

Chapter 6

Contentious Issues and the Reality of Urban Sprawl

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Introduction

Urbanization represents a persistent, global, and inevitable course of urban development, to the effect that urban scholarship has continuously expressed concern over the rapid pace of urbanization worldwide, which affects both developed and developing nations (Sudhira et al., 2004; Jat et al., 2008). As Sharma, Kumar and Kumar (2024) observed, human civilization has continually reshaped the earth over time, reflecting the deep ongoing influence of urban processes. In line with this, Idowu and Olaniyan (2009) emphasize the implications of a growing global population, noting that the nature of urban settlements has evolved, with many semi-urban areas and medium-sized towns transitioning into fully urbanized regions. This global urban development is manifesting in increasingly complex urban dynamics, characterized by the rapid proliferation of informal housing and the concentration of impoverished families in peri-urban zones. As noted by various scholars, the continuous expansion of cities in terms of size and population leads to the widespread challenge of urban sprawl (Ewing, 1997; Olujimi, 2009; Mangweta, Mokoetele and Monama, 2022; Sharma, et al., 2024).

There is a growing global concern and awareness regarding urban sprawl and its ramifications (Downs, 1999; Feng, 2009; Olanrewaju and Adegun, 2021). As Ajiboye, Eren, and Ugehe (2022) noted, understanding the dynamics of urban growth and changes in land use has a significant impact on the future, especially in urban planning. Numerous studies have characterized urban sprawl as a widely recognized yet contentious issue, often debateable (Torrens, 2008; Aljoufie et al., 2013; Aguda and Adegboyega, 2013). The term "urban sprawl" encompasses a range of undesirable characteristics associated with urban growth, including environmental degradation, uncontrolled development, and unplanned suburbanization (Cillier, 2010; Noor and Rosni, 2013; Liu, et al., 2018; Sharma, et al., 2024). There is no wishing away the environmental problems that comes with urban sprawl, even more so the environmental footprints caused by automobile dependency, consumption patterns, eradication of farmlands and green areas that characterise the urbanization process of developing countries (Ajobiewe, 2020). It is precisely because of these reasons that the debates around urban sprawl have flourished in recent decades, and despite the myriads of propositions – as it is a frequently discussed phenomenon – it remains poorly understood due to its varied interpretations among different stakeholders.

This study adopts a three-stage methodological approach. First, it synthesizes scholarly debates and theoretical frameworks on urban sprawl, examining key definitions, causes, and global experiences. Second, it uses Minna, Nigeria, as a representative case to explore urban growth trends and governance challenges common to developing cities. Finally, it maps and quantifies urban expansion over time, with particular attention to land cover changes and identifiable sprawl patterns. These contentious issues encompass definitions, characteristics, causes, measurements, impacts, and consequences, which are both far-reaching and undeniable. In the following sections, the article presents an understanding (theoretical and analytical) of urban sprawl then goes a step further to explore the realities of urban living in various regions worldwide, then concludes whilst focusing on a study conducted in Minna, a city in Nigeria, covering 1972 - 2015.

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Interpreting Urban Sprawl within Theoretical Contexts

In urban studies, theories play a crucial role in elucidating the complexities of the urban phenomena such that analyzing urban growth and residential location in relation to the concept of urban sprawl becomes feasible. This recourse to theory is at the very least important in that “there is no practice without theory”, a sentiment one would find appealing should Neil Brenner’s critique of naïve objectivism be invoked on the basis of rationalizing the importance of theory (see Brenner, Madden and Wachsmuth 2011; Brenner and Schmid, 2015). There are in fact a number of classical descriptive theories (Burgess, 1925; Hoyt, 1939; and Harris and Ullman, 1945) that have been proposed and, in some cases, modified (Vance, 1964, Mann, 1965, Kearsley, 1983, and White, 1987) and reconceptualized to explain the urban phenomena. These classical descriptive theories which as Ajobiewe (2020) reiterated, were works of the Chicago School of Urban Sociology, and for the most part attempted an ecological (functionalist) explanation of urban development.

Although they continue to gain a widespread nostalgic appeal even today not only in the context of land use patterns and urban structure (Cillier, 2010), it is important to add that these ideas of the Chicago school have been notably criticised since the 1960s (see Lefebvre, 1970; Harvey, 1973; and Massey, 1991 cited in Scott and Storper, 2014). Despite these waves of criticisms, they are relevant to the ongoing discourse on urban sprawl because they do offer a fundamental approach to a city-centric paradigm, that has characterised the urban discourse in recent decades. A succinct recapitulation of these theories—the ‘classics of urban theory’—highlights key assumptions, including: (1) urban areas expand outward in a radial, concentric pattern from a central point (Burgess Theory; see Figure 1); (2) high-quality residential zones typically develop along the most efficient transportation routes, near existing commercial hubs, or adjacent to open land (Sector Theory; see Figure 2); and (3) urban development often occurs around multiple central business districts (CBDs) or distinct nuclei, rather than from a single origin point (Multiple Nuclei Theory; see Figure 3)."

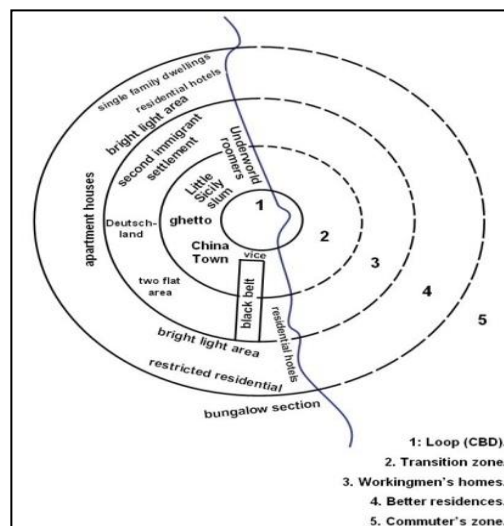


Figure 1. Burgess Theory (1925).

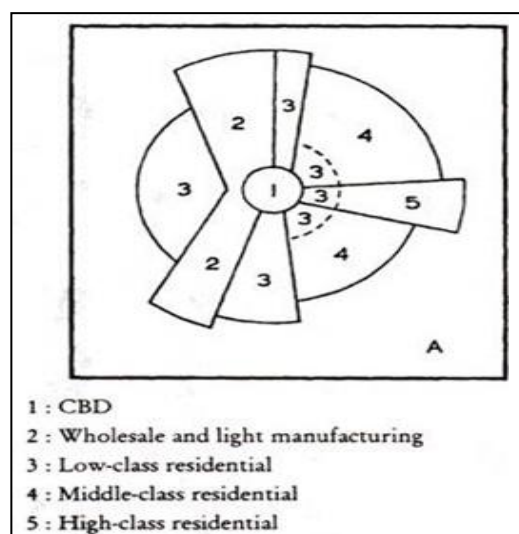


Figure 2. Hoyt's Theory (1939).

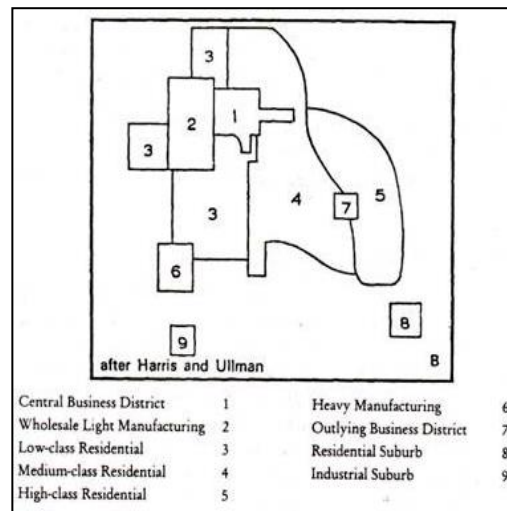


Figure 3: Harris and Ullman (1945)

Beyond the classics of urban theory, there are as well some modified descriptive theories which build upon the classical theories of Burgess, Hoyt, and Harris and Ullman to show the significance of Central Business Districts (CBDs) and nodal cankers in the urban structure of cities during the 20th and 21st centuries. Pacione (2005) and Cellier (2010) employed this theoretical framework to analyse the contemporary composition of urban structures in the 21st century. The theories encompassed within this framework include Vance's Urban-Realm Theory, Mann's Theory of Urban Structure, Kearsley's Modified Burgess Theory, and White's Theory of the 21st Century City. In Vance's Urban Real Theory (1964), there is an emphasis on the development of self-sufficient urban areas, characterized by the emergence of a new downtown that operates independently from the traditional downtown. Mann's Theory of Urban Structure (1965) argues that industrial land use acts as a magnet for residential development among the working class, thereby providing employment opportunities for skilled individuals who can afford longer commutes.

For Kearsley (1983) which ultimately expands upon Mann's framework, the creation of new towns and the establishment of public or private residential estates in suburban areas are direct results of urban renewal initiatives and economic decentralization. Pacione (2005) acknowledges the foundational role of concentric theory in the development of White's Theory of the 21st Century City which argues that the presence of industrial anchors and public sector oversight significantly influences zoning regulations and the overall urban structure. Additionally, the land value theory, articulated by Alonso in 1964, elucidates the relationship between land value and land use. In this sense, land located in urban centres are highly sought after yet limited in availability, resulting in intense competition among various users. This intense competition highlights the strong preference for homeownership in peripheral areas, attributing this trend to the lower cost of land in these regions, which consequently attracts a significant population (Hirsch, 1973; Onokerhoraye and Omuta, 1986). Although transportation costs to these areas may be elevated, the appeal of acquiring a substantial parcel of land or the prospect of reduced rental prices continues to motivate such relocations. Proponents of land value theory have corroborated this assertion, indicating that urban development typically gravitates toward more affordable and accessible land (Cellier, 2010; Cobbinah and Amoako, 2014).

From the foregoing, we illustrate the interrelationship of the theories as factors influencing urban sprawl using the urban sprawl wheel (Figure 4) in line with other scholars (Song and Zenou, 2006; Franz et al., 2006; O'Sullivan, 2009; Cellier, 2010; Cobbinah and Amoako, 2014; Idowu, 2017) to explain the processes of urban transformation. The factors that contribute to urban sprawl, as inferred from these theories, include urban growth, population increase, economic activity, location preferences, availability of space, transportation influences, land use patterns, physical planning strategies, transportation costs, government intervention, low rental and land values, social factors, and horizontal movement patterns.

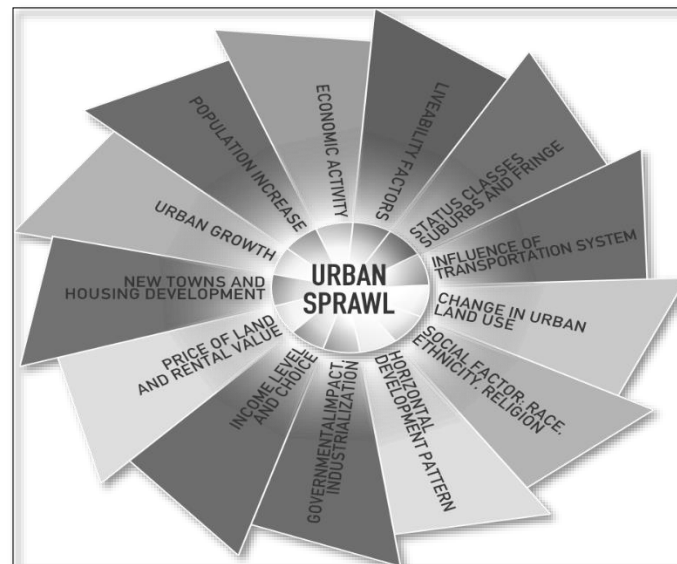


Figure 4: Urban Sprawl Wheel.

Source: Idowu (2017).

Urban Sprawl in Context: Causes, Costs, Control, and Comparative Perspectives

Urban sprawl is a spatial phenomenon that is widely recognized, complex, and often surrounded by controversy (Torrens, 2008; Liu and Jiang, 2011). Cervero (2000) emphasized the complex processes and challenges involved in defining urban sprawl, as well as the various patterns it reflects. Frank et al. (2000), Frenkel and Ashkenazi (2008), and Sharma, et al. (2024) all address the challenges of defining urban sprawl, noting that these difficulties stem from differing and often conflicting perspectives. The body of literature addressing urban sprawl is extensive and varies across different global regions (Torrens, 2008; Hamidi and Ewing, 2014). Researchers have identified several common distinguishing features, including growth patterns, social and aesthetic attributes, decentralization, accessibility, density characteristics, fragmentation, loss of open space, and dynamic processes (Ewing, 1997; Song and Zenou, 2006; Torrens, 2008; Hamidi and Ewing, 2014). Burchell et al. (1998) categorized sprawl into two primary forms: low-density residential scattered development and non-residential scattered commercial and industrial development, highlighting ten specific features that characterize urban sprawl. Conversely, Franz et al. (2006) argue that some features used to define urban sprawl are ambiguous, as they simultaneously reflect both the causes and consequences of sprawl, similar to its characteristics. This is supported by Glaster et al. (2001), who assert that much of the confusion surrounding the characterization of urban sprawl stems from the conflation of ideology, experience, and effects. The various characterizations of urban sprawl in the literature encompass growth, social characteristics, aesthetic preferences, decentralization, accessibility, density, open space, dynamics, and dispersion.

Urban sprawl is attributed to a multitude of causes (Frank et al., 2000). Numerous scholars have examined the factors contributing to urban sprawl, asserting that it cannot be attributed to a singular cause due to the complex and interrelated nature of these factors (Frank et al., 2000; Siedentop, 2005; Frenz et al., 2006; Song and Zenou, 2006; Frenkel and Ashenazi, 2008; Downs, 1999; Besussi et al., 2010). Besussi et al. (2010) note that the causes of urban sprawl are predominantly linked to rapid urbanization and urban agglomeration, resulting in a multifaceted process that leads to inefficient resource utilization in the fringe areas of cities. Frank et al. (2000) identified several factors that promote urban sprawl, including rent gradients, demographic shifts, increasing affluence, land assembly economics, transportation costs, mortgage interest deductions, and land use regulations. Siedentop (2005) delineated two competing causal frameworks for urban sprawl: the first is driven by the demand for urban land, while the second is influenced by specific regulatory frameworks that dictate land ownership, utilization, and distribution in peri-urban regions. Moreover, urban planning itself has been identified as a contributing factor to urban sprawl (Franz et al., 2006).

A multitude of methodologies have been proposed in measurement of urban sprawl (Ewing et al., 1997; 2002; Franz et al., 2006; Torrens, 2008; Terzi and Kaya, 2011). The Smart Growth Movement (SGM) pioneered one of the earliest approaches, which involved visual representations of urban sprawl from a planning perspective, along with the development of various analytical factors to assess and measure the proliferation of sprawl (The Sierra Club, 1998; Ewing et al., 2002). Subsequently, various scholars have devised distinct techniques, categorizing their methodologies. Notable categories for measuring urban sprawl include: (1) density-related measurement techniques, which estimate the population residing in metropolitan areas and

the fluctuations in the percentage of the metropolitan population within urban locales (The Sierra Club, 1998); (2) income-based techniques, which investigate the costs and benefits associated with urban sprawl, such as improved housing affordability and increased equity in housing opportunities across racial demographics (Burchell et al., 1998; 2000; Downs, 1999); (3) methods that assess the degree of employment decentralization (Knap et al., 2005); and (4) comparative analyses of sprawl incidents relative to the age of metropolitan areas and the extent of political fragmentation within those areas. The emergence of remote sensing data and the integration of Geographic Information Systems (GIS) into urban sprawl research have mitigated some of the challenges faced by earlier researchers (Sudhira et al., 2003; 2004; Hamidi and Ewing, 2014). The use of remote sensing and GIS provides an alternative framework for mapping, measuring, and monitoring urban sprawl (Weng, 2010; Basawaraja et al., 2011; Kumar and Tripathi, 2014).

As has been established in literature, urban growth and encroachment are inevitable outcomes of urbanization. The challenge lies not in preventing them, but in managing these changes sustainably and innovatively (Sharma, et al. (2024). This requires identifying, monitoring, and mapping the patterns and directions of sprawl and land use changes, an area that demands further research. The impacts of urban sprawl are complex and multifaceted, affecting various disciplines that engage with the concept (Wassmer, 2005). The impact of urban sprawl can include economic efficiency (Downs, 1999; Ewing et al., 1997), rising cost of infrastructure (Gordon and Richardson, 1997; Ewing et al., 2002; Galster, 2001), and loss of ecologically sensitive lands (Kahn, 2000; Johnson, 2001). The distinctions between the elements of urban sprawl become more pronounced when differentiating its impacts from its consequences. This indicates that the impacts and consequences of urban sprawl are interconnected and are often used interchangeably in various studies (Wassmer, 2005; Frenz et al., 2006; Bhatta, 2009). Broadly, the consequences of urban sprawl can be categorized according to their costs, effects on infrastructure, and environmental implications (Downs, 1999; Frank et al., 2000; Johnson, 2001).

The consequences of urban sprawl are linked to a variety of economic, social, and environmental challenges. Although urban sprawl can produce both positive and negative outcomes, the often uncontrolled or uncoordinated nature of this growth typically leads to negative effects that outweigh the benefits (Bhatta, 2010). These consequences encompass increased costs for infrastructure and public services, inefficiencies in energy supply, widening wealth disparities, detrimental impacts on wildlife and ecosystems, loss of agricultural land, and burdens on rural economic activities and land use. In response to the growing concerns about urban sprawl, countries around the world have implemented various policy instruments aimed at managing urban growth and curtailing the spread of sprawling environments (Bengston and Young, 2006). The effectiveness of these policies is frequently scrutinized in the literature. Johnson (2001) and Bengston and Young (2006) identified key land use strategies and policies adopted in numerous cities across the United States, Europe, and Asia. These strategies, collectively referred to as urban containment policies, include green belts, urban growth boundaries, and urban service boundaries.

Urban sprawl poses a significant spatial challenge for numerous cities worldwide (Almeida, 2005; Oueslati et al., 2015). This phenomenon has been frequently documented in cities such as Washington-Baltimore, Virginia, New York, and New Jersey in the United States. Masek et al. (2000) observed a development pattern in Northern Virginia characterized by a strip configuration along highways, leading to a dispersed urban layout. In New York and New Jersey, a substantial expansion of land area has occurred despite a decline in population growth. Gillham (2002) emphasized the development pattern in the metropolitan regions of Los Angeles, which lacks a singular dominant city centre. Thomas (2002) reported on the unprecedented rate of conversion of green open spaces in Michigan, where potentially contaminated land is being redeveloped near large metropolitan areas. These urban growth patterns highlight the prevalence of urban sprawl in the United States. The layout of the road network has significantly influenced development patterns, connecting various land uses to a secondary network of arterial roadways lined with commercial establishments. Consequently, this has led to the creation of intricate neighbourhoods and roadways that resemble a web, linking individual residences in the urban periphery and extending beyond the visible horizon (Gillham, 2002). Europe is characterized by some of the highest urban agglomeration densities in the world, with over 75% of its population living in urban areas. According to Oueslati et al. (2015), the expansion of urban areas in Europe is occurring at a significantly faster rate than the growth of their populations. For instance, a program aimed at reducing spatial densities was initiated in the early 1970s, primarily targeting medium-sized cities across Europe. However, subsequent studies have shown that there has been no noticeable decrease in spatial agglomerations within Europe, as the demand for land in urban areas, suburbs, and peripheries continues to rise (European Environment Agency, 2006).

An empirical investigation conducted by Queslati et al. (2015) examined the dynamics of urban sprawl across 282 European cities during the years 1990, 2000, and 2006. The researchers employed two indices of urban sprawl to evaluate changes in artificial land area and the degree of fragmentation within each city. The initial findings revealed significant variations in the prevalence of urban sprawl throughout Europe. The report on the state of European cities highlighted that the evolving economic and social contexts associated with

urban transitions have profoundly impacted urban development. Notably, a substantial number of residents have recently migrated from urban centres to suburban areas, where land and housing are more affordable, and thereby exacerbating urban sprawl.

The phenomenon of urban sprawl has prompted extensive research, discussions, and policy initiatives in developing countries (see Sudhira et al., 2003; 2004; Oladele and Oladimeji, 2011; Aguda and Adegboyega, 2013; Xu et al., 2013; Laraba and Shola, 2013). Latin America is recognized as one of the most urbanized regions in the world, with approximately 84% of its population living in urban areas, which leads to complex urban dynamics (Torres, 2011). Many peri-urban areas surrounding medium and large cities in Latin America are experiencing three primary forms of growth: rapid expansion, informal housing, and the concentration of impoverished families. The factors contributing to the prevalence of irregular settlement patterns in Latin America include national population growth, rural-to-urban migration, economic development, property rights, land tenure legislation, and fluctuations in land market prices (Torres, 2011). Cities experiencing such rapid growth include Santiago in Chile, Cancun in Mexico, Camisea in Peru, La Paz in Bolivia, and Macaé in the state of Mato Grosso, Brazil.

In Asia, urban sprawl has intensified over recent decades, leading to dispersed development and sprawling growth patterns (Xu et al., 2013). The primary drivers of changes in land use patterns are the rates of urbanization and population growth (Sudhira et al., 2003; 2004). Urban sprawl is particularly evident in radial patterns around city centers and linear patterns along major highways. Numerous studies conducted in cities such as Udaipur, Mangalore, Bangalore, Raichur, Delhi, Mumbai, Tokyo, Kolkata, and Karachi support this observation, highlighting the excessive consumption of land (Feng, 2009). The pattern of urban growth in China has been linked to the reforms implemented in the 1980s, which resulted in inadequate regulation of development and uncoordinated construction activities in peri-urban areas (Feng, 2009; Feng and Li, 2012; Xu et al., 2013). In Africa, several studies, including those by Okewole (2002), Olujimi (2009), Sebege and Gwebu (2013), and Cobbinar and Amoako (2014), have examined the dynamics of urban sprawl. Olurin (2003) noted that the effects of population dynamics in African cities have led to significant hardships that are often difficult to articulate, as many major cities on the continent struggle with the challenges of rapidly deteriorating physical and living environments. Poor urban planning has been identified as a critical factor undermining both sustainable development and the creation of healthy living conditions in Africa (UN-Habitat, 2010). In Northern Africa, urban growth is characterized by the overcrowding of low-income neighbourhoods in cities such as Cairo, Tripoli, Rabat, and Tunis. In West Africa, urban sprawl is prevalent in major cities and medium-sized towns, including Lagos, Kumasi, Karu, Ibadan, Oshogbo, and Lomé, among others. East Africa remains the least urbanized sub region; however, cities like Nairobi and Dar es Salaam have experienced significant annual growth, indicative of spatial expansion and a high rate of urban sprawl.

Central Africa is witnessing a rapid increase in urban populations, leading to the expansion of cities into peri-urban areas across the region (UN-Habitat, 2011). The drive for affordable housing and land values has drawn many individuals to satellite cities, as well as suburban neighbourhoods across Africa. According to UN-Habitat (2011), several factors beyond residents' preferences for suburban lifestyles have contributed to the spatial expansion of cities in Africa. These factors include ineffective land regulation systems, weak planning controls, and inadequate management of peri-urban areas, land speculation, improvements in commuting infrastructure and services, and increased population mobility. The sprawling characteristics of numerous cities and towns in Nigeria have garnered attention from various scholars (Okewole, 2002; Olujimi, 2009; Alabi, 2009; Aguda and Adegboyega, 2013). These studies largely attribute the unregulated and chaotic urban expansion observed in many Nigerian cities and medium-sized towns to the rapid pace of urbanization. Research focusing on cities such as Lagos, Ibadan, Oshogbo, Akure, Ilorin, Ogbomoshos, Enugu, Kano, Kaduna, Abuja, and Lokoja has highlighted these trends. The urbanization process in Nigeria has been primarily driven by socio-political changes, economic advancements, and demographic transformations, which have collectively contributed to urban sprawl. The growth of peri-urban areas is primarily driven by the increasing population in cities, which has intensified pressure on surrounding peri-urban regions. Olujimi (2009) indicated that economic factors and innovations in housing development significantly impact the construction of self-owned homes and commercial shops in suburban areas. Furthermore, land developed without proper layout plans or building approvals, leading to disorganized suburban growth that can eventually evolve into slum areas.

Material and Method

Minna (see Figure 6) is the capital of Niger State, one of Nigeria's 36 states, located in West Africa. Situated about 150 km northwest of Abuja, it spans the Chanchaga and Bosso local government areas and covers approximately 6,789 square kilometers, with a population density of 34.48 persons per square kilometer (NISEPA, 2020). Its population grew from 345,000 in 2016 to 439,612 by 2019. The city has 26 administrative wards, up from six in 1957, comprising both core and peri-urban areas. Rapid urban growth has outpaced the provisions of the 1979 Master Plan, resulting in unplanned expansion. Minna's historical growth was shaped

by key infrastructural developments. The arrival of the railway in 1905 connected the city to major trade routes in Northern Nigeria and established it as a key collection point for agricultural produce. The transfer of colonial officials from Bida in 1924 elevated its status to Regional Administrative Headquarters (Morenikeji et al., 2015). The construction of the Zungeru–Paiko road in 1928 further supported urban expansion. Pre-independence infrastructure, including the Bosso Dam (1949) and electricity supply (1956), attracted more settlers and spurred population growth. Following Nigeria's independence in 1960 and Minna's designation as the capital of Niger State in 1976, the city gained political and economic significance, accelerating its spatial and social development.

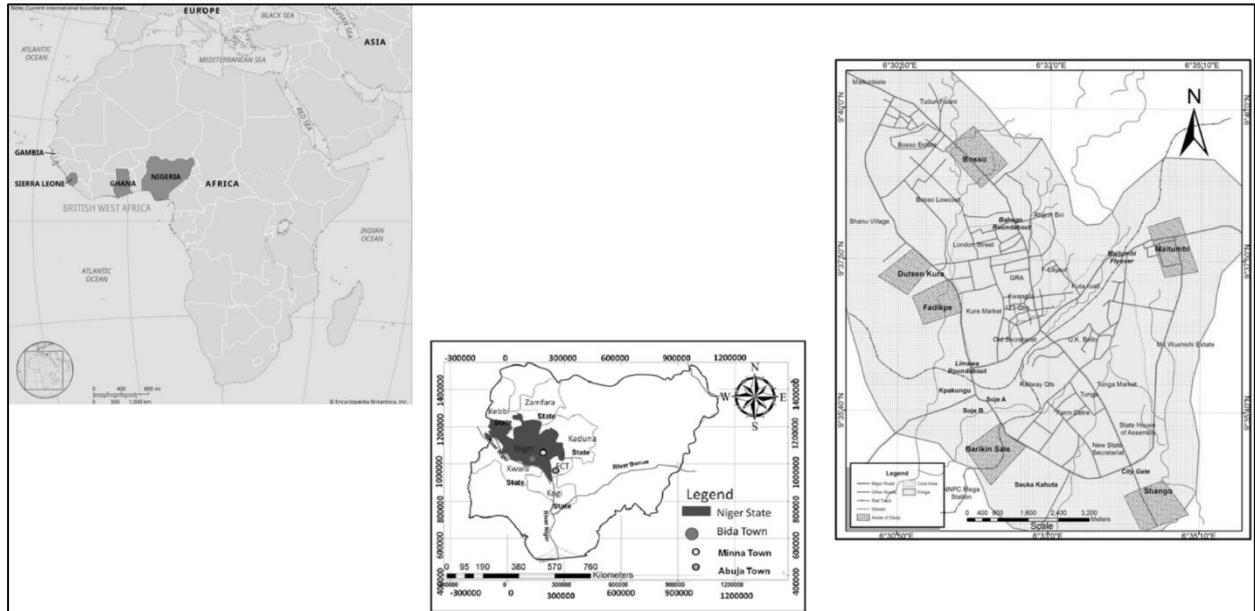


Figure 5: Minna in the Context of Africa, Nigeria and Niger State

Source: Adapted and modified from Chado, Johar and Muhammad (2016), Abdullahi and Olatunde (2017).

The data acquisition phase involved collecting a comprehensive set of satellite images covering the period from 1972 to 2015 to enable a long-term analysis of land use changes. Alongside these images, topographic maps and administrative boundary data were obtained to provide geographic context and ensure accurate spatial referencing. To enrich the analysis and better understand the factors influencing land use change, additional ancillary data such as road networks, land use records, and infrastructure development plans were also gathered. These datasets collectively supported a multidimensional understanding of urban growth and landscape transformation over time.

During the image pre-processing stage, the raw satellite images were standardized through a series of steps including image compositing, which merges multiple images to create a seamless representation, and boundary clipping, which confines the data to the specific study area to eliminate irrelevant regions. The processed images were then subjected to a supervised classification technique to identify and categorize land cover types. This classification segmented the landscape into three primary categories: built-up areas, vegetation, and water bodies, reflecting the major land use types relevant to urban expansion analysis. To assess the reliability and accuracy of this classification, an accuracy assessment was conducted. Following the methodology of Roissiter (2004) and Ajiboye et al. (2022), the classified images were rigorously compared with ground verification data. For this purpose, 150 reference points, carefully selected across various land use types, were identified using Google Earth Pro 2021 to serve as validation benchmarks. The resulting accuracy evaluation employed a confusion matrix approach, which yielded classification accuracy rates of ranging from 87% to 89.5%. This range reflects a consistently high level of precision in the land use classification throughout the study period.

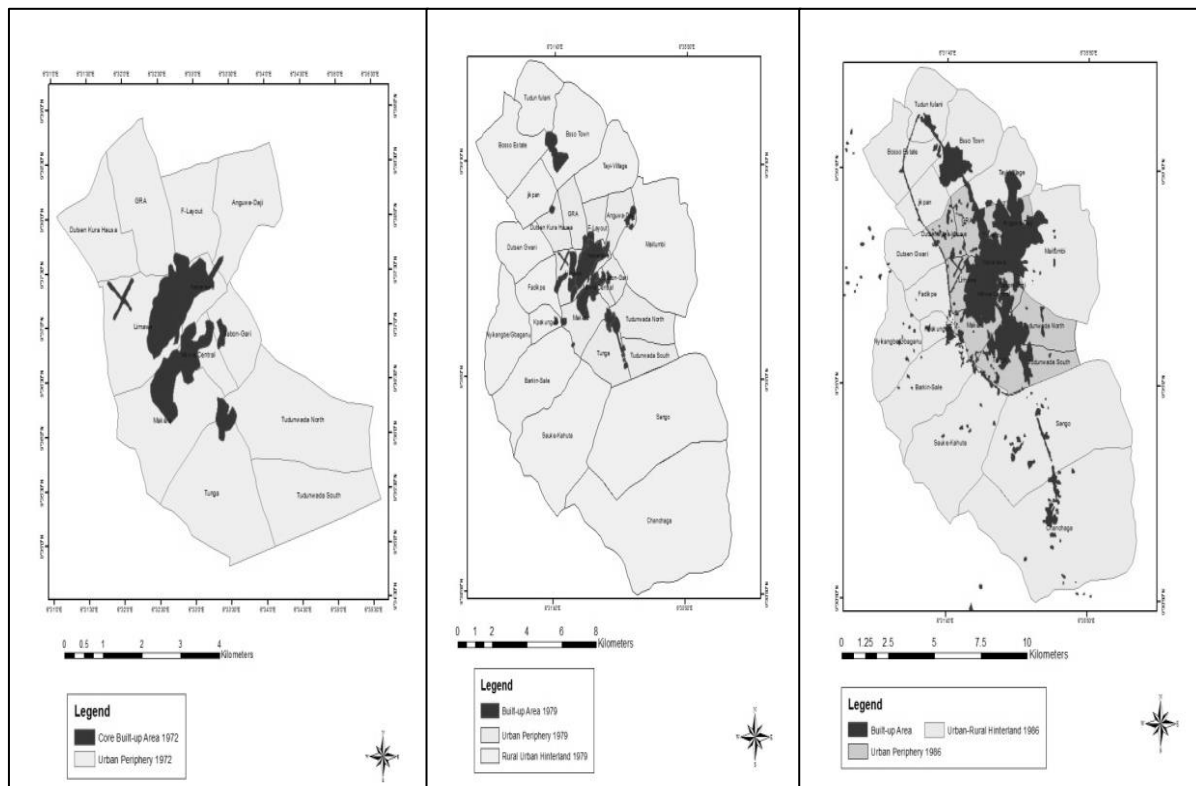
Subsequently, change detection analysis was performed through post-classification comparison, which involved comparing classified images from different years to identify and quantify changes in land cover over time. This step produced change maps that visually illustrated the spatial and temporal patterns of built-up area expansion throughout the study period. The analysis also enabled the identification of predominant directions in which urban areas expanded, offering insights into the nature of urban growth. To further understand these patterns, spatial pattern analysis was conducted by overlaying urban sprawl layers from multiple years. This comparative layering technique allowed for a detailed examination of how urban growth evolved spatially, revealing trends, hotspots, and the overall dynamics of land use transformation. Together,

these methods provided a robust and comprehensive framework for understanding the processes and implications of urban development within the study area.

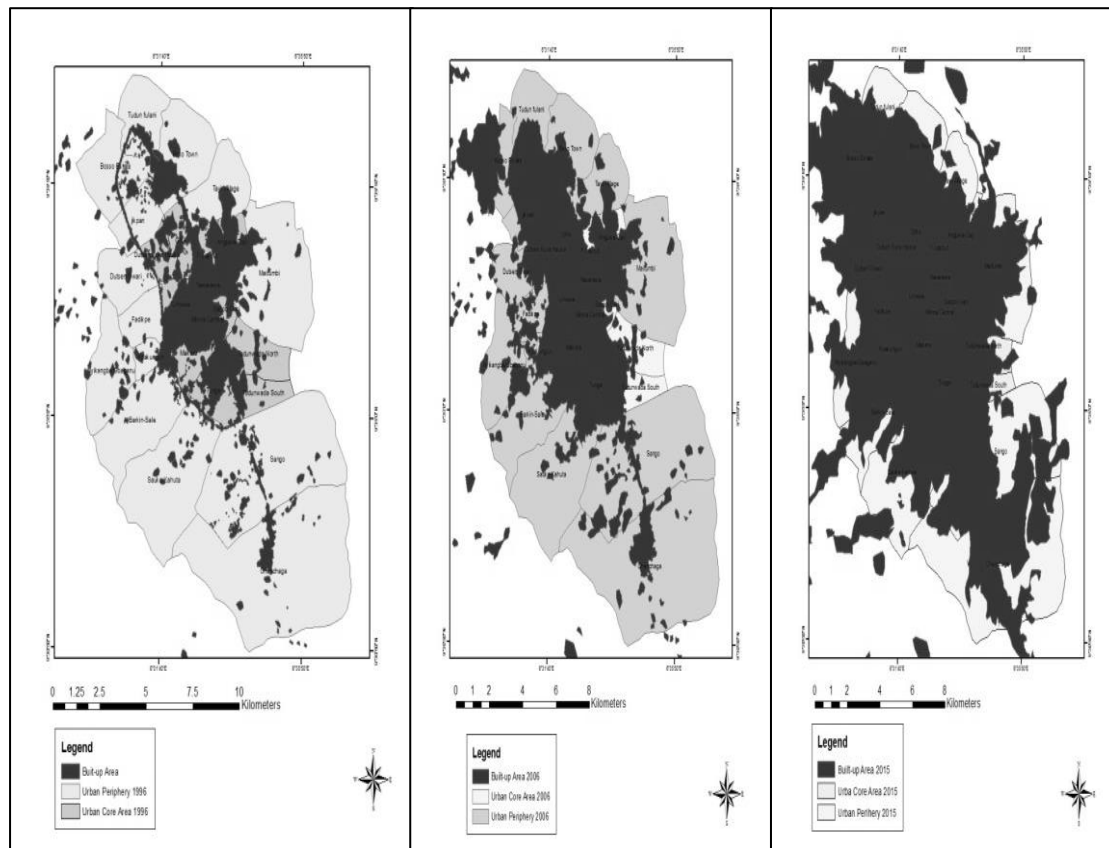
Urban Sprawl in Minna, Nigeria (1972-2015)

Idowu et al. (2020) documented the gradual expansion of urban sprawl in Minna from 1972 to 2015 (Figures 6, 7, 8 and 9). In 1972, Minna was primarily centred on the railway station, with the built-up area limited to the densely populated settlement near the station. The surrounding residential neighbourhoods included Limawa, Makera, Nasarawa, Tudunwada, and Old GRA. The identified peri-urban areas were Limawa, Makera, Angwa-Daji, Dutsen-Kura Hausa, New GRA, Tunga, F-Layout, and the airport road (Figure 5). Figure 6 illustrates four key settlements within Minna's peri-urban area in 1979: Bosso to the north, Tudunwada to the south, Maitumbi to the east, and Kpakungun to the west. These neighbourhoods served as anchors for the further expansion of Minna's peri-urban area, which was significantly influenced by Minna's designation as the administrative capital of Niger State in 1976, resulting in rapid growth.

Figure 6 illustrates Minna's development in 1986. Between 1979 and 1986, satellite settlements situated farther from the core area began to expand toward it, benefiting from newly constructed roads that linked the core area to affordable housing estates. The placement and distribution of government projects in Minna during this period were vital to its development. The growth of Minna's peri-urban area continued, albeit at a slower pace (see Figure 6). Between 1986 and 1996, a trend of dispersed development emerged outside the core area, characterized by a linear strip pattern along major highways and access roads. Neighbourhoods such as Tudunwada, Tunga, F-Layout, and GRA expanded toward the core, while areas like Bosso Town, Tayi Village, Kpakungun, and Chanchaga developed in various directions. Figure 7 illustrates the sprawl development of Minna in 2006. At that time, Minna appeared as a spatially clustered city, with significant integration between the peri-urban and core areas. The neighbourhoods affected included Tudun-Fulani, Bosso Town, Tayi Village, Kpakungun, Dutsen Kura-Gwari, Jikpan, and Bosso Estate. By 2015, the peri-urban area of Minna had undergone significant growth (Figure 7), prompting Orintunsin (2014) to characterize it as a highly cosmopolitan community. This expansion of Minna's peri-urban neighbourhoods diverged from the typical growth patterns observed in northern Nigerian cities, with access to land for various uses identified as a crucial factor in this development.



Figures 6. Land Use and Urban Growth in Minna (1972, 1979, and 1986).



Figures 7. Land Use and Urban Growth in Minna (1996, 2006, and 2015)

The map overlay illustrating the spatial development of Minna (Figure 8) reveals a striking and progressive pattern of urban expansion over several decades. In 1972, the town's developed area had already experienced a notable increase, reportedly expanding to thirty-two times its original size. By 1979, this growth had slowed but remained significant, with the urban footprint reaching thirteen times its previous extent. A more moderate pace of expansion was recorded in 1986 and 1996, with each period showing a threefold increase. By 2006, the town's developed area had doubled yet again. These figures underscore not only a rapid and sustained pace of urbanization but also changing phases of development, likely influenced by socio-economic factors, migration, and policy shifts. The continued expansion reflects a combination of population growth, infrastructural investment, changing land use needs, and increasing demand for residential, institutional, and commercial spaces. The spatial overlay provides a visual narrative of this transformation, showing how once outlying areas have been absorbed into the city's fabric and how Minna has evolved from a compact settlement into a sprawling urban center.

Figure 9 further highlights the directional trend of this urban expansion, revealing that Minna has been growing predominantly towards the west. This westward expansion is not random but strongly influenced by the strategic siting of key institutional and infrastructural assets in that direction. Most notably, the location of the permanent site of the Federal University of Technology, Minna, and the headquarters of the National Examinations Council (NECO) in the western part of the city has acted as a magnet for residential development, commercial activity, and service provision. These institutions have created employment opportunities, increased human traffic, and spurred demand for land and infrastructure in their vicinity. The westward movement is further enabled by the construction of a major western bypass, a critical piece of infrastructure intended to enhance vehicular circulation and regional access. This bypass incorporates two major flyovers, strategically built over the railway lines and the River Suka, both of which previously served as physical barriers to movement and development. By linking the western neighborhoods to the Minna-Bida road, this corridor has not only facilitated expansion but has also helped integrate emerging urban areas into the city's broader transport and economic network. As a result, Minna's growth has become increasingly structured and directional, shaped by both planned interventions and organic responses to institutional presence and infrastructural availability.

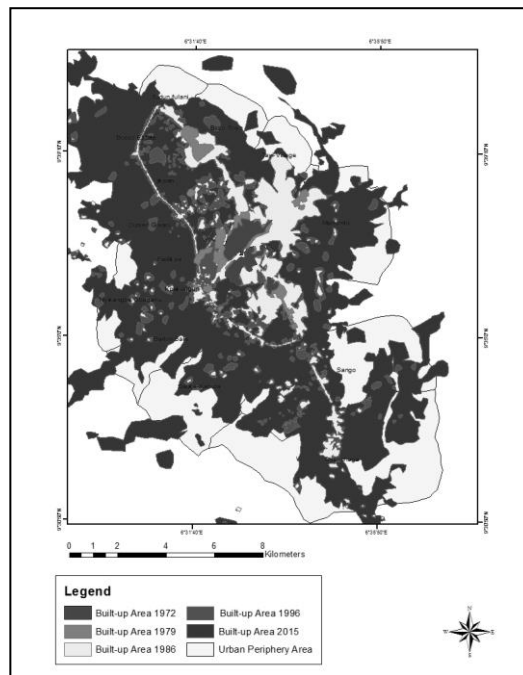


Figure 8: Changes in the Built-up Area of Minna 1972 – 2015.

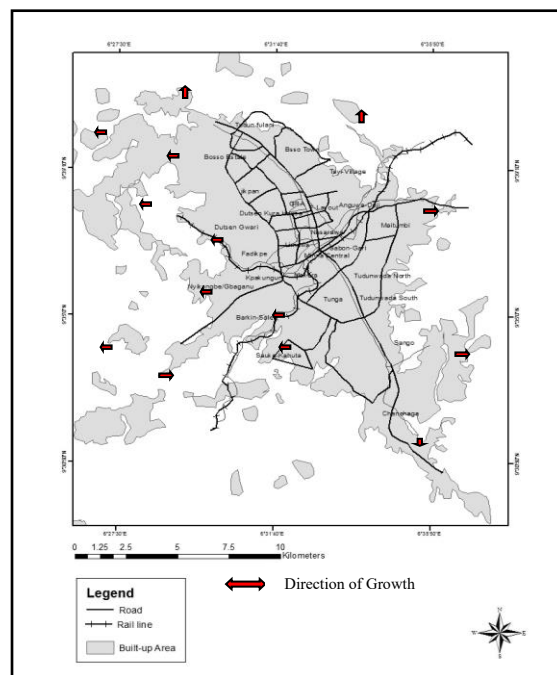


Figure 9. The Direction of Peri-urban Growth in Minna.

Conclusion and Recommendations

This article examined the concept of urban sprawl, emphasizing the debates surrounding its definition and manifestations in both scholarly literature and real-world contexts. The discussion highlights that while the term "urban sprawl" is widely used in planning discourse, there remains no universally accepted definition. Instead, it is often characterized by a range of ambiguous features that reflect both the causes and consequences of unplanned urban expansion. The article also explored the relevance of classical descriptive and revised descriptive theories in interpreting the spatial formation and dynamics of urban sprawl, offering insight into how various urban forms emerge and evolve over time under different socio-economic and political conditions. In the context of Nigeria, and particularly in Minna, urban sprawl is predominantly linked to weak regulatory frameworks and the absence of coordinated planning, leading to unregulated and

disorganized development patterns. The growth of peri-urban areas in Minna reflects a reactive rather than proactive planning approach, where economic forces, population pressure, and informal land transactions shape urban expansion with little oversight. To address these challenges, it is essential that the planning and development of urban areas and their fringes are not left to chance or dictated solely by market dynamics. Instead, deliberate and strategic urban management policies should be implemented to guide orderly growth and prevent the negative consequences of sprawl, such as congestion, environmental degradation, and inefficient infrastructure delivery. A sustainable planning approach is especially crucial for managing the expansion of peri-urban neighborhoods, ensuring they are integrated into the urban system with adequate services and infrastructure. Furthermore, formalizing customary land titles and streamlining land registration processes in Minna should be prioritized, as this would enhance land tenure security, encourage planned development, and reduce land-related conflicts. Such efforts will contribute to a more equitable and sustainable urban future for Minna and similar cities across Nigeria.

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Conflict of Interests

The authors declare no conflict of interest.

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