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Assessing the Sustainability of Urban Growth: A Study on Abuja City, Nigeria

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Abstract **- Recent urbanization in Africa has been uneven and diversified, characterized by rapid urban expansion, informal settlements, limited access to basic resources, and environmental challenges. Cities in Nigeria have witnessed significant urban expansion. Abuja, a rapidly growing metropolitan city, is exposed to long-term sustainability risks, including waste management problems, environmental degradation, and others. This paper aims to examine the urban structure of Abuja city and explore people's perceptions of basic living facilities in the city, such as access to safe water, reasonable public transport, affordable housing, lower food prices, and others. A mixed-method research approach has been employed in this study. The reason for adopting a mixed-method approach is that quantitative analysis provides insights into Abuja's land-use growth rate, built-up land per capita, population growth rate, and people's access to public places. This information helps to identify key city characteristics and to select themes and organize questions for narrative interviews, which aim to better understand people's perceptions of Abuja's sustainability in terms of accessibility to open public spaces, access to safe water, affordable public transportation costs and housing rent, and a sustainable environment. Although Abuja has a high allocation of public open space, financial vulnerability is a major factor that discourages people from frequently visiting these spaces. Moreover, land-use growth in Abuja exceeds pollution control capacity, resulting in unsustainable urban sprawl and increasing strain on resources. Due to inadequate planning and infrastructure implementation, the city lacks the capacity to provide basic necessities to its residents, such as safe water, a sustainable environment, affordable housing, and reasonable public transportation fares.**
Keywords: **Urban Sustainability, Urban Growth, Abuja City, People Perception, Urban Sprawl**

I. INTRODUCTION

Around the globe, different regions are expected to experience population growth at different levels. Population growth in sub-Saharan Africa is projected to increase by 99%, while Europe and North America are expected to undergo an increase of around 2% (Gerten *et al.,* 2019). Having said that, countries such as the Democratic Republic of the Congo, India, Nigeria, Pakistan, Ethiopia, the United Republic of Tanzania, Egypt, and the United States of America are expected to account for over half of the estimated global population increase (Gerten *et al.,* 2019). Projections by the United Nations stipulate that by 2050, approximately two-thirds of the global population will live in cities, with the African continent set to experience the highest rate of urban expansion (Ritchie & Roser, 2018; UNDESA, 2011).

Rapid urbanization has led to deteriorating conditions due to inadequate social services and infrastructure to support expansion (Wajim, 2021). Land-use change has emerged as a major global trend observed worldwide (Gerten *et al.,* 2019). In the future, sustainable development will largely focus on urbanization and adaptation to its associated challenges (Tuhkanen *et al.*, 2022). Spatial planning and urban governance need to consider shifts in urban structure and land-use trends, a critical issue that has been extensively discussed in the planning literature (Alberti, 1996; Kasanko *et al.,* 2006).

Additionally, urban form-such as compact cities and polycentric development (Parr, 2004)-as well as the layout of land uses and activities, including functional mix and high density (Grant, 2002; Jabareen, 2006), are among the spatial approaches that have been developed and implemented in cities (Cortinovis *et al*., 2019). Significant evidence supports the idea of the "urban advantage," which encourages people to migrate to urban areas, as residing in cities enhances opportunities and access to basic public services (Gerten *et al.*, 2019).

Applications in urban land-use monitoring have made it increasingly challenging to define functional urban regions in order to report on land-use policies and objectives (Gerten *et al*., 2019). Demand-driven components such as housing preferences or land market trends should not be the sole drivers of urban expansion (Gerten *et al*., 2019). To avoid unsustainable land development, planning regimes should prioritize design strategies that prevent the establishment of unsustainable urban sprawl (Soule, 2006). Such approaches involve evidence-based policy measures to enhance urban density in areas with accessible public transportation and high-quality services, as well as increasing connectivity between urban cores and subcentres (Gerten *et al*., 2019).

Mapping population density in urban areas and understanding spatial distribution are crucial for informing planners and decision-makers (Guastella *et al*., 2019). The repercussions of urban sprawl are often associated with low-density urban areas, where high public transportation costs lead to increased private automobile use and longer travel

times (Guastella *et al.,* 2019). Additionally, low density results in longer average trips, while spatial discontinuity reduces transit frequency; together, these factors contribute to air pollution and high levels of noise pollution (Guastella *et al*., 2019). Moreover, low-density areas tend to have greater land use per capita, resulting in limited land availability for ecological services and disruption of green spaces, thereby reducing ecosystem capacity (Guastella *et al*., 2019).

Furthermore, Duranton (2015) and van Vliet (2019) state that recent urbanization in Africa has been uneven and diversified, characterized by rapid urban expansion, informal settlements, limited access to essential resources, and environmental crises. Environmental concerns have also intensified due to urbanization and the unsustainable exploitation of natural resources (Odhengo *et al.,* 2024).

II. OBJECTIVE OF THE STUDY

According to Wong *et al*. (2021), Nigerian cities have experienced a significant annual increase in urbanization of about 5%–10%. By 2030, Nigeria's urban population is estimated to reach 60% of the total population (UN-Habitat, 2020). Abuja is centrally located and easily accessible from all regions of Nigeria; from a national perspective, it lies within the Middle Belt region (Majebi *et al.,* 2023). Abuja has experienced substantial urban development in recent decades, with its population rising to nearly 1.5 million (S. I., Adejinmi *et al.,* 2024). The Abuja metropolitan region is still in its early phase compared to developed destinations (Majebi *et al.,* 2023).

In 1979, International Planning Associates (IPA) reinforced Abuja's first comprehensive plan, which included green areas to support the city's population (Obafemi & Olukoya, 2018). However, despite land-use policies such as the 1978 Land Use Act, the 1992 Urban Development Policy, the 1992 Urban and Regional Planning Act, and the 2002 Housing and Urban Development policy (Oloyede Al & Akinbode, 2010; Olajuyigbe & Rotawa, 2011), the decline of green spaces has continued (Obafemi & Olukoya, 2018). Over 70% of green spaces-both designated and undesignated areas-have disappeared, yet Abuja remains one of the fastest-growing cities (Obafemi & Olukoya, 2018).

Additionally, urbanization increases environmental demands, posing risks to long-term sustainability (Riffat *et al.,* 2016). These risks include pollution, waste management problems, environmental degradation, and related challenges (Pona *et al.,* 2021). Nonetheless, there has been a lack of studies focusing on public perceptions of accessibility to essential amenities among residents of Abuja. Addressing this research gap, the objective of this study is to examine the urban structure of Abuja city and explore people's perceptions of essential infrastructure and services, such as access to safe water, public transportation, affordable housing, reasonable food prices, and others.

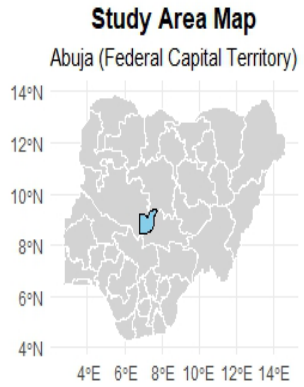

Fig.1 Abuja, Federal Capital Territory in Nigeria

A. Research question

How does rapid urbanization impact the sustainability of Abuja city, and what are public perceptions on the fundamental facilities and services in the city?

III. MATERIALS AND METHODOLOGY

According to Wong *et al.* (2021), Nigerian cities have experienced a significant annual increase in urbanization of about 5%–10%. By 2030, Nigeria's urban population is estimated to reach 60% of the total population (UN-Habitat, 2020). Abuja is centrally located and easily accessible from all regions of Nigeria; from a national perspective, it lies within the Middle Belt region (Majebi *et al.,* 2023). Abuja has experienced substantial urban development in recent decades, with its population rising to nearly 1.5 million (S. *et al.,* 2024). The Abuja metropolitan region is still in its early phase compared to developed destinations (Majebi *et al.,* 2023).

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A. Participant Recruitment

Due to the difficulty of accessing participants living in Abuja city, as I am currently residing in Bangladesh, I reached out to a few former colleagues in Nigeria whom I met during my master's studies. Through them, I obtained contact details of their friends living in Abuja. After receiving these contacts, I approached them and explained the purpose of this research. This was followed by conversations in which the research objectives and the reasons for conducting the study were discussed. After these discussions, three individuals living in Abuja agreed to participate in the study.

B. Interview Process

The narrative interview approach was adopted in this study and was conducted virtually, as it was not viable for me to visit Abuja to carry out in-person interviews due to financial and other practical constraints. Online interviews were selected as an alternative method of data collection because of changing patterns of human interaction, particularly when in-person interviews are not feasible (Khalil & Cowie, 2020). The online interviews provided flexibility in scheduling, as the study participants and I were living on two different continents and in different time zones. To conduct the virtual interviews, a video-conferencing platform was used, taking into account the convenience of the participants. The recorded narrative interviews were later transcribed for data analysis.

C. Ethical Consideration

Conducting qualitative research requires careful ethical considerations. The three participants in this study gave their verbal consent to have the interviews recorded, as transcription of the interviews was required for data analysis. It was clearly stated that the data gathered from the respondents would be used solely for the purposes of this research. The respondents were also informed that the findings would be published in a journal and that their identities would remain undisclosed. Furthermore, to ensure anonymity, any identifying details-such as participants' real names or other personally identifiable information-have not been used in this paper.

IV. RESULTS AND DISCUSSION

A. Accessibility of Urban Population to Open Public Spaces

In Abuja city, the moderate share of built-up area allocated to public open space is 16.4%, while the national average is 12%, which is nearly 4% lower than Abuja's open space allocation. This indicates that, in terms of land development, Abuja has a larger proportion of built-up area devoted to public open space than the national average. However, despite the high allocation of designated open space in Abuja, only 3.9% of the population has access to public open spaces, compared to the national average of 7.7%.

"When the cost of transportation is very high, it does not make sense to visit open public spaces frequently. It is better to reserve money for public holidays like Christmas and so on. The public transport system here is very expensive; cabs and buses do not go everywhere. So, if you are going to a recreational center or an open green space, you have to take multiple modes of transport from home, such as motorbikes, and if you have family members, that also becomes costly. If I want to go to a public open space that is far from my home, I have to spend around 6,000 Nigerian Naira on transport just to get there; it is very expensive." - *Maine* (pseudonym)

As stated by *Mike* (pseudonym): "Public parks do not have sufficient toilets that people can use, and they do not have many facilities to enjoy, apart from sitting out. There is also a lack of entertainment."

Despite having a high allocation of open space compared to other cities, population access to public open spaces in Abuja remains low, and financial constraints are a major factor that discourage people from visiting these spaces frequently. Additionally, another factor contributing to low population access to public open spaces, as indicated by a resident, is the lack of facilities available for enjoyment in Abuja's public open spaces.

B. Built-Up Area of Abuja City

In Abuja city, during the period from 2000 to 2010, there was substantial growth in per capita land consumption (+47.1%), which reveals rapid urban expansion. Whereas from 2010 to 2020, Abuja experienced slower but steady growth (+16.2%), with a decrease in per capita expansion compared to the previous decade.

When comparing Abuja with other cities in Nigeria over the last two decades, Abuja's built-up area per capita has grown at a more significant rate than the average of other cities. This demonstrates that Abuja has undergone more substantial urban development and expansion than other cities.

According to Colsaet *et al.* (2018) and Gao and O'Neill (2021), a country's urbanized land area is typically determined in relation to its population, which uses land for residential, commercial, and other activities. Therefore, the expansion of built-up land should not exceed population growth in order to prevent land competition (Melchiorri *et al.,* 2019).

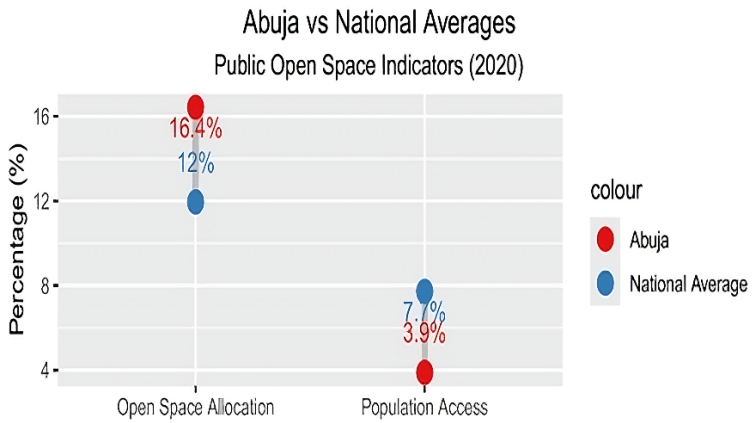

Fig.2 Public Open Space Indicators
(Note: Data analysis and visualization conducted by the author. Dataset Source: Humanitarian Data Exchange, United Nations OCHA, 2024)

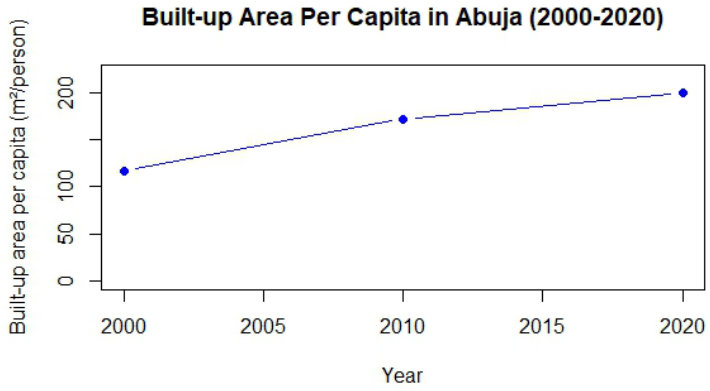

Fig.3 Built-Up Per Capita in Abuja (2000-2020)

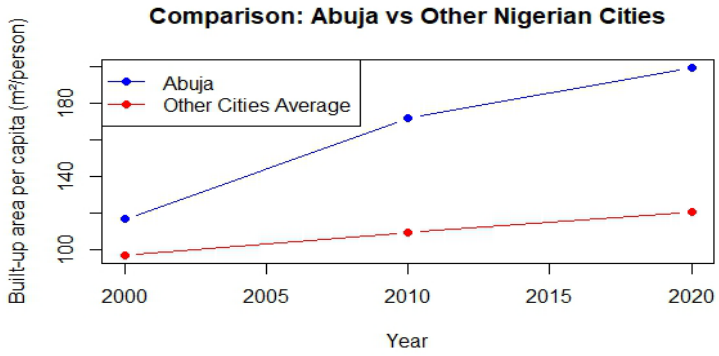

Fig.4 Comparison of Built-Up Per Capita (2000-2020) of Abuja City and Other Cities in Nigeria
(Note: Data analysis and visualization conducted by the author. Data Source: Humanitarian Data Exchange, United Nations OCHA, 2024)

TABLE I DATA OVERVIEW OF BUILD-UP AREA PER CAPITA OF ABUJA CITY

Year	Built Up Area Per Capita (M2 Per Person)	Changes From Previous Period	Cumulative Change
2000	116.91	-	-
2010	171.97	+47.1%	+47.1%
2020	199.81	+16.2%	+70.9%

(Note: Data analysed by the author. Dataset Source: Humanitarian Data Exchange, United Nations OCHA, 2024)

C. Consumption of Land and Population Growth Rate of Abuja City

From 2000 to 2010, Abuja experienced a significant population growth rate of 5.08%. During the period from 2010 to 2020, the population growth rate declined to 3.79%, indicating a decrease compared to the earlier decade. However, despite this decline, Abuja continues to have a high population growth rate.

Between 2000 and 2010, land consumption in Abuja was significantly higher than population expansion, with a land consumption–population growth ratio greater than 1 (>1). Similarly, from 2010 to 2020, the ratio remained greater than 1, although it was lower than in the 2000–2010 period. This suggests that while land consumption has continued to exceed population growth, the degree of surplus declined during 2010–2020. Overall, the increase in land development in Abuja is greater than population growth, as indicated by the ratio remaining above 1.

According to Marquard *et al.* (2020), the UN General Assembly adopted the SDG 11 indicator for land consumption as part of the SDG framework in 2017. This framework provides comparable data on countries' performance in meeting basic human needs, which can be supplemented by national indicators defined by UN member states (Marquard *et al.,* 2020). The objective of SDG 11.3 is to ensure inclusive and sustainable urban planning and management globally by 2030 (United Nations Human Settlements Programme, 2025). Therefore, an indicator value of less than 1 (<1) suggests that growth in built-up area is more moderate than population growth, whereas a value greater than 1 (>1) indicates excessive land consumption that is not aligned with population growth (Marquard *et al.,* 2020).

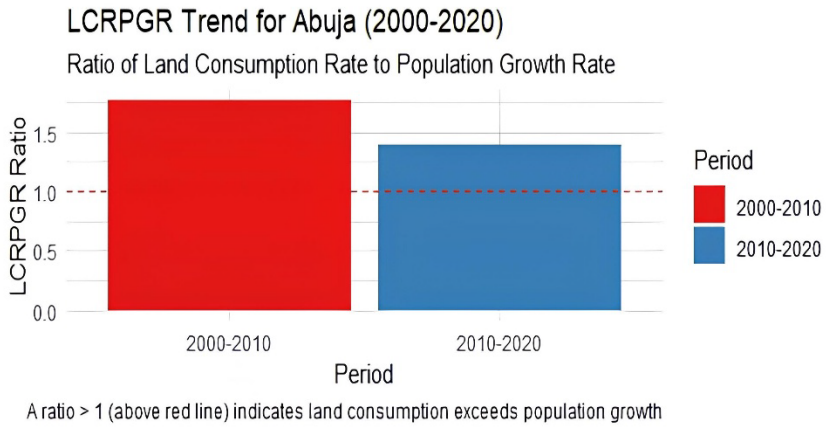

Fig.5 Land Consumption and Population Growth Index of Abuja City

Note: Ratio of land consumption and population growth is >1 which is above red line, showing- consumption of land is faster than population growth. Land consumption to population growth ratio < 1, below the red line demonstrate the growth of population increases rapidly than consumption of land.
(Note: Data analysis and visualization conducted by the author. Data Source: Humanitarian Data Exchange, United Nations OCHA, 2024)

Period (2000-2010): LCR= 8.94%, PGR = 5.08% → (8.94/5.08 =1.76)
Period (2010-2020): LCR= 5.29%, PGR = 3.79% → (5.29/3.79= 1.40)

TABLE II PERCENTAGE OF CONSUMPTION OF LAND AND POPULATION GROWTH IN ABUJA CITY

Land Consumption and Population Growth Rate in Abuja City	Percentages (%)
Land Consumption (2000-2010)	8.94%
Land Consumption (2010-2020)	5.29%
Population Growth (2000-2010)	5.08%
Population Growth (2010-2020)	3.79%

(Note: Data analysis conducted by the author. Dataset Source: Humanitarian Data Exchange, United Nations OCHA, 2024)

Indicator 11.3.1 of the Sustainable Development Goals monitors and measures urbanization by comparing the growth rate of urban land to population growth across different temporal and spatial scales (Nicolau *et al.,* 2018). Assessing the indicator is crucial to understand the land conversion figure concerning to population increase, recognizing previous land utilization pattern, guiding urban expansion planning and resource preservation (Nicolau *et al.,* 2018). Even though the per capita use of land in Abuja city during 2000 to 2020, m2/ per person increased from 116.9 to 199.8 which confirms more land growth. However, the land consumption growth is 8.94% within the period of 2000 to 2010 and between 2010 to 2020 it was 5.29% while the population growth within the period of 2000 to 2010 was 5.08% and between 2010 to 2020 it was 3.79%, that refer to urban sprawl.

Maine (pseudonym) stated: "People are leaving the city because of a lack of access to basic necessities. Regarding the water issue, there is an erratic supply of water by the government. Therefore, most people tend to drill boreholes in their compounds. Those who cannot afford this or who live in apartments without water buy water from vendors. These vendors include water tankers, locally known as *'Mairuwa'*. *'Mairuwa'* is a Hausa word meaning 'water seller.' The Mairuwas buy water from boreholes in 20-litre jerricans and then resell it to residents. The challenges of buying water from Mairuwas include questionable hygiene conditions, unclean jerricans, and price fluctuations. Overall, water scarcity is a result of government neglect. Most government infrastructure has been left to decay without maintenance, and there is no authority to complain to."

Maine (pseudonym) further added: "In Abuja, there is illegal dumping of garbage in unauthorized places and canals, which makes the environment stink, along with dust in the air, especially during the dry season. This has been going on for decades."

Luisa (pseudonym) stated: "Due to economic reasons such as rising house rents, high transportation costs caused by fuel prices, and overpriced food, more people are leaving the city. In Abuja, we have very good housing, but there are no low-cost houses, and the cost of living is higher than in other parts of the country."

Mike (pseudonym) mentioned: "In the area where I live, the government has cut down green spaces, and the areas have been converted into recreational and event spaces. In some places, there is no flat grass."

V. LIMITATIONS AND CONCLUSION

In this study, for the narrative interviews, it was unfeasible to involve a substantial number of participants, which could have given a broader spectrum of people's perceptions on the issues associated with the fundamental facilities and services of living in Abuja city. Besides, conducting in-person interviews could have provided more in-depth information on the challenges people are facing in the city. Despite these limitations, this paper has examined the urban structure of Abuja city and people's perception of the basic facilities and services available to those living in the city. The land utilization is higher than the pollution rise, causing unsustainable urban sprawl and strain on resources, and due to a lack of adequate planning and implementation of infrastructure, the city lacks the ability to provide basic needs to the residents, such as safe water, a sustainable environment, affordable housing and food, reasonable public transportation fares, low-cost fuel, and so on. The land utilization is higher than the pollution rise, causing unsustainable urban sprawl and strain on resources, and due to a lack of adequate planning and implementation of infrastructure, the city lacks the ability to provide basic needs to the residents, such as safe water, a sustainable environment, affordable housing and food, reasonable public transportation fares, low-cost fuel, and so on. Further study could be focused on why the existing housing and urban development policies are not being implemented on the ground level, the basis of these policies, how they are being rolled out, and how people living in the communities could be included in the policymaking process to ensure that the urban planning policies align with people needs in Abuja city.

Declaration of Conflicting Interests

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Use of Artificial Intelligence (AI)-Assisted Technology for Manuscript Preparation

The authors confirm that no AI-assisted technologies were used in the preparation or writing of the manuscript, and no images were altered using AI.

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