobi, has been licensed to conduct research in Homabay on the topic: URBAN SPRAWL AND ITS IMPACT ON THE MORPHOLOGY OF HOMA BAY TOWN for the period ending : 26/April/2022.

License No: NACOSTI/P/21/10216

193760

Applicant Identification Number

Director General  
NATIONAL COMMISSION FOR  
SCIENCE, TECHNOLOGY &  
INNOVATION

Verification QR Code

Kindly Assist where  
necessary.

ASST. CHIEF  
HOMA BAY TOWNSHIP  
SUB-LOCATION



NOTE: This is a computer generated License. To verify the authenticity of this document,  
Scan the QR Code using QR scanner application.



**OFFICE OF THE PRESIDENT**

**MINISTRY OF INTERIOR AND NATIONAL GOVERNMENT CO-ORDINATION**

Telegram, "DISTRICTER" Homa Bay

Telephone: 0725 921 927

REF NO.....

**OFFICE OF THE CHIEF**

**HOMA BAY TOWNSHIP LOCATION**


**P.O BOX 1-40300**

**HOMA BAY**

**Date 03/05/2021**

**REF: PERMIT FOR DATA COLLECTION**

Following the request you made to my office on Monday 3<sup>rd</sup> 2021, I hereby confirm to you that you can proceed with your data collection assignment with a condition that your data collection should only be for educational purposes only. My office is will be ready to accord you any necessary support at the field if need be.

*James Jim Service*  


*DUNCAN OKEICH*

*AG CHIEF HOMA BAY TOWNSHIP*

**SENIOR CHIEF 1  
HOMA-BAY TOWNSHIP LOCATION  
P.O. Box 1 - 40300 HOMA-BAY  
Date:.....**