

## Urban Sprawl's Impact on Land Use in Kenya: A Systematic Review of Literature

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### ABSTRACT

*Urban growth is essential in bringing in new opportunities and a larger labour force, but when it is unconventional and unregulated, it tends to raise new threats and problems in the community and the environment. This urban sprawl phenomenon and its impact on land use need to be explored deeply for comprehensive planning and development. Therefore, it is important to analyse existing evidence related to urban sprawl impacts on land use. In this study, existing knowledge on the impact of urban sprawl on land use in Kenya is described through a systematic literature review. The specific objectives of the review were to assess the general characteristics of studies on urban sprawl impact on land use in Kenya, synthesise the findings of these studies, and highlight the gaps in the studies. A search was conducted on the Google Scholar engine, leading to 4317 results from which 21 articles were selected through a systematic screening process. The review established that the majority of the studies are recent, having been published in the last 10 years, have utilised the quantitative approach, and have been conducted in diverse urban centres in Kenya. The findings of the studies revealed that diminishing agricultural land is the most prominent consequence of urban sprawl. The research found that urban sprawl is taking much of the available agricultural land due to increased demand for housing and the creation of new non-farm economic activities. This phenomenon has threatened to cause food shortages, reduced agricultural exports, hence reduced foreign exchange, and lost job opportunities in the agricultural sector. Another impact of urban sprawl is the decline of conservation areas, including bare land, forests, bushlands, and wetlands. Replacement of land under natural cover with built cover has dire consequences for human life and the ecosystem, including increased cases of floods and soil erosion. The results of this study provide insights that can be used to formulate policies related to urban planning, agriculture, and conservation.*

**Keywords:** Agricultural, Conservation, Land Use, Kenya, Urban Sprawl

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### I. INTRODUCTION

The urban population has been expanding at a high pace globally, driven by the shift of many economies from agriculture to industrial and service-based economies (Njiru, 2018). In 2008, the population of urban dwellers surpassed the population of rural dwellers for the first time in the history of mankind (Fekete, 2022). The growth of the urban population has created demand for land in urban centres and adjacent areas for purposes of housing, infrastructure like roads, and social amenities like schools and hospitals (Njiru, 2018). When urban expansion is not adequately regulated and planned, it leads to the disorganised utilisation of land resources in adjacent areas. This phenomenon is what is referred to as urban sprawl. The effect of urban sprawl is often clear in the peri-urban areas, which are often characterised by diverse land uses.

Urban sprawl is a relatively new term used to explain the movement of population and growth of urban cities in developing countries in recent decades. The term urban sprawl is distinct from urban growth in that growth is exponential, while sprawl is excessive growth when unmitigated (Brueckner et al., 2010). Urban growth is essential in bringing in new opportunities and a labour workforce, but when it is unusual and unregulated, it tends to raise new threats and problems in the community and the environment. Urban sprawl is characterised by the development of suburban areas with sparse settlements, low land use diversity, dispersed and fragmented development, and limited street connectivity (Genovese et al., 2023).

In the United States of America (USA), the urban sprawl phenomenon was witnessed after the Second World War and continued until the 1990s (Leigh & Ball, 2015). The sprawl was linked to developments such as the invention of motorised vehicles that enabled people to commute to cities from suburban areas. Since the 1990s, there has been a greater effort to promote smart city growth, and a new model of urbanism in the USA has brought an end to sprawl. In Europe, Siedentop and Fina (2012) observed that continuous expansion of the urban population and infrastructure between 1990 and 2006 had led to fragmented habitat patches in the United Kingdom, Netherlands, and Belgium. This indicates that urban sprawl is also evident in Europe.

Urban sprawl mainly happens in third-world countries due to the rapid increase in population and the migration of people into cities to look for employment opportunities. Lack of proper instruments for managing rapid urbanisation has also contributed to the urban sprawl in developing countries. Many African countries are managing

their urban areas using policies and regulations that were formulated 60 years ago (Namalwa et al., 2024). Projections showed that the urban population in developing countries will increase two-fold by the year 2050 to reach approximately 55.5 billion people (Sakketa, 2023). Further statistics showed that from 2005 to 2010, the urban population in Africa grew by more than thirteen million per annum, and it is expected to rise to 25 million people per annum by the years 2045 and 2050 (Skar et al., 2020). The urban sprawl is projected to negatively impact countries in sub-Saharan Africa, as sub-Saharan Africa has the highest urban growth rate of approximately 4 percent. Sub-Saharan Africa has a population of over 472 million people, and it is expected to double in the next 20 years (Skar et al., 2020). The current research strives to highlight the impact of urban sprawl on land use.

In Kenya, the proportion of the population residing in urban centres increased from 7.36% in 1960 to 29% in 2023 (Kintai et al., 2023). Currently, there are over 15 million Kenyans residing in urban areas, with the proportion of urban dwellers projected to increase to 50% by the year 2030 (Kintai et al., 2023). Unfortunately, urban planning in Kenya has not evolved at the same pace as the growth in the urban population (Thuo, 2013). This has resulted in the uncontrolled sprawl of the urban centres into adjacent land.

### 1.1 Statement of the Problem

The uncontrollable growth of urban areas is still persistent in many parts of Kenya and has increased in intensity in recent decades (Sakketa, 2023). However, the impact of this sprawl on land use is not well understood. Studies examining the impacts of urban sprawl on land use in Kenya are fragmented, focusing on single case studies and selected peri-urban areas. As a result, there is a limited understanding of the general urban sprawl pattern across the country and the impact of this sprawl. This study seeks to address this gap by synthesising studies on urban sprawl and its impact on land use conducted in different parts of Kenya to make these studies available on one platform. This will make it easy for policymakers and practitioners to access existing evidence and use it to inform policies and practices.

### 1.2 Research Objective

- i. To assess the general characteristic of studies on urban sprawl impacts on land use in Kenya.
- ii. To synthesize findings of studies on urban sprawl impacts on land use in Kenya
- iii. To highlight gaps in the body of literature on urban sprawl impacts on land use in Kenya

## II. LITERATURE REVIEW

### 2.1 Theoretical Review

This study was anchored in the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analysis) model that was developed by a group of international experts in evidence-based medicine and systematic reviews (Liberati et al., 2009). PRISMA was designed to provide a structured framework for assisting authors to conduct systematic reviews in a clear and transparent manner. The model comprises 27 items divided into six sections that cover the entire review process. These six sections are: title and abstract, methods, results, synthesis of results, interpretation, and funding and disclaimer (Page et al., 2021). PRISMA provides a structure for the review methodology, including the search strategy, study selection criteria, data extraction, risk of bias assessment, and results interpretation. The PRISMA model promotes the transparency of the literature review process, improves the reproducibility of results, enhances the credibility of findings, and facilitates the meta-analysis of literature (Liberati et al., 2009).

### 2.2 Empirical Review

Urban sprawl is a phenomenon that is characterised by the physical growth of urban centres and the decline in their densities (Genovese et al., 2023). The phenomenon is linked to economic and demographic growth, enhanced mobility for individuals, and rising affluence. These factors have motivated many people to shift from central city areas to suburban areas. Although patterns of urban sprawl are similar across the globe, results vary from one context to another. For instance, dispersed settlement patterns are observed in the European cities of Brussels, Milan, and Porto, while a more compact land-use pattern is evident in Munich, Amsterdam, and Manchester (Siedentop & Fina, 2012). This implies that the impact of urban sprawl recorded in other parts of the globe may not necessarily reflect the impact of urban sprawl in Kenya.

In addition, Rosni and Noor (2016) observed that because urban sprawl is a wide research issue, there is a congruent interpretive framework for its causes and impacts. The impacts may vary from political, economic, and environmental to physical impacts. The study by Sharma et al. (2024) observed that unplanned growth of urban centres was the leading cause of land use changes in India. The study further revealed that land use change that has been induced by urban sprawl varies according to regional conditions. The study documented land use changes like



loss of natural habitats, reduction of wetlands and water resources, degradation of farming lands, loss of green lands, and soil erosion as a result of urban sprawl in India.

### III. METHODOLOGY

#### 3.1 Research Design

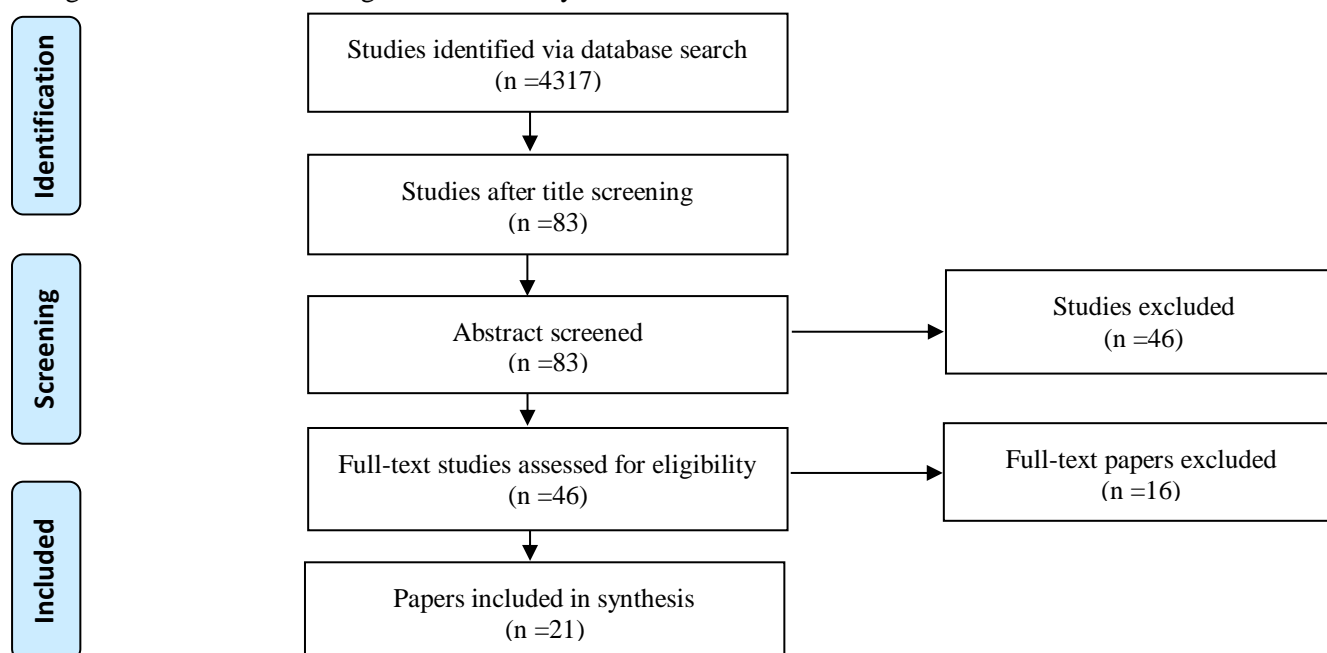
The study utilised a systematic literature review design. Unlike narrative reviews, a systematic review follows a systematic and transparent procedure such as searching, screening, and classifying studies (Paré & Kitsiou, 2017). In addition, structured search methods were used on a representative sample of a larger group of published works. The authors extracted from each study certain characteristics of interest, such as publication years, research approach, research design, data collection methods, and research outcomes. In essence, each study included in this systematic review was treated as a unit of analysis (Paré & Kitisiou, 2017).

#### 3.2 Search Strategy and Screening

The search was conducted on the Google Scholar search system because it provides access to multiple research databases and journals from diverse disciplines (Gusenbauer & Haddaway, 2020). The search system is multi-disciplinary, meaning it gives access to journals from a wide range of disciplines and generates reproducible results. The search phrase “urban sprawl impacts on land use in Kenya” was used. Keywords used in the search were ‘urbanisation’, ‘urban sprawl’, ‘urban change’, ‘urban expansion’, ‘urban land use’, and ‘urban growth’ in combination with ‘impacts’, ‘factors’, agricultural land, or ‘effects’. The initial search yielded 4317 results. Articles were selected from the search results according to the following criteria:

1. **Topic:** The article had to include an analysis of the impacts of urban sprawl on land use. Papers that discussed urban sprawl or land use only without establishing a link between the two were excluded.
2. **Document type:** the document had to be an empirical article published in a peer-reviewed journal. Theses, books, book chapters, and journal articles that were not empirical in nature were excluded from the study.
3. **Study location:** The article had to document a study conducted in Kenya. Articles on studies that were conducted in other countries were excluded.
4. **Publication language:** The article had to have been published in the English language. Articles published in any other language were excluded.

The authors identified articles that meet the inclusion criteria by first screening the title. The title screening process led to the identification of 83 articles that met the inclusion criteria. The authors moved on to the next phase, which entailed screening the abstracts of the articles to determine whether all met the inclusion criteria. The abstract screen process led to the exclusion of another 46 articles, either because they were not empirical in nature or because they were not published in a peer-reviewed journal. The remaining 37 articles were included in the final phase of screening, which entailed going through the full paper. The full paper screening led to the elimination of 16 articles, leaving 21 articles that were eligible for the study.



**Figure 1**  
*Literature Selection Flow Chat*

### 3.3 Data Extraction and Synthesis

Four types of data were extracted namely: publication year, location of the study, research methodology, and findings. These meta-data were used to classify the articles into different categories to bring out the landscape of existing literature on urban sprawl impact on land use in Kenya.

## IV. FINDINGS & DISCUSSIONS

### 4.1 General Characteristic of the Reviewed Articles

Nine out of the 21 articles (42.8%) were published after 2020, ten (47.6%) were published between 2011 and 2020, and the remaining 2 (9.5%) were published between 2008 and 2020. No study that was published before 2008 was found. These results suggest that most of the research on urban sprawl impacts on land use in Kenya is recent and thus provides up-to-date information.

In terms of methodology, 12 articles representing 57.1% of the sample were quantitative, seven (33.3%) were mixed-method studies, and two (9.5%) employed the qualitative research approach. These results imply that research on the impact of urban sprawl on land use in Kenya is diverse in terms of the methodology used. However, the quantitative methodology seems to be the most preferred. The studies have used a wide range of designs, but the most common is the retrospective longitudinal design, which has been used in 38% of the articles. The retrospective longitudinal design mainly entails reviewing satellite images from previous years with the view of documenting changes in settlement and land-use patterns. Other research designs used in the articles include the cross-sectional survey (23.8% of the articles), convergent parallel mixed-method (19%), case study (14.3%), and the explanatory sequential mixed-method design (4.8%).

The reviewed studies have been conducted in diverse geographical locations. Four articles (19%) have focused on Nairobi and its environs, while Nakuru and Kisumu are joint-second with three articles each (14.3%). The other articles are spread across different locations, including Embu Town, Kimilili Town in Bungoma County, Nyahururu Town, Machakos, Siaya Township Ward, Thika Municipality, Town Council of Karuri in Kiambu County, Voi Town, and Wote Town Area. Table 1 summarises this information:

**Table 1**

*Characteristic of Reviewed Literature*

Author/Year	Research approach	Design	Location
Annan et al. (2022)	Quantitative	Retrospective longitudinal design and cross-sectional survey	Nakuru
Cheruto et al. (2023)	Mixed methods	Explanatory sequential mixed method research	Kapsaret and Simat Ward in outskirts of Eldoret town
Fekete (2022)	Mixed methods	Case study design	Nyeri Town and Nairobi City
Kimutai et al. (2023)	Mixed methods	Convergent triangulation mixed method design	Kimilili Town in Bungoma County
Kioko et al. (2022)	Quantitative	Cross-sectional survey design	Peri-urban Machakos
Konyango et al. (2021)	Mixed methods	Convergent triangulation mixed method design	Siaya Township Ward
Korir (2014)	Quantitative	Retrospective longitudinal design (1973- 1993)	Eldoret Municipality
Mandere et al. (2010)	Mixed methods	Convergent triangulation mixed method design	Nyahururu
Mubea et al. 2013	Quantitative	Retrospective longitudinal design (1986- 2010)	Nakuru
Muiruri and Odera (2018)	Quantitative	Retrospective longitudinal design (1976- 2010)	Thika Municipality
Muleke et al. (2018)	Quantitative	Cross-sectional survey design	Njoro Sub-County
Mundia and Murayama (2008)	Quantitative	Longitudinal design (1976- 2030)	Nairobi
Murimi et al. (2019)	Quantitative	Cross-sectional survey design	Embu Town
Nyabonyi et al. (2023)	Quantitative	Cross-sectional laboratory study	Nairobi City
Nyongesa et al. (2022)	Quantitative	Retrospective longitudinal design (1999- 2019)	Voi Town
Obange and Wagah (2019)	Qualitative	Case study design	Kisumu City
Omasire et al. 2020	Mixed methods	Convergent triangulation mixed method design	Wote Town Area

Onyango et al. (2021)	Quantitative	Retrospective longitudinal design (1978- 2018)	Kenyan Lake Victoria Basin
Rakama et al. (2017)	Quantitative	Retrospective longitudinal design (1985- 2015) and cross-sectional survey	Riat and Kajulu Hill peri-urban areas in Kisumu County
Thuo (2013)	Qualitative	Case study design	Town Council of Karuri in Kiambu County
Wangai et al. (2019)	Mixed methods	Retrospective longitudinal design and cross-sectional survey	Parts of Nairobi and Kiambu counties

#### 4.2 Urban Sprawl Impact on Land Use

All the studies reported growth in the urban population. Mubea et al. (2013) reported that the proportion of land under urban uses in Nakuru had increased from 12.4% to 22.3% between 1986 and 2010. Similarly, Korir (2014) found that low-density residential area land in Eldoret increased from 256.5 hectares to 439.4 hectares between 1973 and 1993. In addition, Rakama et al. (2017) observed that the proportion of built-up land in Riat and Kajulu Hill peri-urban areas in Kisumu County increased from 20.13% to 54.73% between 1985 and 2015. Also, Wangai et al. (2019) documented that the area under settlements in Nairobi and Kiambu counties increased from 10.77% to 37.16% between 1990 and 2010. These studies highlight the magnitude of the urban sprawl phenomenon in Kenya. The urban sprawl has impacted land use as follows:

**Table 2**

*Brief Summary of Findings of Urban Sprawl Impact on Land Use*

Theme/ Impact	No. of Articles	Percent
Decline in proportion of land under agricultural production	15	71.4
Decline in conservation areas	6	28.6

##### 4.2.1 Decline in Proportion of Land under Agricultural Production

The decline in agricultural land is the most frequently identified impact of urban sprawl on land use in Kenya. Fifteen articles, representing 71.4% of all the reviewed articles, documented a decline in agricultural land due to urban sprawl. The articles have identified two mechanisms that underlie the relationship between urban sprawl and the decline in land under agricultural production. Areas near Nairobi City are the most severely affected. The study by Njiru (2018) established that 61.5% of land in Kiambaa and Kiambu Sub-Counties in Kiambu County had been converted from agriculture to build land between 1986 and 2014. This conversion is largely attributed to the sprawling of the population in Nairobi City, leading to a spillover effect on the adjacent Kiambu County.

The first mechanism is increased demand for land for housing to accommodate the sprawling urban population. This demand has increased the value of land in areas surrounding urban centres, creating an incentive for land owners to subdivide their land and sell it to real estate developers (Mandere et al., 2020; Murimi et al., 2019). The study by Murimi et al. (2019) found that the majority of land owners in Embu Town and its environs owned one acre or less. This land size is too small to support a viable agricultural venture. The small size of the land is attributed to sub-divisions for purposes of real estate development. Some landowners convert their agricultural land into real estate land and develop housing by themselves because the hike in demand for housing has made real estate ventures more profitable than agriculture. The study by Muleke et al. (2018) found that the conversion of agriculture land to real estate was negatively and significantly associated with distance from the Nakuru City central business district (CBD). This implies that agricultural land located near the CBD is more likely to be converted into real estate land than that located far away. This result highlights the link that exists between urbanisation and the decline of agricultural land.

Another mechanism that underlies the relationship between urban sprawl and the decline in land under agriculture is the rise of alternative income-generating activities. Most of the peri-urban areas in the country relied on farm activities for their livelihood in the past. However, the rise in the human population has increased demand for goods and services like transportation, hairdressing, masonry, plumbing, and mechanical work. The rise of non-farm income-generating activities has caused a significant section of peri-urban dwellers to abandon agriculture in favour of these alternative economic activities. Thuo (2013) observed that many residents living in and around the Town Council of Karuri in Kiambu County had opened up businesses like shops and salons to serve the increasing population of newcomers. The population of households that are dependent on agriculture has declined. The study by Mandere et al. (2010) also found that the proportion of households that depended on agriculture in Nyahururu declined from 90% to 49% between 1960 and 2010. Similarly, Cheruto et al. (2023) found that the proportion of households that relied on on-farm activities in Kapsaret and Simat wards in the outskirts of Eldoret town has declined over the years due to the expansion of Eldoret town.

Unlike most other studies, the study by Rakama et al. (2016) found that the proportion of land under agriculture in Riat and Kajulu Hill peri-urban areas in Kisumu County increased from 13.81% to 15.14% alongside the increase in the proportion of built-up land. This implies that the relationship between urban sprawl and land under agriculture varies from one setting to another. It also suggests that there are factors that moderate the magnitude and direction of this relationship. One of these factors could be the availability of bare land. In the study by Rakama et al. (2016), the proportion of bare land in the study area declined from 14.44 to 3.19, while the proportion of land covered by bushes decreased from 51.62% to 26.92%. These results suggest that the availability of bare land and bush lands provides space for the expansion of both agricultural and real estate land. It is logical that crop production would also increase with urban sprawl because the growth in population increases demand for food.

#### 4.2.2 Decline in Conservation Areas

Another impact of urban sprawl on land use is a decline in conservation areas such as forests, parks, wildlife conservancies, wetlands, and bare land. Six articles, representing 28.6% of the reviewed papers, documented declines in conservation areas. The most affected type of conservation area is bare land (Rakama et al., 2016; Wangai et al., 2019). The study by Rakama et al. (2016) recorded a 10% decline of bare land in Riat and Kajulu Hill urban areas, while Wangai et al. (2019) recorded declines of 26% in parts of Nairobi and Kiambu counties. Bare land plays a crucial role in the ecosystem. It provides ecosystem services such as habitat for wildlife, soil erosion, and carbon sequestration. It also helps to maintain soil quality, prevent sedimentation, promote drainage, and support groundwater recharge. The decline of bare land has created various challenges, including floods as there is no ground for drainage, soil erosion, depletion of underground water resources, climate change, and the loss of recreation sites.

Urban sprawl has led to the decline of forest land, mainly through the clearance of forests to make way for development such as housing and roads (Mubea et al., 2013; Kimtai et al., 2023; Korir, 2014; Wangai et al., 2019). The decline in forest land has major implications for the ecosystem as it has contributed to the climate change phenomenon that is often associated with adverse events like droughts and floods. The destruction of forests has also led to a loss of biodiversity, affecting tourism, which is a major economic activity in the country. Loss of forest land has also affected the availability of water, as trees act as essential water catchment areas. The loss has also exposed the ecosystem to soil erosion and affected activities like beekeeping and agroforestry. Apart from the need to make way for development, other factors emanating from urban sprawl that have led to the decline of forest land include increased demand for food, heightened demand for timber and wood products, and a spike in the demand for cooking fuel (Rakama et al., 2017). Demand for food has seen forests cleared for the purpose of food production.

Urban sprawl has also led to the decline of wetlands, mainly through the drainage and filling of these lands to create space for development such as housing, infrastructure, or industries (Wangai et al., 2019). Urban sprawl has also created impervious surfaces like roads, pavements, parking lots, and buildings, which reduce infiltration of water. As a result, there is a lot of runoff water that causes erosion and sedimentation in wetlands. There are also cases where poorly planned development such as buildings and walls has cut-off or blocked rivers that drain water into specific wetlands, leading to the decline of these wetlands. Destruction of wetlands leads to the loss of biodiversity because wetlands are essential habitats for a wide range of plant and animal species. It has also exposed the ecosystem to floods by altering the natural hydrology of an area and increasing the number of impervious surfaces. The study by Nyabonyi et al. (2023) found that urban sprawl had compromised the quality of water in many water bodies within Nairobi National Park, leading to the loss of plant and wildlife species. These findings suggest that another way in which urban sprawl has led to the loss of wetlands is by increasing water pollution.

#### 4.3 Gaps in Existing Body of Literature

Existing literature on urban sprawl and its impact on land use provide valuable and comprehensive insights regarding the relationship between the two variables. However, two major gaps have been noted that may require further exploration.

##### 4.3.1 Lack of Strong Theoretical Foundation

One of the gaps noted in the existing body of literature is the lack of a strong theoretical foundation for the studies. Fourteen articles, representing 66.7% of the reviewed studies, were not anchored on any theory. This implies that two-thirds of the studies on urban sprawl and its impact on land use in Kenya are not anchored on any theory. Theories are essential in research as they give a study a clear understanding of the underlying mechanisms and relationships between variables (Islam et al., 2022). Lack of theories in the majority of the studies examining the effect of urban sprawl on land use may lead to disjointed research, making it difficult to develop effective policies or management strategies. Lack of a theoretical foundation also limits the generalisation and application of results in other areas. It may also affect the quality of the investigation because theories play a central role in defining research methods and procedures. Among the studies that had a theory, bid-rent theory was the most frequently used theory. Table 3 summarises this information.

**Table 3***Theories anchoring Research on Urban Sprawl and Land Use*

Theory	No. of articles	Percent
Bid-rent theory	4	19.0
Concentric zone model	1	4.8
Hoyt theory	1	4.8
Theory of urban expansion	1	4.8
Urban market theory	1	4.8
Plurality theory	1	4.8
Theory of multiple nuclei model	1	4.8
Double-hurdle model	1	4.8
No theory	14	66.7

Results in Table 2 indicate that bid-rent theory is the most preferred theory for anchoring studies on urban sprawl impact on land use. The other theory features the theory of urban expansion, urban market theory, and plurality theory, all of which were used in the same article. This explains why the percentages in Table 2 do not add up to 100. Bid rent theory was proposed by William Alonso, Richard Muth, and John Mills in the 1960s to explain the distribution of housing prices and population density within cities (Kimtai et al., 2023). The main proposition of this theory is that the price of real estate changes as the distance from the central business district changes due to demand. This theory provides a plausible explanation of how urban sprawl can impact land use by creating demand that affects the prices of land.

#### 4.3.2 Reliance on Satellite Image Data

Another gap that was noted was the reliance on satellite image data to assess urban sprawl and changes in land use. Urban sprawl and land use changes are concepts that are not easy to measure. Twelve studies, representing 57.1% of the reviewed studies, utilised this data. While satellite image data is valuable for measuring urban sprawl and land use change, this method has several weaknesses. The first is that the spatial resolution of satellite images is limited, making it difficult to distinguish between different land uses or to identify small-scale changes (Simelane et al., 2021). This implies that studies making use of this data might have missed small-scale changes in land use, affecting the validity of their findings.

Secondly, satellite image data raises concerns related to temporal resolution because they have limited revisit times (Mosammam et al., 2017). This means that changes are not captured in real-time, and the frequency of observations may not be sufficient to capture short-term changes. In fact, most of the studies that relied on satellite image data focused their analysis on three or four images captured at different times. This frequency or number of images may not provide an accurate view of changes that have taken place over several years. In particular, the limited temporal resolution means that the data may not capture changes that occur over short periods of time (Simelane et al., 2021).

## V. CONCLUSIONS & RECOMMENDATIONS

### 5.1 Conclusions

Urban sprawl is a major challenge for cities and towns in developing countries. A lot of research has been conducted to examine the impact of the impact of urban sprawl on land use, but these studies are fragmented, making it difficult for stakeholders to utilise them to inform policies and practices. This study aimed to synthesise this research by identifying the general characteristics of studies in this area, key findings on the impacts of urban sprawl on land use, and gaps in the existing body of literature.

The review has established that the majority of the studies have been conducted in the last 10 years, meaning that the research is current. Most of the studies have used a quantitative approach followed by a mixed-methods approach. The studies have been conducted in diverse urban centres in the country, which enhances the generalizability of the findings. The study's findings suggest that the impact of urban sprawl on land use can be classified into two major themes. The first theme is the decline in the proportion of land used for agricultural production. The studies have found that the expansion of urban areas has led to a reduction in agricultural land due to increased demand for housing and the rise of non-farm income-generating opportunities. The second theme is the reduction of conservation areas, including bare land, forests, parks, and wetlands. The studies found that the sprawling of the urban population has led to a reduction in the proportion of land under conservation use. The transformation of natural land cover into built cover has major implications for human life and the environment.

## 5.2 Recommendations

These findings highlight the need for effective urban planning and management. Land use in Kenya is mentioned in local and national policies, but there seems to be a hitch with its implementation. Currently, the planning and land utilisation approaches in Kenya are defined by the Kenya National Land Use Policy of 2017. The policy was designed to lay the groundwork for the groundwork for sound land use practices, conservation enhancement, quality utilisation of land and land-based resources, and proper management of demographic and health parameters. However, there are concerns regarding the transparency and implementation parameters of this policy. The findings also have implications for stakeholders in the agriculture sector, as the loss of fertile agriculture land is bound to have a negative impact on the sector as well as food security in the country.

Two main gaps have been found in the reviewed literature, including a lack of a strong theoretical foundation and reliance on satellite image data. To enhance the quality of research into the impact of urban sprawl on land use, future research should be founded on theories to provide an opportunity to build strong theories that would provide a framework for policy and be proactive in urban planning and agriculture. Satellite image data should be combined with ground truthing methods such as field observations and surveys to validate the accuracy of satellite-derived land use and settlement images.

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