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Impact of Urban Sprawl on Green Areas of Calabar Metropolis Nigeria

Emri, Samuel Inaku[1], Edide, James[2], Elogbo, Blessing Agwu[3] and Duke, Joseph Bassey[4]

[1,4]Department of Urban and Regional Planning, Faculty of Environmental Sciences University of Cross River State, Calabar-Nigeria

[2,3]Department of Urban and Regional Planning, Faculty of Environmental Sciences, University of Calabar, Nigeria

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***Corresponding Author:** Emri, Samuel Inaku

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Abstract **Original Research Article**

Urban sprawl is one of the issues plaguing the green areas in Calabar Metropolis. Human population is growing exponentially and this urban growth has led to urbanization and accelerated migration which has resulted in what has been named "urban sprawl", which is the irregular expansion of cities into green areas. The aim of the research is to ascertain the relationship between sprawl and green areas. Data collected revealed that between 2005 and 2024 urbanization increased by 115.2% in 20 years, with many built-up areas growing by as much as 0.39 Hectares per day. While, the green areas (sparse vegetation, thick forest and flooded vegetation) shrinks by 80.33%. The consequence is that the climate is affected in a many ways due to the depletion of the green areas in favour of buildings. To curb/reduce the menace, it is recommended that The Town Planning Department of the Ministry of Lands Calabar has to be proactive through the preparation of structural plans, layout plans ahead of the invasion of the periphery by land speculators. Haphazard/unplanned developments have to be controlled through efficient and regular monitoring of the urban environment. Geospatial techniques should be employed to detect areas that are fast growing and such areas should be planned ahead.

Keywords: Urban Sprawl, Green Areas, Development, Residential, Land Use, Planning, Vegetation, Built-up.

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1.0 INTRODUCTION

Population growth all over the years has consistently put pressure on green areas especially in urban areas with high demand for land. Rapidly increasing population and ever expanding activities (residential, commercial, institutional, industrial developments etc.) have brought about extensive land-use changes throughout the world. In 1960s, the global urban population was about 34 percent of the total, however by 2014, urban population accounted for 54 percent of the total. Indeed, by the year 2050, the proportion living in urban areas is expected to reach 66 percent (UNDESA, 2014).

As at 2024, 56 percent of the world's population about 4.4 billion inhabitants live in cities. This trend is expected to continue, with the urban population more than doubling its current size by 2050, at which point nearly 7 of 10 people will live in cities (World Bank, 2024). Mills, 2003, Zhao, 2011, have it that it was after 1960 that urban sprawl started gaining attention as an issue that need a challenge that needs to be addressed.

According to Karakayaci, and Karakayaci, (2019), the most important capital required to carry out the activities is land, but its way of usage, quality and description differ according to sectors. Land described as farmland in rural areas is referred to as plot in urban areas. These changes in nomenclature resulted from increase in population, advance in technology etc. In between farmland in rural areas and plot in urban areas emerged hinterland. A land with characteristics different from the term farmland and plot, such land was referred to as urban sprawl. In USA, especially towards the end of 1950's urban sprawl resulted in the occupation of forests (Bhatta, 2010). Such areas are in most situation deprived of basic public infrastructure and amenities due to negligence by government/authorities concern as it is experienced currently in the study area. These are the exact situations in Calabar Metropolis, areas such as Esuk Otu, Nneta Village, Akima Nsa, Ikot Eneobong, NEPA quarters, Nasarawa, Ikot Awatim, Enima Omin Ikpai, Adiabo etc. These sprawled areas lack basic facilities such as motor able roads, health facilities, security post, poor electricity supply, poor mobile network and pipe borne water. Instead cases of theft and insecurity are rife, private borehole littering the landscape and gully

erosion sites due to absence of drainage channels to control storm water.

It was predicted in 2018 by the United Nations that, by 2025, the proportion of urban communities would have increased to as high as 62.9% in 2011 to 69% in 2050. The report further stated that within this period, the world population is expected to have increase by 2.3 billion, passing from 7.0 billion to 9.3 billion.. This predictions portray that more land will be required to accommodate the increasing population and associated life supporting activities. Increase demands for land will exert pressure on green areas as developments sprawl.

According to Akinmoladun, (1999) urban sprawl is the awkward spreading out of the limbs of either a man or a community. The first he said is the product of bad manners, while the second is the product of bad planning. Urban sprawl usually begins without any overall plan, new developments are situated wherever builders could buy land. Urban sprawl is simply growth for the sake of growth. It is the spread and irregular outward growth of urban areas.

Unfortunately, much of the recent urbanization has taken the form of urban sprawl, which uses much land and can harm the environment (Shlomo, 2023). The ever expansion of urban areas spreading and pushing outwards towards the periphery without Town Planning guidance is a misnomer. Urban land as well as lands in rural areas needs to be well planned to accommodate the growing population.

Green area refers to open spaces within urban or rural environments that are primarily covered in vegetation like grass, trees and plants. They can range from small pocket parks to large national forest. They are areas or open spaces reserve, protected areas of undeveloped landscape used for recreational and/or agricultural purposes, in recent times residents also use it for dumping of waste illegally. Green areas within and around urban areas enhances the aesthetics of neighbourhoods. They are for relaxation, source of fruits and herbs. (Wangai, Burkhard, and Muller 2016, Du Toit, Cilliers, Dellimer, Goddard, Guenat and Cornelius, 2018).

Green area/space, is any open piece of land that is undeveloped (has no buildings or other built structures) They make up many parts of our cities and towns, which include Schoolyards, Community/private gardens, Cemeteries, Parks, Wetlands, Playgrounds, Public seating areas, Public plazas, vacant lots etc.

2.0 STATEMENT OF THE PROBLEMS

Rampat development is the term that best describe current land use trend in Calabar Metropolis. More Farmland and natural surrounding areas are giving way to new housing developments, shopping and industrial centres, highways and other facilities that have becomes a normal part of everyday life. It is generally unplanned, uncontrolled and unintended. Urban sprawl is responsible for environmental challenges plaguing our cities. It usually begins without any overall plan. New developments are situated wherever builders could buy land. Planning was not only neglected, it was actually prevented. Government bodies did not come with overall development plan, much less enforce it, rather, what we have is reactive planning which is in place and does not produce a logically consistent plan hence it produce urban sprawl. The consequence is the substantial loss of green areas due to sprawl. The conversion of large amount of prime agricultural land that were used for rubber plantation in Esuk Otu, Akima Nsa, Ikot Eneobong, Adiabo, Nyanghassa, Ikot Omin etc. for construction, in the periphery has exacted pressure on the green areas of Calabar Metropolis, even the Botanical Garden along Mary Slessor Avenue is not spared as commercial developments is gradually shrinking the green area.

3.0 THEORETICAL FRAMEWORK/LITERATURE REVIEW

3.1 Theoretical Framework

The study was based on Johann Heinrich Von Thünen Model of Agricultural Land Use. Early in the 19th century Johann Heinrich von Thünen (1783-1850) developed a model of land use that showed how market processes could determine how land in different locations would be used. The Von Thünen model is an excellent illustration of the balance between land cost and transportation cost. Von Thünen model also states that as one gets closer to a city, the price of land increases. Von Thünen developed his model of the spatial distribution of agriculture land more than 200 years ago from observations on the distribution of activities on farmland surrounding towns in southern Germany. However, the theory is adopted for this study because the nature of urban sprawl in Calabar Metropolis shows some similarity with what happened in Germany. A situation where lands formerly used as rubber plantation by PAMOL has now becomes host to leapfrog residential development.

3.2 Literature Review

The term sprawl was first used in 1937 by Earle Druper of the Tennessee Valley Authority in the context of national conference of planners (Wassmer, 2002 Nechyba and Walsh 2004). According to Wassmer, (2002) urban sprawl was used in the opening paragraph of an article by the sociologist Williams White: in Fortune Magazine, in 1958. Planners have since then used the term to categories an urban development, generating undesired social effects. Urban Economists also adopted the term and added to the debate terms like scatter, leapfrogging and ribbon development.

Urban sprawl has spread to various domains, but no common definition agreement has been obtained. This leads to situations where urban sprawl is an ambiguous term that may be used by various or several domains, such as urbanism, geography, economics or recently also remote sensing and data science. There are many definitions of urban sprawl from writers and researchers on urban sprawl. Researchers define definitions based on the respective context. Although, there are various definitions of urban sprawl, but have a similar understanding. According to Vito, Rosa, Leonard, Valerio and Luca,

(2022), Urban sprawl, is the phenomenon of low-density settlement diffusion over large peri-urban areas, and it is amongst the most debated topics in the fields of urbanism.

Earlier on, researchers such as Weitz and Moore (1998), Gordon and Richardson, (2000), EEA, (2000), Torren, and Alberti, (2000), Galster, Hanson, Ratcliffe, Wolman, Coleman, & Freihage, (2001), Chin, (2002), Habibi and Asadi (2011), Bhatta (2010), Sleav and Nikivorof (2013), Ewing, and Hamidi, (2014), have viewed urban sprawl from various perspectives.

Weitz and Moore, (1998) viewed urban sprawl as a spreading and development that has non-central characteristics of metropolitan and non-metropolitan cities. Sprawl was classified into five categories include sprawl impacts on public/private capital and operating costs, transportation and travel costs, and conservation of terrestrial or national habitats, quality of life, social problems. They are many challenges that herald urban sprawl in human society. Challenges such as increased income inequality, job insecurity, rising housing costs, long journeys to offices and Central Business District (CBD), environmental problems, loss of farmland, intolerance, psychological disorientation, and chaos. According to critics, urban sprawl tends to leave an undefined term. (Gordian and Richardson, 2000). It is simply equated with unplanned growth

The European Environmental Agency (EEA 2000) defines, sprawl as the physical pattern of low density expansion of large urban areas under market conditions into the surrounding ones. Urban sprawl is an uncontrolled irregular expansion of developments into the surrounding periphery from urban area with poorly planned patterns of development. Therefore, it can be said to be continues dispersed development to low density residential units and isolated tracts, separated from each other areas by vacant land, forming ribbon or leapfrog pattern along highways or other driving agents or forming spatial patch within undeveloped land (Torren, and Alberti, 2000).

Galster, et al, (2001) understood Sprawl as an urban form building process that transforms a former mono-centric component structure into a discontinue poly centric and disperse settlement structure. It is seen as land conversation a situation where urban land growth rates significantly outstrip the rate of population growth over a period of time, with low density dominance. Hence, poses economic, aesthetics and physical costs to residents in area.

According to Chin, (2002) basically there is convergence view as to what constitutes urban sprawl so there is little agreement in the characteristics, causes and effects of urban sprawl. However, one thing is certain, urban sprawl takes place in the suburbs. Chin, (2002) maintain that Urban sprawl is positioned against the ideal compact city and features of high density, centralized development and mixed spatial functions.

While, Bhatta (2010), Slaev, and Nikivorof (2013) and Ewing and Hamidi, (2014), are all in agreement that urban sprawl is characterized by unplanned and uneven growth pattern driven by many processes, and leads to inefficient use of resources. It has a negative connotation, although not all urban growth is sprawl. For example, the type of urban growth in infill is generally regarded as a solution for urban sprawl.

Habibi and Asadi (2011) sees urban sprawl as physical plan of low density growth in large urban areas, these areas are leapfrog, leaving agricultural pockets, small area use, and transport dominance by private vehicles. They lack central planning or land use control. Developments sprout as desired by developer and the needs they stand as stop gap to. So, it is common to see informal shops springing up at locations to take advantage of lack of departmental stores, schools to take care of education needs of residents as well as patent stores to attend to health needs of residents. Tube well or borehole own by private individual take charge of water provision because the Cross River State Water Board Limited exist in name only.

Karakayaci and Karakayaci, (2019) defined urban sprawl as lands that have lost their rural characteristics and yet cannot be defined as urban due to various problems such as unplanned urban growth and use of non-agricultural purpose. The inability for these peripheries that have been encroached by expansion not to have all the needed social services makes it to remain as a glorified urban area.

All definitions of urban sprawl point in one direction, which is to say, urban sprawl is an unplanned, unorganized irregular urban growth, outward spread of development from urban centers into the rural areas it is an un-sustainable form of development.. A cording to Abdeljawad, and Nagy, (2023) Cities urgently need effective policies and plans for strategic urban development that can slow down uncontrolled urban growth. While, Gashi, and Ramadani, (2022) said compact city is the best goal to prevent or reduce the negative effects of urbanization on the environment.

4.0 MATERIALS AND METHODS

4.1 The Study Area

Calabar Metropolis comprises two local government areas, Calabar Municipality and Calabar South Local Government Area. Calabar Urban Area comprises of Calabar Municipality and Calabar South Local Government Area. Politically it is situated in the Southern Senatorial district. The study area lies approximately in between Longitudes 8º18’25’’E and 8º 22’ 29.04’’E of the Greenwich meridian and latitudes 5º 06’10.56’’N and 4º 54’ 43.21’’N of the Equator. Calabar Urban Area shares boundaries with Odukpani Local Government Area in the north, in the South by the estuaries, Great Kwa River/Akpabuyo Local Government Area in the East and Calabar River in the West. The city is about 48km from the estuary where Cross River and Calabar Rivers meet before joining the Atlantic Ocean. It has an area of 331.551 square kilometers.

The population of Calabar has been rising steadily over the years. In the 1963 census the population was 99,350 by the census figures of 1991 the population of Calabar had astronomically risen to 328,876 (NPC, 1991). According

to the census figure 2006, Calabar has a population of 371,022 (NPC), but when projected to 2024 with a growth rate of 3.0 percent put the population at 631,640 persons.

The ancient city of Calabar has a long history and a fascinating heritage. Nearly after a century of contact with European sailors, Calabar gained recognition as an International Sea Port in the 16th century. From 17th to 19th century, Calabar became a major slave trade port in West Africa. Calabar accounted for approximately 30 percent of Africans carted away to the new world (America) as slaves from Africa. This represented the largest exit of slaves from a single point in Africa (Ojikpong, Agbor and Emri, 2016). The study area is inhabited by the Efiks, the Quas and Efuts. The people speak Efik and English fluently. See Figures 1 and 2. The study area has twenty two political wards, with Calabar Municipality having ten (10) political wards and Calabar South Local Government having twelve (12). See figure 1.

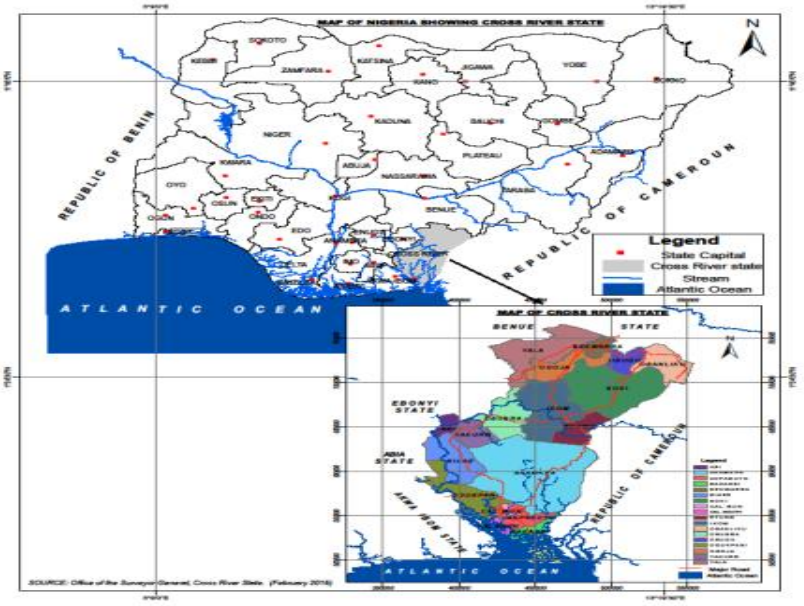

Fig 1: Map of Nigeria showing location of Cross River State.

Source: Cross River State Geographical Information Agency (CRGIA, 2025).

4.2 Methodology

Research data were gathered from both primary and secondary sources. Ground trotting, interview, observation and Geographic Information System were employed for collection data for the study. The data were analyzed to understand the level and direction of expansion. The period under study has 1995-2004, 2005-2014 and 2015-2024. The land cover is classified into five groups, this includes built up areas, Green areas subdivided into three; (sparse vegetation- cultivated land areas), thick vegetation, flooded vegetation- wet lands and swamp and rivers).

Data were analyzed and presented in tables with their percentages, further analysis include the land use land cover changes presented in tables based on the changes presented on the image between 1995 to 2024.

4.3 Data Analysis

The analysis of urban sprawl in Calabar Metropolis was concern with land use changes over time. To achieve this, Geographic Information Systems (GIS) technologies were employed to analyze and visualize the dynamics of the changes detected. Maps were extracted across three distinct epochs: 1995-2004, 2005-2014, and 2015-2024, as depicted in Figures 2, 3 and 4 respectively. These maps provide a spatial representation of the changes in land use patterns, enabling a thorough analysis of the development of residential areas and shrinking of green areas in Calabar Metropolis.

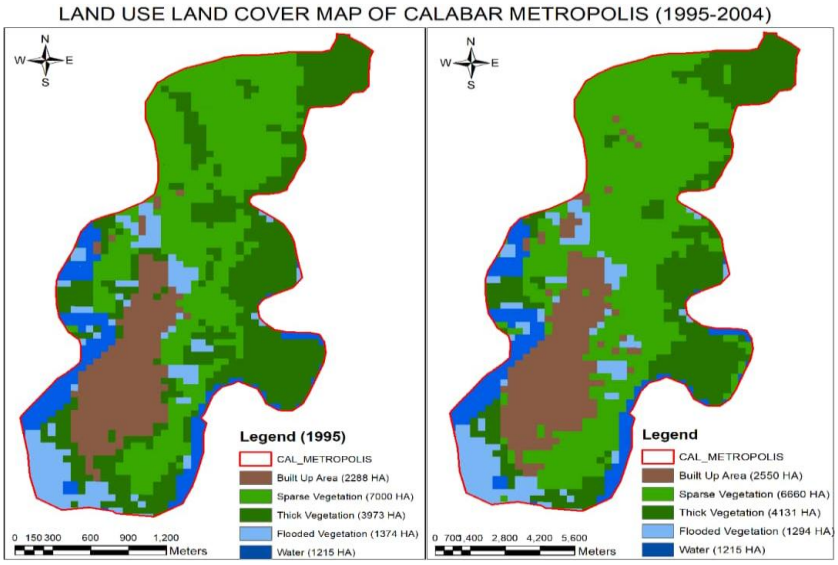

Fig 2: Land Use /Land Cover Map of Calabar Metropolis for 1995 - 2004.

Source: Cross River State Geographical Information Agency (CRGIA, 2025).

Figure 2, shows the extent of land use in Calabar Metropolis between 1995 and 2004. The analysis on figure 2, is presented in table 1 and it shows that built up area increased to 2,714 hectares (17.1%) in 2004 from 2,287 hectares (14.4%) in 1995, representing 2.7% increase. This suggests a gradual expansion of urban areas during this period. By 2004, sparse vegetation had decreased to 42% from 44.2% in 1995. Thick vegetation also showed a slight decrease, while flooded vegetation and water bodies remained relatively stable.

Table 1: Land Use /Land Cover Data for 1995-2004.

S/N	LAND USE CLASSIFICATION	1995- 2004					
		1995 (HA)	%	2004 (HA)	%	Difference	
						Hectares	%
1.	Built Up Area	2,287	14.4	2,714	17.1	427	2.7
2.	Sparse Vegetation	6,999	44.2	6,654	42.0	-345	-2.2
3.	Thick Vegetation	3,978	25.1	3,924	24.8	-54	-0.3
4.	Flooded Vegetation	1,371	8.7	1,343	8.5	-28	-0.2
5.	Water	1,215	7.6	1,215	7.6	0	0
TOTAL		**15,850**	**100%**	**15,850**	**100%**	**834**	**26%**

Source: Researchers Analysis (2025)

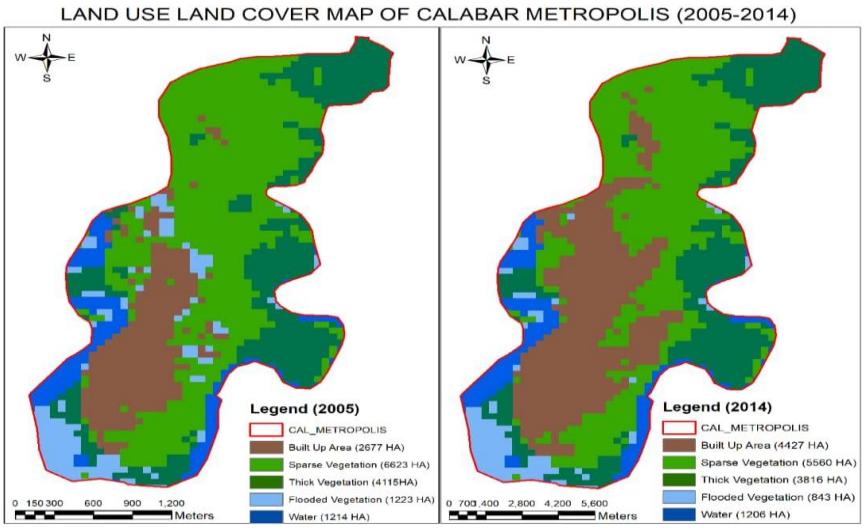

Fig 3: Land Use /Land Cover Map of Calabar Metropolis for 2005 - 2014.
Source: Cross River State Geographical Information Agency (CRGIA, 2025)

Figure 3, shows the land use/land cover data for 2005-2014. The analysis of figure 3, is presented in table 2, built-up area experienced a significant increase from 2,677 hectares in 2005 to 4,427 hectares in 2014, representing 11.1% increase. This rapid expansion of urban areas suggests a period of rapid urbanization. Notably, built-up areas covered 16.9% of the total area in 2005 and surged to 28% by 2014. Sparse vegetation decreased from 41.8% to 35.1% of the total area, while thick vegetation also showed a decline. Flooded vegetation decreased by 2.5%, indicating possible environmental degradation.

Table 2: Land Use/Land Cover Data for 2005-2014.

S/N	LAND USE CLASSIFICATION	2005-2014					
		2005 (HA)	%	2014 (HA)	%	Difference	
						Hectares	%
1.	Built Up Area	2,677	16.9	4,427	28	1750	11.1
2.	Sparse Vegetation	6,623	41.8	5,560	35.1	-1063	-6.7
3.	Thick Vegetation	4,113	26.0	3,815	24.1	-298	-1.9
4.	Flooded Vegetation	1,223	7.7	843	5.2	-380	-2.5
5.	Water	1,214	7.6	1,205	7.6	-9	-0.1
TOTAL		**15,850**	**100%**	**15,850**	**100%**	**0**	**0**

Source: Researchers Analysis (2025)

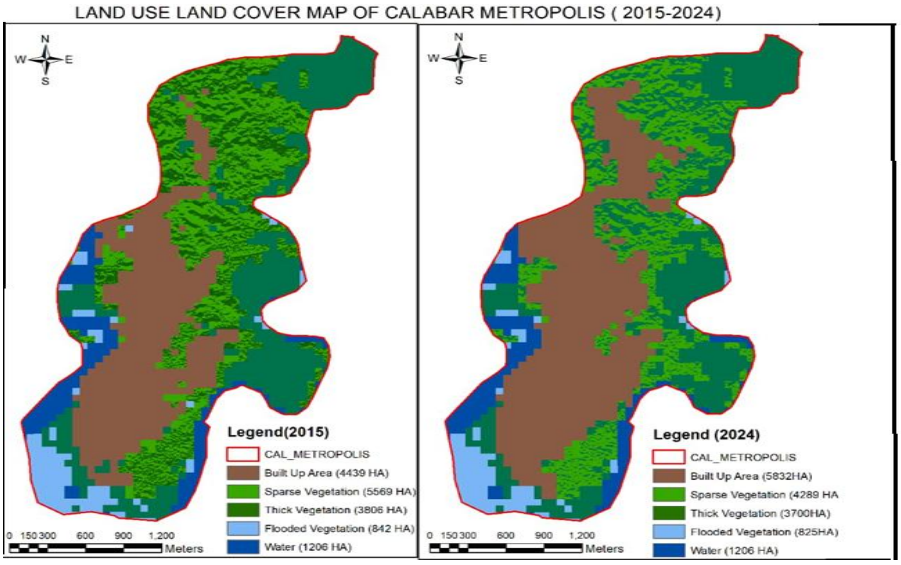

Fig 4: Land Use / Land Cover Map of Calabar Metropolis for 2015 - 2024.

Source: Cross River State Geographical Information Agency (CRGIA, 2025).

Figure 4, presents the land use/land cover data for 2015-2024. The analysis of figure 4, is presented in table 3, the built-up area continued to expand, increasing from 4,436 hectares in 2015 to 5,832 hectares in 2024, representing an 8.8% increase. In 2015, built-up areas covered 28% of the total area, and by 2024, this had grown to 36.8%. Sparse vegetation further decreased from 35.1% to 27.1% of the total area, while thick vegetation remained relatively stable. Flooded vegetation showed a minimal decrease, and water bodies remained stable.

Table 3: Land Use/Land Cover Data for 2015 - 2024.

S/N	LAND USE CLASSIFICATION	2015-2024					
		2015 (HA)	%	2024 (HA)	%	Difference	
						Hectares	%
1.	Built Up Area	4436	28.0	5832	36.8	1396	8.8
2.	Sparse Vegetation	5567	35.1	4289	27.1	-1278	-8.0
3.	Thick Vegetation	3804	24.0	3701	23.3	-103	-0.7
4.	Flooded Vegetation	839	5.3	825	5.2	-14	-0.1
5.	Water	1204	7.6	1203	7.6	-1	0.0
TOTAL		**15850**	**100%**	**15852**	**100%**	**0**	**0**

Source: Researchers Analysis (2025)

Table 4: Land Use/Land Cover Data for 2005 - 2024.

Land use class	2004 area coverage (Hect.)	Percentage (%)	2014 area coverage (Hect.)	Percentage (%)	2024 area coverage (Hect.)	Percentage (%)	Area coverage (+/-)	Percentage (+/-)	Percentage rate of change
Built up	2714	17.1	4427	28	5532	36.8	2818	19.7	115.2
Sparse Vegetation	6654	42.0	5560	35.1	4289	27.1	-2365	-14.9	-35.48
Thick Forest	3924	24.8	3815	24.1	3701	23.3	-224	-1.5	-6.05
Flooded vegetation	1343	8.5	843	5.2	825	5.2	-518	-3.3	-38.8
Water	1215	7.6	1205	7.6	1203	7.6			
Total	**15850**	**100**	**15850**	**100**	**15850**	**100**			

Source: Researcher Field Work, 2025

It is observed from table 4, that between 2005 and 2024 built up area increased by 115.2 %, the same period witness a decreased in the green areas (sparse vegetation, thick forest and flooded vegetation). Built up areas along Goodluck Jonathan bypass is purely on flooded vegetation (wetlands) reclaimed by developers. Thick forest in areas such as Ekorinim, Esuk Otu, Akima Nsa, Enima, Ikot Eneobong etc. have most of the green areas cleared for building.

5.0 DISCUSSION OF FINDINGS

Interviews with staff of the Town Planning Department of the Ministry of Lands and Urban Development, Calabar suggest that the rapid urbanization and expansion of built-up areas in Calabar Metropolis can be attributed to a combination of factors that have led to increased pressure on land resources which resulted in the conversion of natural habitats to other uses.

Some residents in Ekorinim who have lived there for a long time, informed the researchers that Ekorinim used to be a typical forest in the 60‘s. They lamented that increased human activities due to population has resulted in rapid deforestation of both mangrove and rainforest in the area for building and for fuel wood which has impacted negatively on the green area.

Development of residential areas in Calabar Metropolis reveals a consistent trend of urban sprawl/expansion over the past three decades. Built-up areas have increased significantly, from covering 14.4% of the total area in 1995 to 36.8% in 2024 (See tables 1 and 3). This rapid development has transformed the landscape, with sparse vegetation and flooded vegetation experiencing notable declines. Increase in population is attributed to both natural increase and influx of migrants from other local governments of the state and other states in Nigeria to the state capital for greener pasture as well as education fulfillment. These influx have led to demand for housing which has triggered rent increase, hence the hunger for home ownership to escape the burden of high rent has driven residents to purchase land at any point their money can afford. It is essential to balance development with environmental conservation as the city grows and make sure that resident needs are accommodated while minimizing the negative impacts on the environment.

6.0 CONCLUSION AND RECOMMENDATION

Calabar Metropolis is experiencing the sprawl phenomenon where built-up area continue to expand astronomically. These expansion is mostly noticed at the periphery, which has led to sharp decrease in green areas. Interestingly, an inverse relationship exist between green areas and built up areas. Hence, an increase in built up area means a decrease in green area. The period under study (1995-2024) experienced a consistent decrease of the green areas in favour of physical development developments.

RECOMMENDATION

It is recommended that the Town Planning Department of the Ministry of Lands Calabar has to be proactive through the preparation of structural plans, layout plans ahead of the invasion of the periphery by land speculators. Zoning ordinance/principles have to be adhered to strictly to prevent nuisance that will be created by sprawl.

Haphazard/unplanned developments have to be controlled through efficient and regular monitoring of the urban environment. Using geospatial techniques is necessary, to detect areas that are fast growing and needs to be planned ahead.

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