

From Agriculture to Urban: Land Use Changes in Ho Municipality, Ghana.

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abstract

This paper examines land use and land cover (LULC) changes in the Ho Municipality, a secondary city in Ghana, over a twenty-year period (2004–2024). Using a mixed methods approach that integrates remote sensing analysis of Landsat images with in-depth interviews of residents and municipal officials, the study quantifies spatial transformations and explores their social and economic drivers. The results show that built-up areas expanded nearly fourfold, largely at the expense of farmland and grasslands. While this pattern is consistent with the late stage of Urban Transition Theory, the Ho case reveals distinctive dynamics: land revaluation is incremental and household-led rather than driven by large-scale developers, and livelihood transitions remain limited due to a narrow economic base. Farmers and residents increasingly view land as a financial asset for rental housing and commercial development, reflecting a shift from agrarian to rent-based livelihoods. The findings demonstrate that secondary cities like Ho experience urban land transitions without corresponding economic diversification, deepening livelihood precarity while accelerating environmental degradation. By situating Ho within wider African urbanization debates, the paper highlights the need for context-sensitive planning and governance frameworks that can mediate land commodification while safeguarding livelihoods and ecological sustainability.

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Introduction

Urbanization is one of the most transformative forces reshaping the global landscape in the 21st century. According to the United Nations (2019), over 55% of the world's population now resides in urban areas, a figure projected to rise to about 68% by 2050. While urbanization often spurs economic growth and infrastructure development, it also places immense pressure on land resources, ecosystems, and food systems. A central consequence of this transformation is the alteration of land use and land cover (LULC), with urban expansion increasingly encroaching on agricultural lands, forests, wetlands, and other natural areas (Long et al., 2021; Dadashpoor et al., 2019; Tu et al., 2018).

In Africa, urbanization is at an unprecedented rate, often outpacing planning and infrastructure development. UN-Habitat (2020) reports that less developed regions, particularly East Asia, South Asia, and Africa, will undergo 96% urban growth, with Africa leading at a 4% annual urban population increase. While much attention has been given to megacities like Lagos, Nairobi, and Kinshasa, smaller cities and secondary towns are also experiencing equally significant, albeit less visible, transformations (Yeh & Chen, 2019).

This rapid and largely unregulated growth has resulted in widespread land conversion, urban sprawl, informal settlements, and the degradation of ecological services (Tepson et al., 2025). The consequences include increased vulnerability to climate hazards, water and food insecurity, and the marginalization of peri-urban agricultural livelihoods (World Bank, 2019). Ghana exemplifies these broader trends. Once a primarily agrarian country, it has seen rapid urban growth over the past three decades, with more than half

its population now living in urban areas (GSS, 2021). Cities like Accra and Kumasi have expanded dramatically, often in fragmented and inefficient ways (Korah, 2021). Meanwhile, smaller municipalities are undergoing their own urban transitions, shaped by population growth, infrastructural investments, and changing land tenure systems. These transitions often manifest in the conversion of agricultural and forested lands to built-up areas, leading to environmental degradation, land-use conflicts, and socio-economic dislocation (Cobbinah & Aboagye, 2017; Koroso et al., 2021).

Despite growing research on land use change in Ghana, existing studies have largely focused on major metropolitan areas. Little is known about the spatial and temporal dynamics of LULC change in secondary municipalities although they play a critical role in national development and regional urban systems. Nevertheless, these areas are where urban sprawl is often most unchecked, and where land-use planning capacities are weakest.

This study addresses that gap by investigating the land use and land cover changes in the Ho Municipality over a 20-year period (2004–2024). It examines the extent and patterns of LULC transformation, explores the driving forces behind these changes, and assesses their socio-environmental implications. By applying theoretical frameworks such as Urban Transition Theory, Von Thünen's Model, and Bid-Rent Theory, the study contributes to both empirical and theoretical understandings of urban change in the Global South. Ultimately, it offers actionable insights to inform sustainable urban development and land-use planning in Ghana and similar contexts.

Literature Review

Urbanization and Urban Sprawl

Urbanization is the movement of populations from rural areas to urban centers, resulting in increased population density, infrastructure development, and economic activity concentration. It is influenced by factors such as

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economic opportunities, improved living standards, and access to services like education, healthcare, and transportation (Ritchie et al., 2024).

Urban sprawl refers to the uncontrolled expansion of urban areas into rural or peri-urban lands, often resulting in dispersed development patterns, inefficient land use, car dependency, and fragmented communities (Ofoli et al., 2024). Urban sprawl has become a global phenomenon, particularly in developing regions, where rapid urbanization is pervasive. Sprawl is prevalent in many cities across the world, particularly in North America, Europe, and rapidly urbanizing regions of Asia, Africa, and Latin America. Urban sprawl is a growing issue in the United States and Canada, with cities like Los Angeles, Atlanta, and Houston exemplifying this phenomenon (Ewing & Hamidi, 2015). European cities have also seen suburbanization and sprawl, particularly in southern and eastern Europe (Kovács et al., 2019). Rapid economic growth and urbanization in China and India have led to significant urban sprawl, with cities like Beijing and Bengaluru experiencing substantial sprawl (Verma et al., 2017). In Africa, rapid population growth, economic migration, and insufficient urban planning are driving urban sprawl, with cities like Lagos, Accra, and Nairobi expanding into peri-urban areas (Yiran et al., 2020).

Urban expansion is driving LULC change, converting natural and agricultural lands into built environments, especially in developing countries. With over 55% of the world's population living in urban areas, expected to rise to 68% by 2050 (United Nations, 2018), this rapid urbanization often leads to arable land loss, habitat fragmentation, and increased environmental pressures. Africa's urban population is growing at 4% annually, compared to the global average of 2%. The UN (2018) predicts that by 2050, over half of Africa's population will live in urban areas, with Sub-Saharan Africa experiencing some of the fastest-growing cities globally. Sub-Saharan Africa is experiencing high urban growth rates, with cities like Lagos, Kinshasa, and Dar es Salaam experiencing annual growth rates of over 4%. Smaller cities and secondary towns are also growing rapidly, serving as hubs for rural populations moving to urban centers (World Bank, 2019).

In West Africa, cities like Lagos, Accra, and Abidjan are among the fastest growing ones and are facing challenges in the management of urban sprawl, provision of adequate infrastructure, and addressing social inequalities. Currently, over half of Ghana's population lives in urban areas, transforming the country's economic and social landscape (GSS, 2021).

According to the GSS reports, the Ho municipality has experienced a continuous increase in urban population growth over the last two decades. In 2021, the urban population stood at 125,914¹ as against 54,506 for the rural population. The Ho Municipality in Ghana's Volta Region has a long history of agriculture, which influences its land use patterns. Historically, the community relied on subsistence farming and trade-related activities. However, post-colonial growth and economic development have increased the demand for land for housing, infrastructure, and other non-agricultural purposes (Songsore, 2020). Urban expansion, particularly in Ho, has encroached on agricultural land, causing tension between agricultural and urban land users. Urban sprawl and the increasing demand for housing and infrastructure have led to land conversion into residential, commercial, and industrial uses (Peerzado et al., 2019; Bren d'Amour et al., 2017). This has led to conflicts over land ownership and usage rights, with farmers in peri-urban areas often facing challenges as their lands are acquired for urban development projects. This has raised concerns about food security and the sustainability of agriculture in the municipality.

Concepts of Land Use and Land Cover (LULC) Changes

Land use generally refers to the human use and management of land for various purposes, such as agriculture, urban development, forestry, recreation, and transportation (Metternicht, 2018). It encompasses human activities and economic functions that dictate land usage. Land cover, on the other hand, describes the physical and biological surface of the earth, including vegetation, water bodies, bare soil, and built-up areas (Gondwe et al., 2021). Land cover includes natural and man-made materials like forests, grasslands, wetlands, and urban structures (Noda et al., 2019; Melese, 2016). The distinction between land use and land cover is basically on their focus (Wulder et al., 2018). Land use pertains to the human purpose assigned to a specific land area, while land cover describes the physical characteristics of that land area

(Anderson, 1976). A single type of land cover can have different uses, such as logging, conservation, or recreation (Metternicht, 2018). Land Use and Land Cover (LULC) changes are alterations in landscapes caused by human activities and natural processes over time (Garg et al., 2019). These changes are global phenomena, influenced by factors such as population growth, economic development, urbanization, agricultural expansion, and environmental policies (Wei & Ewing, 2018).

Rapid urbanization has become a dominant driver of LULC changes, particularly in developing regions where cities are expanding rapidly (Xu et al., 2020). Urbanization converts agricultural land, forests, and wetlands into residential, commercial, and industrial areas, contributing to urban sprawl, environmental degradation, and changes in land use patterns. This shift is particularly evident in Asia, Africa, and Latin America, where cities grow faster than the infrastructure needed to support them (Dadashpoor et al., 2019). Understanding LULC changes is crucial for urban planners, as they influence the planning and management of cities, affecting infrastructure development, housing, transportation, and environmental sustainability (Ewing & Hamidi, 2015). The expansion of urban areas can lead to the loss of agricultural lands and green spaces, contributing to environmental challenges such as air pollution, increased carbon emissions, and loss of biodiversity (World Bank, 2019). Land use and land cover (LULC) changes significantly impact urban development, environmental sustainability, and socio-economic livelihoods, particularly in rapidly urbanizing regions. In Ghana, various studies have investigated the drivers, patterns, and consequences of these changes across different spatial and temporal scales, providing a comprehensive understanding of their dynamics and implications.

Ampim et al. (2021) analyzed LULC changes across Ghana from 1995 to 2019, uncovering significant transformations, including a 131.7% increase in built-up areas and a 23.3% rise in forest cover. These trends were accompanied by substantial losses in grassland (51.1%) and other vegetation (41%). The study attributed these changes to factors such as rural-urban migration, government reforestation initiatives, and agroforestry programs. It emphasized the importance of routine LULC monitoring to identify emerging challenges and opportunities for sustainable development.

Focusing on the Odaw River Basin, Ntajal et al. (2022) revealed the detrimental effects of urban expansion on water resources, including increased flooding and water pollution. The study highlighted poor waste management and soil sealing as key contributors to these issues. They recommended integrative urban planning, flood control measures, and enhanced waste management as measures to address environmental and public health risks.

Koranteng et al. (2020) examined LULC dynamics in Kumasi and surrounding districts, reporting rapid urban expansion and a 500% increase in built-up areas over three decades. This growth came at the expense of agricultural land and forest cover, exacerbating land-use conflicts and threatening livelihoods. The authors advocated for reforestation and sustainable agricultural practices to balance urban growth with environmental conservation.

Addae and Oppelt (2019) used predictive modeling techniques to study urban growth in the Greater Accra Metropolitan Area, where built-up areas expanded by 277% between 1991 and 2015. Again, Iddrisu et al. (2023) explored the impacts of urban expansion on livelihoods in peri-urban Tamale, using the Sustainable Livelihood Framework (SLF) to analyze how horizontal urban growth affected agricultural land and economic activities. The findings indicated a shift from agricultural to mixed livelihoods, with challenges such as reduced farm sizes and income losses for peri-urban farmers. The study advocated vertical development and livelihood diversification strategies, such as poultry farming and beekeeping, to reduce reliance on arable land.

Across these studies, common themes emerge, including the pervasive loss of agricultural and vegetative land to urban uses, the environmental consequences of urbanization, and the socio-economic shifts experienced by peri-urban populations. However, the context-specific nuances, such as the role of reforestation in mitigating forest loss or the adaptive strategies employed by affected households, underscore the need for tailored approaches to sustainable land management.

Theoretical frameworks underpinning the study

Understanding land use and land cover (LULC) changes in urbanizing contexts requires a multi-dimensional theoretical approach that captures not

¹ Doubled within two decades. Urban population for Ho in 2000 was 61,658

only spatial dynamics, but also, socio-economic and developmental processes. This study draws primarily on Urban Transition Theory to frame the socio-demographic and institutional drivers of urban expansion, complemented by Von Thünen's Model and Alonso's Bid-Rent Theory, to aid the interpretation of the spatial distribution and competition for land in the Ho Municipality.

Urban Transition Theory

Urban Transition Theory explains how societies evolve from predominantly rural to predominantly urban configurations over time, in response to population growth, economic transformation, technological change, and institutional restructuring (Farrell, 2017; Songsore, 2020). Modeled as a staged process, urban transition comprises five key phases of urban evolution: pre-transition, early transition, mid-transition, late transition, and post-transition. Each stage reflects the configurations of demographic distribution, economic activity, and spatial organization (He et al., 2016). In the pre-transition stage, rural life dominates, with agriculture as the primary occupation (Liu & Cao, 2017). The early and mid-transition stages witness increasing rural-to-urban migration, the growth of towns, and the rise of urban services (Menashe-Oren & Stecklov, 2017). The late transition stage, which is relevant to this study, is marked by the dominance of urban populations, sprawling cities, and heightened pressure on land and infrastructure (Friedmann, 2005; Harloe, 1996). Eventually, the post-transition stage brings stabilization, where cities focus more on sustainability and improved quality of life (Liu, 2019).

Urban Transition Theory is particularly valuable for this study because it provides a structural explanation for the observed LULC patterns in Ho. The municipality's transformation over the past two decades, from a dominantly agricultural zone to an increasingly urbanized landscape, reflects key characteristics of the late transition stage. The rapid expansion of built-up areas and the corresponding decline of grasslands and agricultural lands are not isolated occurrences; they are symptoms of broader demographic, economic, and policy shifts that accompany urban transitions. Thus, the theory enables us to frame land conversion not merely as a spatial process, but because of Ho's evolving urban identity, shaped by internal migration, infrastructural investment, and changes in land governance.

Von Thünen's Model of Agricultural Land Use

To complement this broad socio-demographic framing, the study also draws on Von Thünen's Model of Agricultural Land Use. Developed in the 19th century, this model explains how land uses are spatially organized around a central market based on transportation costs and economic rent (Dentinho, 2023; Han et al., 2022). The model suggests that land closest to the market (in this case, the urban core of Ho) is the most valuable and therefore, the first to

be converted from agricultural to urban uses. As one moves farther from the urban centre, land is more likely to remain in agricultural production due to lower market access and land values. This theoretical lens is especially helpful in understanding the patterns observed in Ho, where peri-urban areas once dominated by farming have increasingly been absorbed into residential and commercial development. The findings of this study, including the concentration of built-up expansion around the Ho's core and the encroachment into surrounding farmlands, align closely with Von Thünen's predictions.

Bid-Rent Theory

Further deepening the spatial-economic analysis, Bid-Rent Theory of Alonso (1964) offers an additional explanation for how different land users compete for space within and around urban areas. According to this theory, various users, such as commercial enterprises, residential developments, and agriculture, are willing to pay different prices (or rents) for land based on their need for proximity to the urban centre (Chidi, 2019). Commercial users tend to outbid others for central locations, while residential and industrial users settle in intermediate zones, and agricultural users are pushed to the periphery. In contexts like Ho, where land use planning is often weakly enforced, this bidding process becomes even more pronounced. Economic actors with greater purchasing power or political influence are able to acquire land for development, often displacing existing agricultural uses. This dynamic is evident in the study area, where the expansion of housing and infrastructure has occurred largely at the expense of productive grasslands and farmlands.

Together, these three theories offer a robust framework for understanding the complex processes of LULC change in Ho Municipality. Urban Transition Theory helps to situate the municipality's transformation within a broader developmental trajectory, explaining why the changes are occurring. Von Thünen's Model clarifies where the changes are most likely to begin, particularly in areas close to the urban centre. Bid-Rent Theory, in turn, explains how land competition and economic valuation drive the reallocation of land uses across space. By integrating these perspectives, this study does not only document patterns of land change, but also, interprets the underlying forces and implications, thereby offering a deeper understanding of the socio-environmental consequences of urban growth in Ghana's secondary cities.

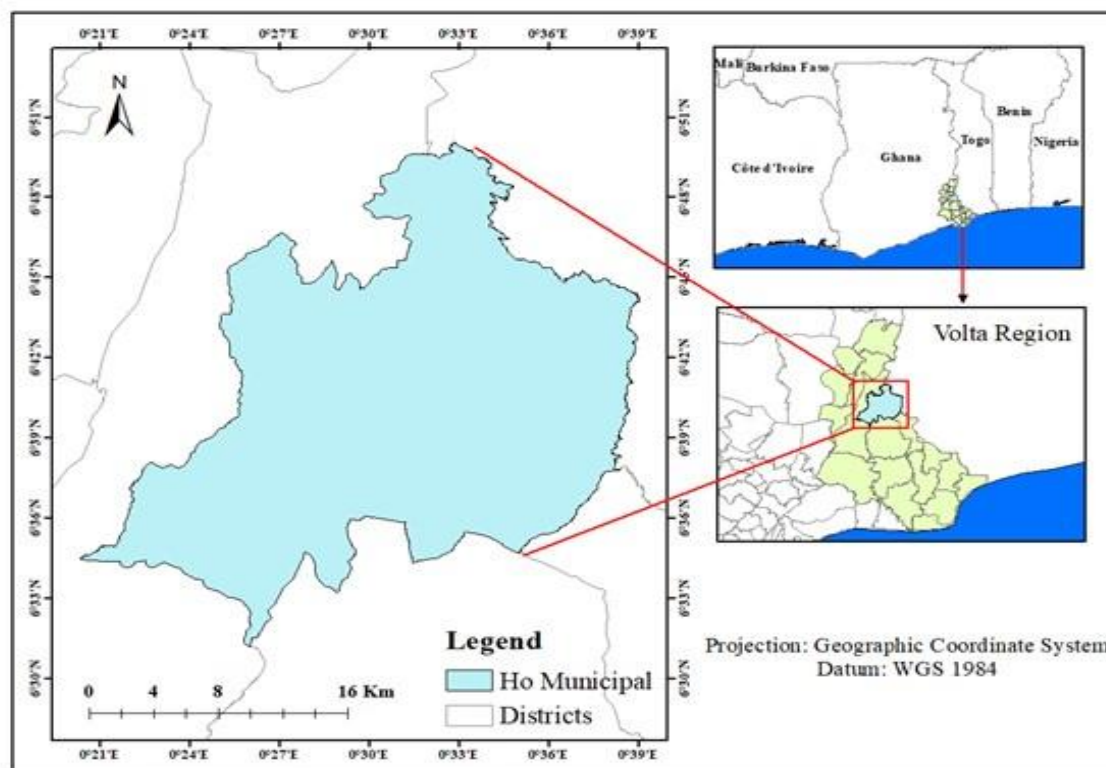


Figure 1: Study Area (Ho Municipal)

Materials and Methods

Study Area

The Ho Municipality, located in the Volta Region, was founded through the Legislative Instrument (L.I) 2074 in 2012. Until this instrument was passed, the municipality was made up of Agotime-Ziope and Ho West and the Ho District. Ho serves as the Municipality's capital and the Volta Region's economic hub. It is located between latitudes 6°20"N and 6°55"N, and longitudes 0°12'E and 0°53'E. The municipality is surrounded to the south by Adaklu and Agotime-Ziope Districts, to the north and west by Ho West District, and to the east by the republic of Togo. The municipality sits on an area of 2,361 square kilometers. The municipality experiences an average monthly temperature of 220-320 degrees Celsius, with an average yearly temperature of 16.50-37.8 degrees Celsius. This consistently high temperature is beneficial for agricultural production. The rainfall pattern is separated into two seasons: major (March-June) and minor (July-November). The average annual rainfall ranges from 20.1mm to 192mm, with the maximum amount falling in June and the lowest in November. The municipality has 33.83 square kilometers of forest reserve in Ho Hills and Kabakaba Hills. This study employed a mixed-methods design (Creswell, 2014), combining geospatial analysis with qualitative interviews to capture both the spatial dynamics and the socio-institutional drivers of land use and land cover (LULC) change in the Ho Municipality.

Landsat imagery (30 m resolution) for 2004, 2009, 2014, 2019, and 2024 was obtained from the United States Geological Survey (USGS) archive. Images were pre-processed through atmospheric and radiometric corrections to ensure comparability across years. Supervised classification was performed using the Maximum Likelihood Algorithm in ArcGIS, with four categories defined: built-up, grassland, forest, and bare land. Classification accuracy was validated using ground-truthing points and high-resolution Google Earth imagery (Capolupo et al., 2020), with overall accuracy above 85% and Kappa coefficients greater than 0.80 (Bloch & Kraemer, 1989). Change detection was conducted using post-classification comparison to quantify transitions between classes, while Normalized Difference Vegetation Index (NDVI) analysis was applied to assess changes in vegetation density.

To complement the spatial analysis, qualitative data were collected through semi-structured interviews. Thirty (30) residents were selected using a combination of purposive and snowball sampling. Purposive sampling ensured inclusion of both urban and peri-urban communities within the Ho Municipality, capturing a range of perspectives on land use and land cover (LULC) change. Snowball sampling was used to identify long-term residents, particularly farmers and landholders who had lived in the municipality for at least 20 years and possessed deep experiential knowledge of land transformation. While the sample is not statistically representative of the entire population of Ho, it is analytically representative of the key groups most affected by land conversion. In addition, five municipal officials were interviewed from departments directly involved in land-use governance. These included the Physical Planning Department, the Works Department, the

Department of Agriculture and the Environmental Health Unit. As land administration functions fall under the Lands Commission rather than the Municipal Assembly, supplementary perspectives were obtained from the local Lands Commission office. This ensured institutional accuracy and provided a holistic view of land governance in Ho.

All qualitative data were analyzed manually using thematic analysis. Transcripts were coded according to emerging themes such as drivers of LULC change, governance challenges, livelihood impacts, and environmental consequences. This allowed for systematic comparison of perspectives across residents and officials, and for linking lived experiences to spatial trends identified in the remote sensing analysis. The geospatial and qualitative strands were analyzed concurrently and then integrated through triangulation. Spatial patterns identified in satellite imagery were interpreted alongside thematic insights from interviews, enabling a holistic understanding of both the quantitative extent of land cover change and its qualitative drivers and consequences. This integration allowed the study to move beyond descriptive mapping toward an explanation of how demographic, economic, and governance processes shape LULC change in the Ho Municipality.

Findings

This session presents the findings of the research. To make a better argument, we first look at the urban population trend of the study area to ascertain growth or otherwise.

Figure 2 shows the urban population growth trend of the Ho municipality over the last five decades. The urban population of the Ho Municipality has seen consistent growth from 24,199 in 1970, and it increased to 125,914 in 2021. Notably, the population witnessed a significant rise between 2000 and 2010, nearly doubling from 61,658 to 104,532. This could be a suggestive period of accelerated urbanization or economic activities that attracted more people to the municipality. This growth trend reflects the broader pattern of urbanization seen in many parts of Ghana, driven by factors such as rural-to-urban migration, population growth, and economic opportunities in urban centers as asserted by GSS, 2021. This stage reflects the late transition stage that sees urban dominance, with most of the population living in cities and towns as highlighted by the Urban Transition Theory.

The study further investigates LULC dynamics. Figure 3 shows the spatial distribution of LULC of the study area for 2004, 2009, 2014, 2019, and 2024 while Tables 1 and 2 show the area statistics of the LULC units and the extent of changes that have occurred. The area statistics were calculated, considering the pixel count and the total size of the study area. In 2004, area categorized as Grassland was the dominant (329.00 km² representing 57.34%) LULC type. The next was Bare lands (115.84 km² representing 20.19%) while, Dense Vegetative cover, occupied 102.25 km² (17.82%). Built-up had the least (26.72 km², thus, 4.66%) area coverage.

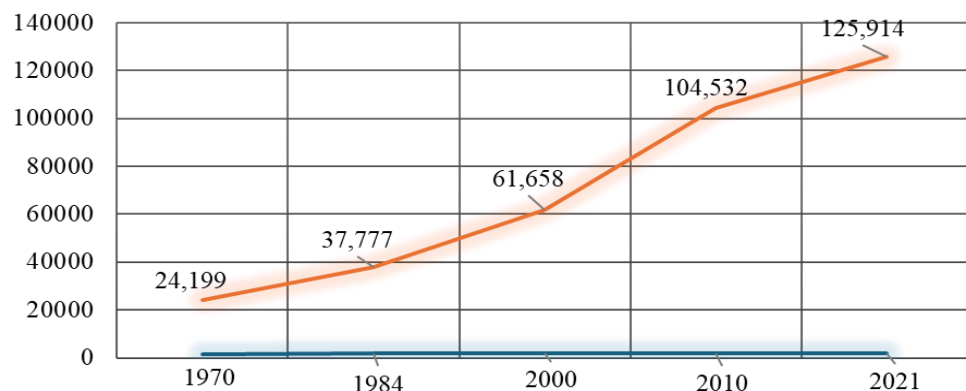


Figure 2: Urban Population growth for Ho Municipality

Source: GSS, 2021

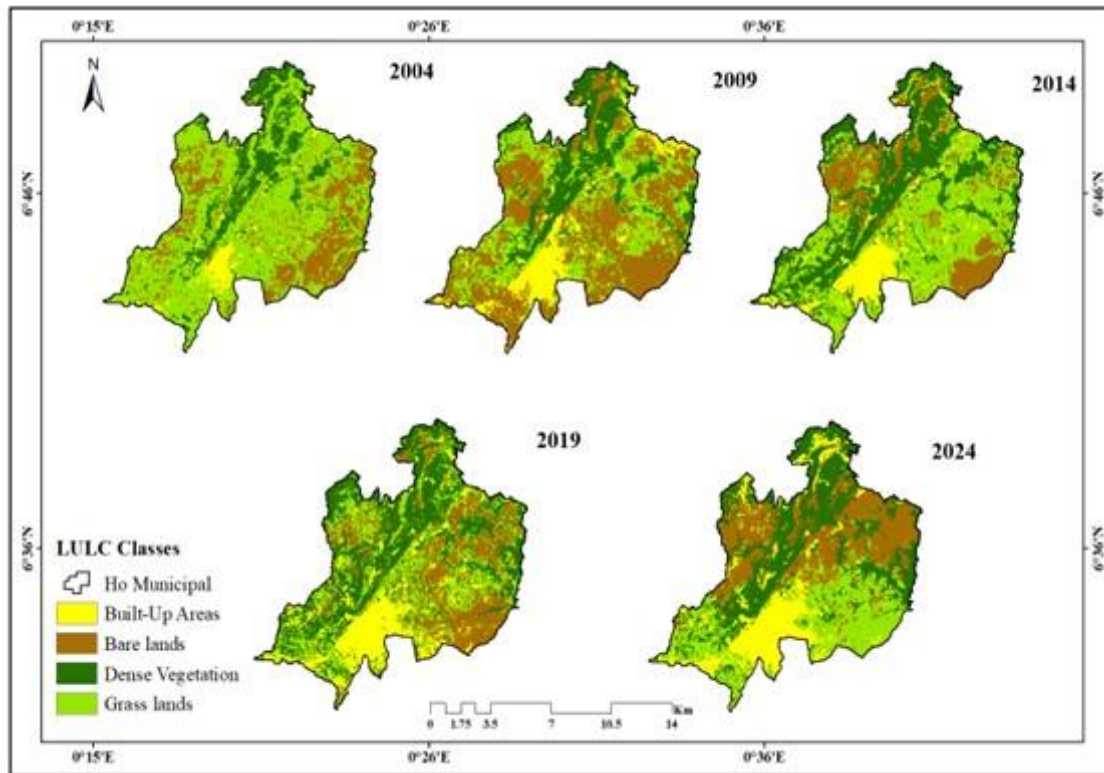


Figure 3: Land use/cover classes classified imagery
Source: Authors' construct, 2024

Table 1: Land use and land cover change (2004 - 2024)

LULC Classes	Pixel Count	Area (Km ²)
Built-up areas to bare lands	639	0.5751
Built-up areas to dense vegetation	564	0.5076
Built-up areas to grasslands	375	0.3375
Bare lands to built-up areas	11305	10.1745
Bare lands to dense vegetation	10278	9.2502
Bare lands to grasslands	54893	49.4037
Dense Vegetation to Built-Up Areas	9009	8.1081
Dense Vegetation to Bare lands	9019	8.1171
Dense Vegetation to Grasslands	3284	2.9556
Grasslands to Built-Up Areas	63770	57.393
Grasslands to Bare lands	106846	96.1614
Grasslands to Dense Vegetation	105477	94.9293

Source: Authors' construct, 2024

Table 2: Land area (Km²) covered by land use/cover classes

	2004		2009		2014		2019		2024	
LULC classes	km ²	%	km ²	%	km ²	%	km ²	%	km ²	%
Built-up Areas	26.72	4.66	62.06	10.81	69.09	12.03	91.18	15.89	101.75	17.72
Bare lands	115.84	20.19	227.67	39.66	96.71	16.84	131.90	22.98	150.90	26.28
Dense Vegetation	102.25	17.82	118.70	20.68	193.32	33.66	203.82	35.51	188.13	32.76
Grasslands	329.00	57.34	165.57	28.85	215.19	37.47	147.05	25.62	133.43	23.24

Source: Authors' construct, 2024

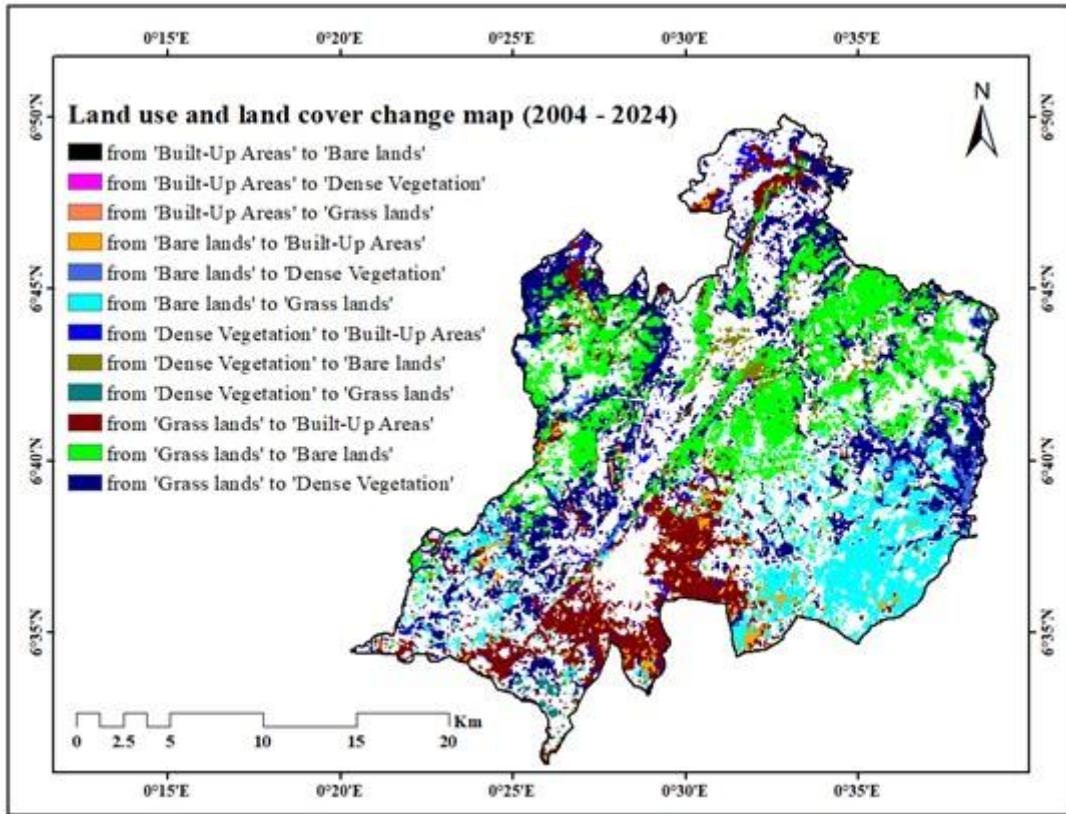


Figure 4: Land use and land cover change map (2004 - 2024)

Source: Authors' construct, 2024

Figure 4 above illustrates how land use and land cover (LULC) in the Ho Municipality has changed over two decades, from 2004 to 2024. The map highlights the expansion of built-up areas, showing a clear growth of urban land use at the expense of other land types such as agricultural land or natural vegetation. This urban expansion is most evident in the areas surrounding the city of Ho, where urban sprawl has encroached into previously rural or undeveloped lands. Agricultural land near the urban core may have significantly shrunk during this period. This discovery mirrors the idea of the Von Thünen Model which explains that as cities expand, agricultural land near urban centres is often the first to be converted to urban use due to its proximity to the market. Tables land 2 complement figure 5 to give a better understanding to the visual representation of the transformation of land use over time, emphasizing how urban growth has reshaped the spatial structure of the Ho Municipality over a 20-year period.

Between 2004 and 2009, three of the land use and land cover classes, namely, built-up, bare lands, and dense vegetation, have experienced an increase in their area coverage (see Tables 1 and 2). The built-up category had increased in terms of area coverage from 26.72 km² to 62.06 km² (10.81%). Bare lands increased in size to 227.67 km², representing a percentage of 39.66% while dense vegetation also had a percentage increase from 17.82% to 20.68%, representing an area of 118.70 km². On the contrary, the Grassland category recorded a substantial reduction in size. About 163.43 km² of Grassland was lost. From 2009 to 2014, the dynamics changed. An expansion of land area continued for the dense vegetation as well as the built-up class. The area under bare lands, however, significantly decreased from 227.67 km² (39.66%) to 96.71 km² (16.84%), while Grassland increased from 165.57 km² (28.85%) to 215.19 km² (37.47%). The built-up class also increased from 62.06 km² to 69.09 km² representing a percentage change of over 1.23%. Dense vegetation also increased from 165.57 km² (28.85%) to 215.19 km² (37.47%). This corroborates the findings of Ampim et al. (2021) who observed a 23.3% increase in forest cover nationally, attributed to reforestation and agroforestry

programs by the state. This suggests that targeted interventions can mitigate some of the environmental consequences of urban growth.

The findings further indicates that between 2004 and 2024, built-up areas in Ho expanded nearly fourfold, rising from 4.66% to 17.72% of total land cover (see Table 2). This reflects rapid urban expansion characteristic of the late stage of the Urban Transition, where farmland is progressively displaced by residential and commercial uses. Yet, unlike in Accra or Kumasi, Ho's smaller and less diversified economy offers limited opportunities for livelihood transition. Residents underscored this constraint. As one woman noted:

In Ho, unlike Accra, one cannot easily transition between livelihoods. My daughter went to Accra seven years ago and has changed jobs several times when things were bad for her. This would have been very difficult in Ho - (48-year-old woman, 2024).

Similarly, a 79-year-old farmer explained:

I have been farming all my life, and I don't know anything apart from farming. I am old now, but I have to walk several miles to reach my farm. For the past two years, I have not been able to farm for this reason. I survive on remittances from my son who lives in Accra - (79-year-old farmer).

These narratives confirm the broader finding that while urbanization transforms land use, it does not automatically create new livelihood opportunities in secondary cities. Instead, places like Ho experience land-use change without equivalent economic diversification, leaving households more vulnerable. This highlights the uneven geography of urban transition in Ghana and extends Urban Transition Theory by showing that the "urban shift" does not necessarily translate into smooth household adaptation in weaker urban economies.

Also, the conversion of agricultural lands into built-up areas undermines food security in the municipality. As observed in this study, grasslands, which often serve agricultural purposes, declined sharply, shrinking from 57.34% of total land cover in 2004 to 23.24% in 2024 reflecting the steady conversion of

farmland into urban uses. Officials linked this directly to policy reforms that facilitated land commodification:

Ho Municipality has long been known for farming. But the commodification of land, especially since the structural adjustment programme, has given much of the farmlands away to housing and commercial activities (Municipal Officer 1, 2024).

The finding mirrors the works of Iddrisu et al. (2023), Koranteng et al. (2020); Addae and Oppelt (2019) who asserted that rapid urbanization in Ghana has led to significant conversion of agricultural lands to built-up areas. This trend threatens livelihoods dependent on agriculture and may adversely contribute to increase in environmental challenges such as flooding as noted by Ntajal et al. (2022). The decline of grasslands and farming areas was not simply a product of local population growth, but was also tied to the broader policy reforms. As officials noted, the structural adjustment programme redefined land as a commodity, accelerating its conversion into housing and commercial activities. This confirms wider debates on neoliberal urbanism in Africa, where policy reforms have deepened market-driven land allocation (Amanor, 2010). In Ho, the commodification of farmland has transformed land from a subsistence base into a tradable asset, reshaping both livelihoods and landscapes.

NDVI analysis revealed declining vegetation cover, particularly around Ho's central business district and peri-urban growth corridors. Interviews confirmed that proximity to markets and roads drives commercial redevelopment, in line with Bid-Rent Theory. As a business owner put it:

Everybody wants land close to the business centre or by the main road. Even structures near the markets are constantly renovated to accommodate more businesses (40-year-old business owner, 2024).

Similarly, rental housing, especially student hostels, was seen as more profitable than farming as indicated by a hostel owner

Real estate and hostels bring in more constant money than farming. I rent out my hostels to students every year, and the value of real estate never depreciates (Hostel owner, 2024).

Residents' emphasis on the profitability of land near roads and markets demonstrates how Bid-Rent dynamics operate in Ho. Commercial and residential uses increasingly dominate land once used for farming. However, unlike in Accra where formal developers drive this process, in Ho it is household and small-scale actors who renovate buildings, construct hostels, and convert plots into businesses. This incremental, household-led commercial revaluation illustrates how urban theory must be contextualized: while classic bid-rent logic holds, the social actors driving change differ, producing a more fragmented and informal pattern of land-use transition.

Interestingly, farmers themselves increasingly see land as a financial asset rather than an agricultural resource. A 54-year-old farmer explained:

If I get enough money, I will develop my farmland into a two-chamber and a hall self-contained house for rent. I will retire and live on the rental income (54-year-old farmer)

Another farmer noted, every year you have to farm, but you are never sure whether the crops will do well. I have given half of my land to my son who wanted to invest in a student hostel, and I will give the other half to my daughter for her project (60-year-old farmer, 2024).

Officials confirmed this trend, linking it to migration-driven housing demand: Ho is a secondary city and plays the role that Accra plays for this part of the Volta Region. People move here for jobs, schooling, and other opportunities, and they need housing and shopping centres. Farmlands are cleared to make way for these developments (Municipal Officer 2, 2024).

These perspectives show that Ho's urban expansion is not only a process of displacement, but also, of household-driven land revaluation, where farming families strategically convert land into rental housing or commercial projects. This aligns with Von Thünen's model of peri-urban land conversion but highlights how secondary city contexts can reshape classic theories: transitions are not driven by large-scale capital, but by localized, family-led strategies.

Study Contribution

This study contributes methodologically and empirically to the growing body of research on land use and land cover change in the secondary cities of Africa. While most existing studies in Ghana have focused on metropolitan regions such as Accra and Kumasi, this research demonstrates the value of applying a mixed-methods framework in a smaller urban center. By integrating multi-temporal Landsat analysis with manual thematic coding of qualitative interviews, the study does not only quantify spatial transformations, but also, explains their drivers through local narratives and governance perspectives. This dual approach addresses the common gap in LULC studies, where remote sensing often produces descriptive maps without adequate social interpretation. The Ho case indicates that even in contexts of limited formal data, combining geospatial techniques with purposive and snowball interviews can generate nuanced, actionable insights that are directly relevant for urban planning, land governance, and sustainability policy.

Conclusion

The study has shown that the Ho Municipality is undergoing a significant urban transition characterized by rapid expansion of built-up areas and the displacement of farmland and vegetation. These changes mirror broader trends in Ghanaian cities, and also, reveal important distinctions. Unlike Accra and Kumasi, Ho's land-use transitions are driven less by formal developers and more by households, farmers, and small-scale actors who incrementally convert land for rental housing, hostels, and commercial activities. This process reflects bid-rent and Von Thünen dynamics, yet is mediated by local tenure systems, household livelihood strategies, and regional migration pressures.

A key implication is that urbanization in secondary cities does not guarantee livelihood adaptation. Instead, Ho's limited and undiversified economy restricts the possibility of residents shifting from farming to other forms of employment, resulting in heightened vulnerability and reliance on remittances. The commodification of land accelerated by structural adjustment reforms which has transformed farmland into a financial asset, but often without corresponding gains in household security or municipal planning capacity.

The uniqueness of Ho lies in how it expands our understanding of African urban transitions: it demonstrates that land-use change can outpace economic diversification, producing a fragile form of urban growth with significant ecological and social risks. Addressing these challenges requires governance frameworks that balance land commodification with sustainable livelihoods and environmental protection. For policy and planning, Ho offers both a warning and an opportunity: the warning of unchecked sprawl in secondary cities, and the opportunity to implement proactive, inclusive, and ecologically sensitive planning before these trajectories become irreversible.

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References

- Addae, B., & Oppelt, N. (2019). Land-use/land-cover change analysis and urban growth modelling in the Greater Accra Metropolitan Area (GAMA), Ghana. *Urban Science*, 3(1), 26.
- Alonso, W. (1964). Location and land use: Toward a general theory of land rent. Harvard University Press.
- Amanor, K. S. (2010). Family values, land sales and agricultural commodification in South-Eastern Ghana. *Africa*, 80(1), 104-125.
- Ampim, P. A., Ogbe, M., Obeng, E., Akley, E. K., & MacCarthy, D. S. (2021). Land cover changes in Ghana over the past 24 years. *Sustainability*, 13(9), 4951.
- Anderson, J. R. (1976). A land use and land cover classification system for use with remote sensor data (Vol. 964). US Government Printing Office.
- Bloch D. A. and Kraemer H. C. (1989). 2 x 2 kappa coefficients: Measures of agreement or association. *Biometrics* 45, 269-287.
- Bren d'Amour, C., Reitsma, F., Baiocchi, G., Barthel, S., Güneralp, B., Erb, K. H., ... & Seto, K. C. (2017). Future urban land expansion and implications for global croplands. Proceedings of the National Academy of Sciences, 114(34), 8939-8944.
- Capolupo, A., Monterisi, C. & Tarantino, E. (2020). Landsat images classification algorithm (LICA) to automatically extract land cover information in Google Earth engine environment. *Remote Sensing*. 12, (1201), 1-26; www.mdpi.com/journal/remotesensing
- Chidi, C. L. (2019). Bid-rent theory and urban land use of Butwal Urban Area, western Nepal. *The Third Pole: Journal of Geography Education*, 11-20.
- Cobbinah, P. B., & Aboagye, H. N. (2017). A Ghanaian twist to urban sprawl. *Land Use Policy*, 61, 231-241.
- Creswell, J. W. 2014. *A Concise Introduction to Mixed Methods Research*. London: SAGE.
- Dadashpoor, H., Azizi, P., & Moghadasi, M. (2019). Land use change, urbanization, and change in landscape pattern in a metropolitan area. *Science of the Total Environment*, 655, 707-719.
- Dentinho, T. P. (2023). Johann Heinrich Von Thünen (1783–1850): A Systemic View of Human Interaction Within Space. In *Great Minds in Regional Science, Vol. 2* (pp. 71-87). Cham: Springer International Publishing.
- Ewing, R., & Hamidi, S. (2015). Compactness versus sprawl: A review of recent evidence from the United States. *Journal of planning literature*, 30(4), 413-432.
- Farrell, K. (2017). The rapid urban growth triad: a new conceptual framework for examining the urban transition in developing countries. *Sustainability*, 9(8), 1407.
- Friedmann, J. (2005). *China's urban transition*. U of Minnesota Press.
- Garg, V., Nikam, B. R., Thakur, P. K., Aggarwal, S. P., Gupta, P. K., & Srivastav, S. K. (2019). Human-induced land use land cover change and its impact on hydrology. *Hydro Research*, 1, 48-56.
- Gondwe, J. F., Lin, S., & Munthali, R. M. (2021). Analysis of land use and land cover changes in urban areas using remote sensing: Case of Blantyre City. *Discrete Dynamics in Nature and Society*, 2021(1), 8011565.
- Habitat, U. N. (2020). The value of sustainable urbanization. *World Cities*
- Han, H., Yuan, Z., & Zou, K. (2022). Agricultural location and crop choices in China: A revisit on von Thünen model. *Land*, 11(11), 1885.
- Harloe, M. (1996). Cities in the Transition. *Cities after socialism: urban and regional change and conflict in post-socialist societies*, 1-29.
- He, C., Chen, T., Mao, X., & Zhou, Y. (2016). Economic transition, urbanization and population redistribution in China. *Habitat International*, 51, 39-47.
- Iddrisu, S., Siiba, A., Alhassan, J., & Abass, K. (2023). Land-use and land cover change dynamics in urban Ghana: implications for peri-urban livelihoods. *International Journal of Urban Sustainable Development*, 15(1), 80–96. <https://doi.org/10.1080/19463138.2023.2184822>
- Korah, P. I. (2021). Emergent new cities and spatial transformation in Ghana's Greater Accra Region: Exploring the drivers, governance and consequences of growth.
- Koranteng, A., Adu-Poku, I., Donkor, E., & Zawila-Niedzwiecki, T. (2020). Geospatial assessment of land use and land cover dynamics in the mid-zone of Ghana. *Folia Forestalia Polonica*, 62(4), 288-305.
- Koroso, N. H., Lengoiboni, M., & Zevenbergen, J. A. (2021). Urbanization and urban land use efficiency: Evidence from regional and Addis Ababa satellite cities, Ethiopia. *Habitat International*, 117, 102437.
- Kovács, Z., Farkas, Z. J., Egedy, T., Kondor, A. C., Szabó, B., Lennert, J., ... & Kohán, B. (2019). Urban sprawl and land conversion in post-socialist cities: The case of metropolitan Budapest. *Cities*, 92, 71-81.
- Liu, P. K. (2019). *Urbanization and development: The rural-urban transition in Taiwan*. Routledge.
- Liu, Z., & Cao, H. (2017). Spatio-temporal urban social landscape transformation in pre-new-urbanization era of Tianjin, China. *Environment and Planning B: Urban Analytics and City Science*, 44(3), 398-424.
- Long, H., Zhang, Y., Ma, L., & Tu, S. (2021). Land use transitions: Progress, challenges and prospects. *Land*, 10(9), 903.
- Melese, S. M. (2016). Effect of land use land cover changes on the forest resources of Ethiopia. *International Journal of Natural Resource Ecology and Management*, 1(2), 51.
- Menashe-Oren, A., & Stecklov, G. (2017). Population age structure and sex composition in sub-Saharan Africa: a rural-urban perspective. *IFAD Research Series*, (17), 1-41.
- Metternicht, G. (2018). *Land use and spatial planning: Enabling sustainable management of land resources*. Springer.
- Noda, A., Kondoh, A., & Nishihiro, J. (2019). Changes in land cover and grassland area over the past 120 years in a rapidly urbanised area in Japan. *One Ecosystem*, 4, e37669.
- Ntajal, J., Höllermann, B., Falkenberg, T., Kistemann, T., & Evers, M. (2022). Water and health nexus—land use dynamics, flooding, and water-borne diseases in the Odaw River basin, Ghana. *Water*, 14(3), 461.
- Ofoli, A. L., Ablo, A. D., & Wrigley-Asante, C. (2024). Urban sprawl and the changing socioecological systems in peri-urban Ghana. *Local Environment*, 29(10), 1402-1420.
- Peerzado, M. B., Magsi, H., & Sheikh, M. J. (2019). Land use conflicts and urban sprawl: Conversion of agriculture lands into urbanization in Hyderabad, Pakistan. *Journal of the Saudi Society of Agricultural Sciences*, 18(4), 423-428.
- Ritchie, H., Samborska, V., & Roser, M. (2024). Urbanization. *Our world in data*.
- Songsore, J. (2020). The urban transition in Ghana: Urbanization, national development and poverty reduction. *Ghana Social Science Journal*, 17(2), 57-57.
- Tepson, D., Bawakyillenuo, S., & Amedoh, B. (2025). From Green to Grey: Mapping Vegetation Loss, Institutional Gaps, and the Realities of Reforesting Dome, Accra in the Face of Climate Change. *Journal of Sustainable Forestry*, 1–12. <https://doi.org/10.1080/10549811.2025.2553199>
- Tu, S., Long, H., Zhang, Y., Ge, D., & Qu, Y. (2018). Rural restructuring at village level under rapid urbanization in metropolitan suburbs of China and its implications for innovations in land use policy. *Habitat International*, 77, 143-152.
- United Nations Department of Economic and Social Affairs. (2019). *World urbanization prospects: The 2018 revision*. UN/United Nations Human Settlements Programme. (2010). State of the world's cities 2010/2011: Bridging the urban divide. Earthscan.
- Verma, S., Chatterjee, A., & Mandal, N. R. (2017). Analysing Urban Sprawl and Shifting of Urban Growth Centre of Bengaluru City, India Using Shannon's Entropy Method. *Journal of Settlements & Spatial Planning*, 8(2).
- Wei, Y. D., & Ewing, R. (2018). Urban expansion, sprawl and inequality. *Landscape and urban planning*, 177, 259-265.
- World Bank. (2019). World development report 2020: Trading for development in the age of global value chains. The World Bank.
- Wulder, M. A., Coops, N. C., Roy, D. P., White, J. C., & Hermosilla, T. (2018). Land cover 2.0. *International Journal of Remote Sensing*, 39(12), 4254-4284.
- Xu, X., Shrestha, S., Gilani, H., Gumma, M. K., Siddiqui, B. N., & Jain, A. K. (2020). Dynamics and drivers of land use and land cover changes in Bangladesh. *Regional Environmental Change*, 20(2), 54.
- Yeh, A. G.-O., & Chen, Z. (2019). From cities to super mega city regions in China in a new wave of urbanisation and economic transition: Issues and challenges. *Urban Studies*, 57(3), 636-654. <https://doi.org/10.1177/0042098019879566> (Original work published 2020)
- Yiran, G. A. B., Ablo, A. D., Asem, F. E., & Owusu, G. (2020). Urban sprawl in sub-Saharan Africa: A review of the literature in selected countries. *Ghana Journal of Geography*, 12(1), 1-28.