

SPATIO-TEMPORAL ANALYSIS OF THE GROWTH AND DEVELOPMENT OF SLUMS IN SOKOTO METROPOLIS

Rufa'i Abubakar

Department of Geography, Sokoto State University, Sokoto

Corresponding Author's email: rufaiabubakar2@gmail.com



Abstract

In the last two decades, some neighbourhoods within Sokoto metropolis have reportedly shown preponderance of slum characteristics. However, there is no documentary evidence to support the claim. This study therefore attempted a Spatio-temporal analysis of slums growth and development in Sokoto metropolis (1994-2019). An extensive reconnaissance survey was carried out, and with the aid of 3m accuracy Global Positioning System (GPS) hand held receiver, locations and expansion of slums were captured and mapped. Six areas were identified as slums in the study area, which are: Mabera (Kantin Sani) (15.52Ha), Gidan Sauro (8.60Ha), Nufawa (8.04Ha), Sabon Garin Mai-kwabo (2.26Ha), Sagin Lemu (2.72Ha) and Gidan rana (2.42Ha). Average Nearest Neighbour was used to determine spatial pattern of slums which showed that slums in the study area were dispersed ($P < 0.05$). From the reconnaissance survey conducted, it was observed that the general condition of the environment was considered to be very poor and unsecured. The study concludes that there are six slums in the study area with monumental expansion. It therefore recommends that government should ensure the development of new master plan to guide present and future development of the metropolis.

Keywords: Spatio-Temporal, Growth and Development, Slums. Sokoto

Background of the Study

Human use of land has altered the structure and functioning of the environment. The most spatially and economically important human use of land globally includes cultivation in various ways, construction, reserves, protected lands and timber extraction (Fabiyyi, 2006). Recently settlements and sprawl development are becoming large active land use changes especially in the developing regions of the world. Land use pattern can provide an insight into the factors that have caused the land to change. Population increase has resulted in manifestation of unnecessary pressures on available infrastructure, environmental degeneration, traffic congestion, housing shortages and high level of crimes (Olalekan, 2014). Urban population in Africa is growing faster than that of any other continent (Fabiyyi, 2006). In 2018, 55% of the world's population lives in urban areas, proportion that is expected to increase to 68% by 2050. The projection show that urbanization, combined with the overall growth of the world's population could add another 2.5 billion people to urban areas by 2050 (UN-DESA, 2018). The projection further note that future increases in the size of the world's urban population is expected to be highly concentrated in just a few countries. India, China and Nigeria will account for 35% of the projection growth of the world urban population between 2018 and 2050. By 2050, it is projected that India will added

416million urban dwellers, China 255million and Nigeria 189million. The driving forces behind the rapid urbanization in Africa today are the combination of rural-urban migration and natural increase within the towns and cities themselves (UN-Habitat, 2006).

A slum is a heavily populated informal urban settlement characterized by substandard housing and squalor. While slums differ in size and other characteristics, they generally lack reliable sanitation services, supply of clean water, reliable electricity, law enforcement and other basic services (UN-Habitat, 2006). Slum residences vary from shanty houses to professionally built dwellings that because of poor-quality construction or provision of services have deteriorated into slums. Slums are homes for the poor; they are settlements with unplanned pattern and arrangement with inadequate access to safe water, sanitation, overcrowding, poor structural quality of houses and insecure residential status. Slums form and grow in many different parts of the world for many different reasons. Some causes include rapid rural-to-urban migration, economic stagnation and depression, high unemployment, poverty, informal economy, poor planning, politics, natural disasters and social conflicts (Amis, 2002).

The growth of slums is expected to have major consequences on both humans and the environment, which are inextricably linked. The interplay of this linkage produces distinct characteristics in slums. This perhaps attest to the fact that the condition that exist in slums such as living under physical threat from natural disaster and impact of slum resident on their environment due to lack of basic services affects their socio-economic status. The growth and expansion of slums can therefore, threaten sustainable urban development and quest for the emergence of sustainable cities and communities. The literature on slum development has grown considerably, the physical, socio-economic and political forces that generate and sustain the formation of slums are abundant. These include the works of Ogbonna *et.al* (2016), Agbola & Agunbiade (2009), Yoade *et. al* (2019) and Ajayi *et. al* (2014). These authors observed that when the provision of urban facilities and infrastructure cannot meet up with the rising population trend, deterioration of the environment sets in.

The current and continued advancements in Remote Sensing (RS) and Geographical Information Systems (GIS) had made it possible for information collection and processing on urban land use changes, improving our ability to map and monitor slums (Strietching, 2005). The range of spatial resolutions offered by remote sensing platforms can be used to map slums to varying levels of analysis. It provides an unobtrusive method for collecting physical data on slums, and in some cases provides the only source of available information for some slums (Andrew *et al*, 2016). Remote sensing can capture physical information on slums at higher temporal resolutions that can range from continuous coverage to daily, weekly or monthly coverage.

In the last two decades, some neighborhoods within Sokoto metropolis have shown preponderance of slum characteristics. Slums are a source of concern to both government and dwellers of the neighborhoods because of their roles in distortion of urban planning, vulnerability to attacks by diseases because of their unhygienic living conditions, non statutory legal recognition, serving as crimes hotspot and waste accumulation centres, among many others.

Studies by Mamman (1999) and Dantuni (2010) both indicated that Sokoto urban fringes are under continuous pressure of being engulfed by residential and other land uses. This expansion has been both formal and informal, with many unplanned and non-government approved developments. This therefore, underscores the need to map areas that have shown preponderance of slum characteristics, identify their growth and examine their spatial pattern in Sokoto metropolis.

The aim of this study is to analyze growth and development of slums both in space and time in Sokoto metropolis. The following objectives were pursued to achieve the above stated aim, which is to:

- i. Identify and map locations of slums in Sokoto metropolis.
- ii. analyze the growth of slums between 1994 and 2019.
- iii. examine the spatial pattern of slums in Sokoto metropolis.

Study Area

The study area is the Sokoto metropolis, the capital of Sokoto State. It occupies an area between Latitudes 12°46'N to 13°08'N and Longitudes 5°14'E to 5°30'E (SURPB, 2019). The study area is bounded by Kware Local Government to the North, Wamakko to the West, Dange-Shuni to the south and Wurno to the east. Historically, Sokoto has an excellent regional location combined with a strategic defensive position. A common feature of cities in Northern Nigeria is a defensive wall and a number of city gates denoting entry points from other neighbouring areas. In Sokoto, the wall is presently nonexistent. However, almost all the known gates have been preserved at their original locations which show an indication of how rapidly the city grew. The old city center surrounded by the gates only represents a small proportion of the city at present. The predominant architecture in the city is currently a mixture of modern buildings in a traditional context, reflecting the prevailing physical and economic condition of the residents. Privacy in housing is important to the city dwellers; as such, even the modern or semi modern houses reflect the traditional concept of privacy. The study area has an estimated population of about 662,000 people as of 2021 with 96 persons per square kilometer and 3% growth rate annually (UN, 2022).

Materials and Methods

Data Types and Collection

Data Identification and Mapping of Slums

Based on the reconnaissance survey, areas with a preponderance of slum characteristics were identified using the following indicators of urban blight outlined by United Nation Development Programme (UNDP): tenancy, availability of facilities and environmental problems. The locations of slums are the Global Positioning Systems coordinates of slums boundaries identified by the residents of the neighbourhood.

Spatial Pattern of slums in the study area

The pattern of slums in the study area was assessed using the Average Nearest Neighbour (ANN) statistic.

Slums Growth Assessment

The Google street map is a vector data which was used in conjunction with the local knowledge of the researcher to map the slum areas. A Global Positioning System (GPS) hand held device of 3m accuracy was used to capture coordinates of slum boundaries. This was made possible by the active participation of the old residents of the neighbourhood, where boundaries were identified at some interval years. Obtained coordinates from the field were imported into the ArcGIS environment and digitized into polygons of area extents. Number of slums, year of emergence and area was estimated and compared over the years. In addition, key informant interviews were conducted with the traditional ward head (*Mai-Anguwa*) of slum areas to elicit responses on the origin and development of these areas.

Results and Discussions

Slums Identification and Mapping

Based on United Nation Development Programme (UNDP) indices for slum formation, six slums were identified in the study area, they include; Gidan Sauro, Gidan Rana, Sagin Lemu, Sabon Garin Mai-kwabo and Mabera (Kantin sani) and Nufawa. These indices include: tenancy, availability of facilities and environmental problems. From the reconnaissance survey, it indicates that services such as water supply, electricity, sanitation roads and drainage as well as schools are inefficient, inadequate and below the minimum levels in these areas. For example, water supply to individual household is lacking with few public stand pipes. This arrangement is similar made for electricity, drainage, toilet facilities e.t.c. The environmental problems associated with these areas are erosion and flooding due to absence of drainages. However, indiscriminate dump of waste is evident and have polluted these areas. From the Central Business District (CBD) of the study area, all the slums are located in the northern part, with the exception of Mabera (Kantin Sani) which is located at the eastern part.

Shamaki and Dankani (2010) described Sokoto metropolis as a city with large number of poor (on average 46.1%) and unemployed. They pointed out that Sokoto is not highly urbanized like some state e.g. Lagos, Ibadan or Kaduna, but, about 40% of its population lives in dilapidated houses. United Nations Human Settlements Programme (2003) has outlined rapid urban population expansion, natural growth, deteriorating of old city centres and tendency to form ethnic neighbourhood as some of the factors responsible for slum growth globally. Bobadoye and Fakere (2016) also outlined factors resulting on the formation and growth of slum in Nigeria; Scarcity of lands, services and secure of tenure, neglect of building and their environment which make them become derelict, poverty and illiteracy, use of substandard building materials, poor maintenance culture and congestion. The premise for the growth of slum in the study area has corresponded to some of the factors outline by the global report on human settlement (Urban Population expansion and natural growth within the slum).

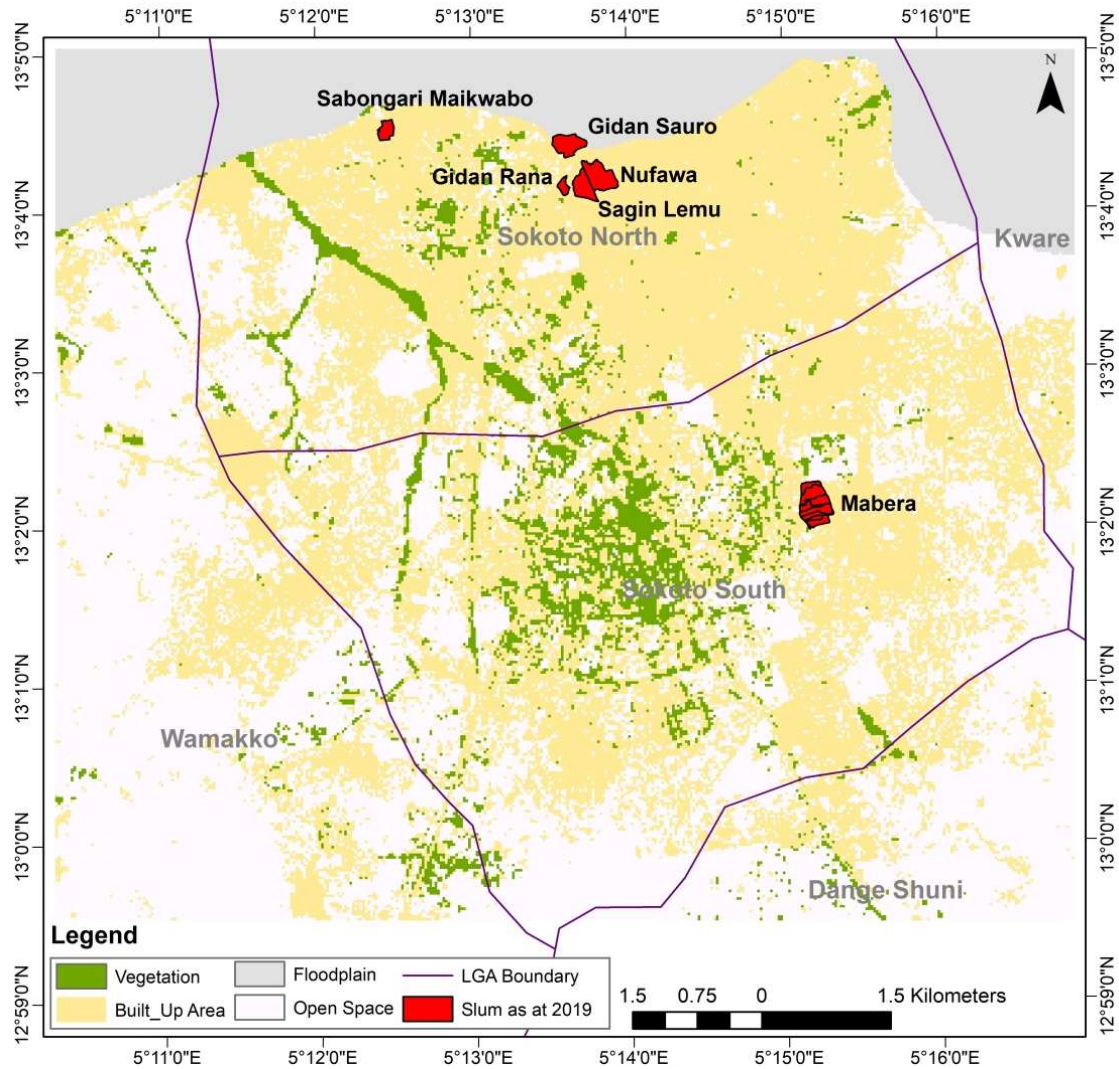


Figure 1: Slums in the study Area

Source; Author's Fieldwork 2019

Spatial Pattern of slums in the study area

The patterns of slums in the study area were analyzed using Average Nearest Neighbour (ANN) statistic.

Figure 2, shows that the patterns of slums in the study area is dispersed. This is because the observed mean distance (1295.3906 meters) is greater than the expected (592.4482 meters) (Hypothetical random distribution) at P Value of 0.000.

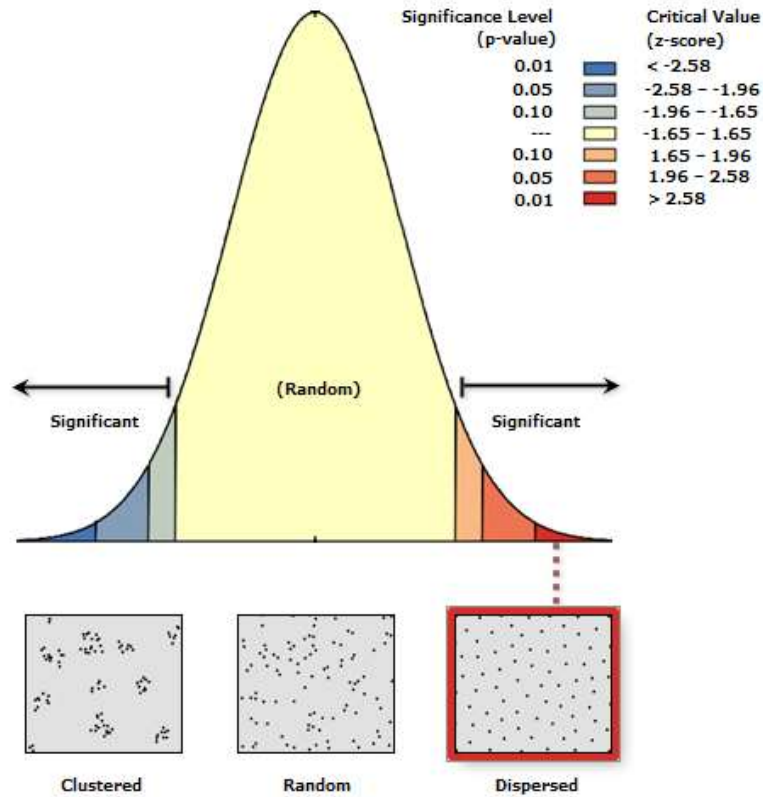


Figure2: Pattern of Slums in the study area

Source; Author's Fieldwork 2019

Average Nearest Neighbor Summary	
Observed Mean Distance:	1295.3906 Meters
Expected Mean Distance:	592.4482 Meters
Nearest Neighbor Ratio:	2.186504
z-score:	5.560014
p-value:	0.000000

Although the pattern of slums in the study area appeared dispersed, they are located in the northern part. The dispersed pattern was affected by the slum at Mabera and Sabon Garin Mai-kwabo which looks like an outlier among others. It could also be consequent upon the vastness of the study area which can influence the Average Nearest Neighbor result. (Environment System Research Institute, 2003). The non random nature of the slums is an indication that some factors are particularly favourable for their development.

Slums Growth in the Study Area

Analysis of data with respect to the growth of slums indicates that there has been expansion of slums in the study area from 1994-2019. Figures 3, 4, 5, 6, 7, and 8 present the maps of the slums both in space and time (Spatio-Temporally). The growths of the identified slums were presented below:

Slum Areas	Area Coverage (1994)	Area Coverage (2004)	Area Coverage (2019)
Sagin Lemu	1.03Ha	2.23Ha	2.72Ha
Nufawa	0.50Ha	3.05Ha	8.04Ha
Sabon Garin Mai-Kwabo	0.10Ha	0.42Ha	3.26Ha
Mabera	1.87Ha	2.00Ha	15.52Ha
Gidan Sauro	0.20Ha	0.94Ha	8.60Ha
Gidan Rana	0.27Ha	0.47Ha	2.42Ha

Source: Authors Fieldwork, 2019.

Sagin Lemu

Sagin Lemu was occupying 1.03Ha, 2.23Ha and 2.72Ha for the years 1994, 2004 and 2019 respectively. This has shown a tremendous increase particularly between 1994 and 2004. Sagin Lemu is the oldest area among all the areas identified as slums in this study. According to the traditional Ward Head (*Mai Anguwa*) the area was in existence even before the turbaning of the 17th Sultan of Sokoto (Sultan Abubakar III). By implication, the area has existed for more than 80 years. This is because Sultan Abubakar III was turbaned on 5th June, 1938. The word "*Sagi*" literally means a minor city gate (delineating a boundary). Although in this case, the delineation was not by the gate but by a set of orange trees which stretch horizontally from east to the west of the present day Sagin Lemu. The area has served as a major linking road to the old market in Sokoto for most of the people coming from far Dan-Borai, and Rijiyar Kaura of (Tangaza and Gudu) local government areas of Sokoto State. They usually made their stopovers under the orange tree sheds and tied their animal which was used to transport themselves from their various destinations before their eventual integration into the market.

The people of the area are mostly Hausa by tribe and Muslim by religion. This has paved way for the practice of extended family system, resulting in the high birth rate and the need for more space to accommodate their growing population. The continued increase in the population coupled with migrant from Dundaye area of Wamakko local government play a tremendous role in the expansion of the area.

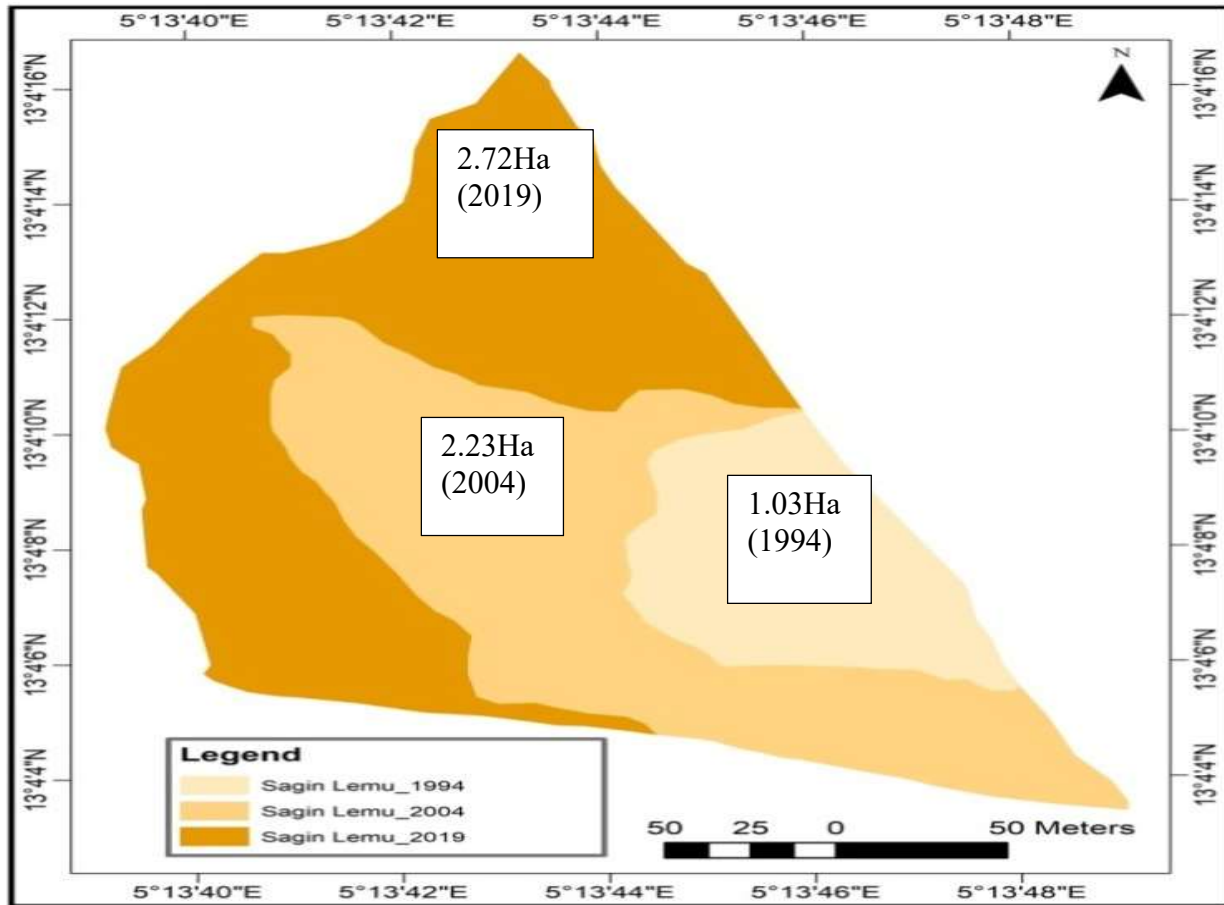


Figure3: Sagin Lemu, 2019
Source; Author's Fieldwork, 2019

Nufawa

Nufawa is another slum area occupying 0.50Ha, 3.05Ha and 8.04Ha for the years 1994, 2004 and 2019 respectively. This indicates that growth of this area became accelerated between the years 2004-2019. Considering the foregoing discussion on the historical evolution of Sagin Lemu (a slum area identified under this study area), Nufawa can be considered as an extension of Sagin Lemu. It shares boundary with Sagin Lemu to the west and has similar historical antecedent. The name of the area is a testimony of the first settlers of the area. Sokoto old market played a tremendous role in the formation and development of this area. Unlike Sagin Lemu where most people make a stopover and later returned to their destination, Nufawa had experienced temporary resettlement of the people coming to make economic transaction in the market. Different tribes do normally visit the area which serves as transit before the market day. But, the Nufawa tribes (Nupe) are the most dominant semi sedentary settlers. This, according to the traditional ward head of Nufawa (*Mai Anguwa*) may not be unconnected with distance from Sokoto to the present Niger State. Therefore, most of them come a day before the market day which was usually on Friday.

This temporary resettlement has yielded the result of creating some sheds and shacks which have now turned into what is known as Nufawa area. Increased in the population of the neighboring area (Sagin Lemu) coupled with locational choice particularly by the people affected by the construction of some major drainages in Sokoto metropolis in 1976 and alongside with the need of proximity to the two major Mosques of Sultan Bello and Shehu (based on the belief that they were the only accepted places of worship). This has contributed in the formation and expansion of Nufawa area.

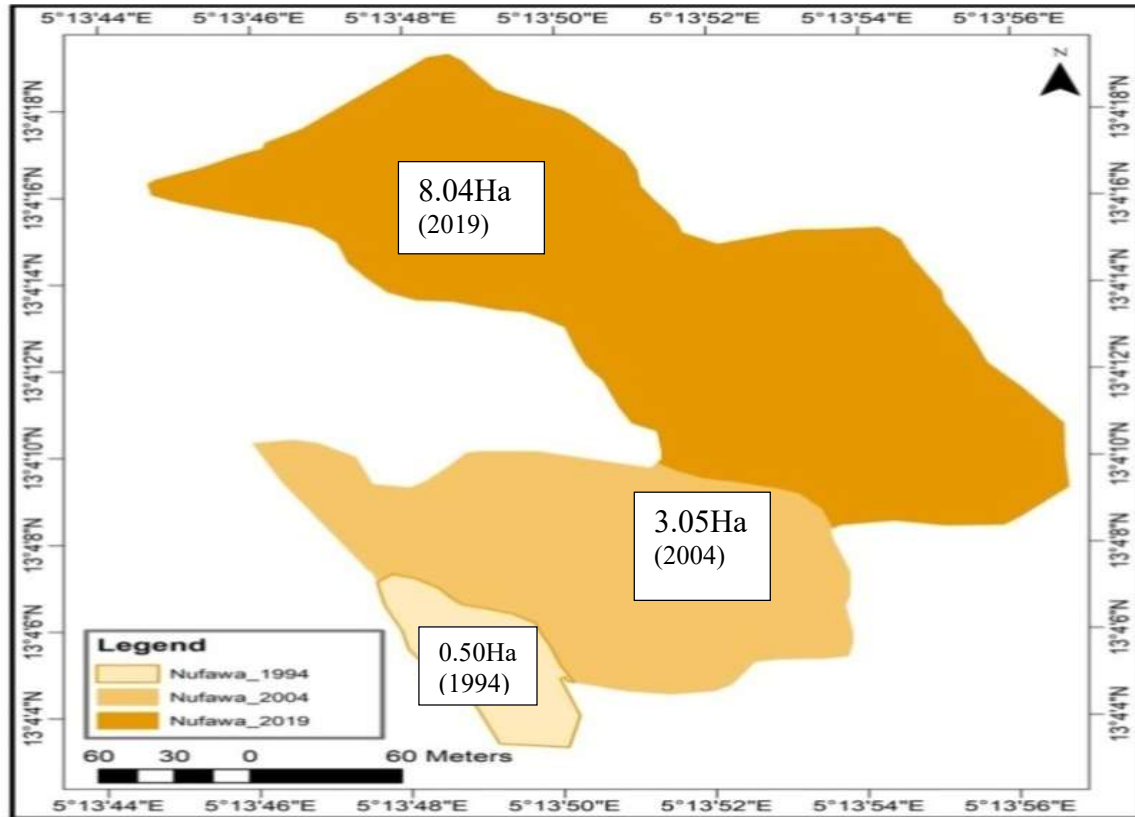


Figure4: Nufawa, 2019
 Source; Author's Fieldwork, 2019

Sabon Garin Mai-kwabo

Sabon Garin Mai-kwabo However, was occupying a total area of 0.10ha, 0.42ha and 3.26ha for the year 1994, 2004 and 2019 respectively. It is evident that the rapid period of expansion is between 2004 -2019.

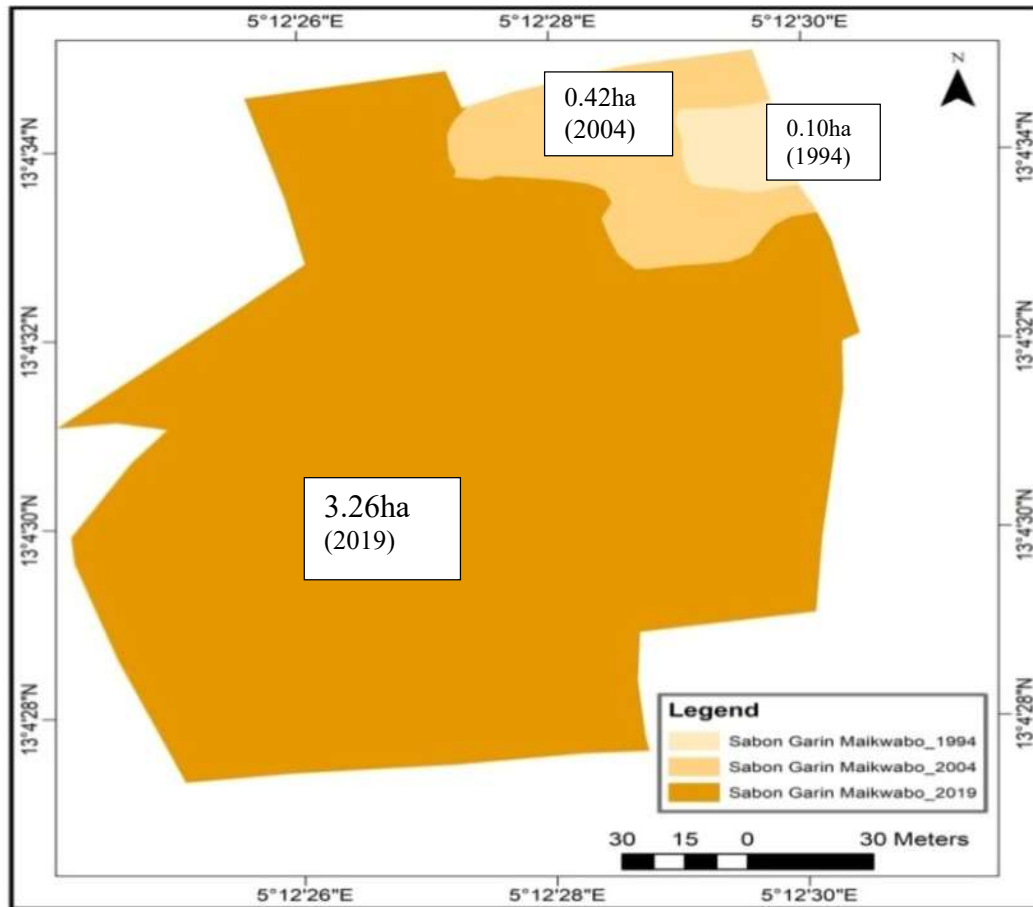


Figure5: Sabon Garin Mai-kwabo, 2019
Source; Author's Fieldwork, 2019

Sabon Garin Mai-kwabo, however, is the new emerging settlement that was formed in the years under consideration for this study. According to the traditional Ward Head of the area, the dwellers of the area are mostly migrant from Sagin Lemu. The reason for their resettlement was on the basis of the fact that the present area they are occupying now are their farmland when they were at Sagin Lemu. Natural growth within their former area has pushed them to resort to resettlement in their farmlands.

Mabera

Mabera occupied 1.87ha, 2.00ha and 15.52ha for the year 1994, 2004 and 2019 respectively. This implies that Mabera is the biggest slum in the study area as at 2019 and has the most tremendous period of expansion is between 2004 and 2019.

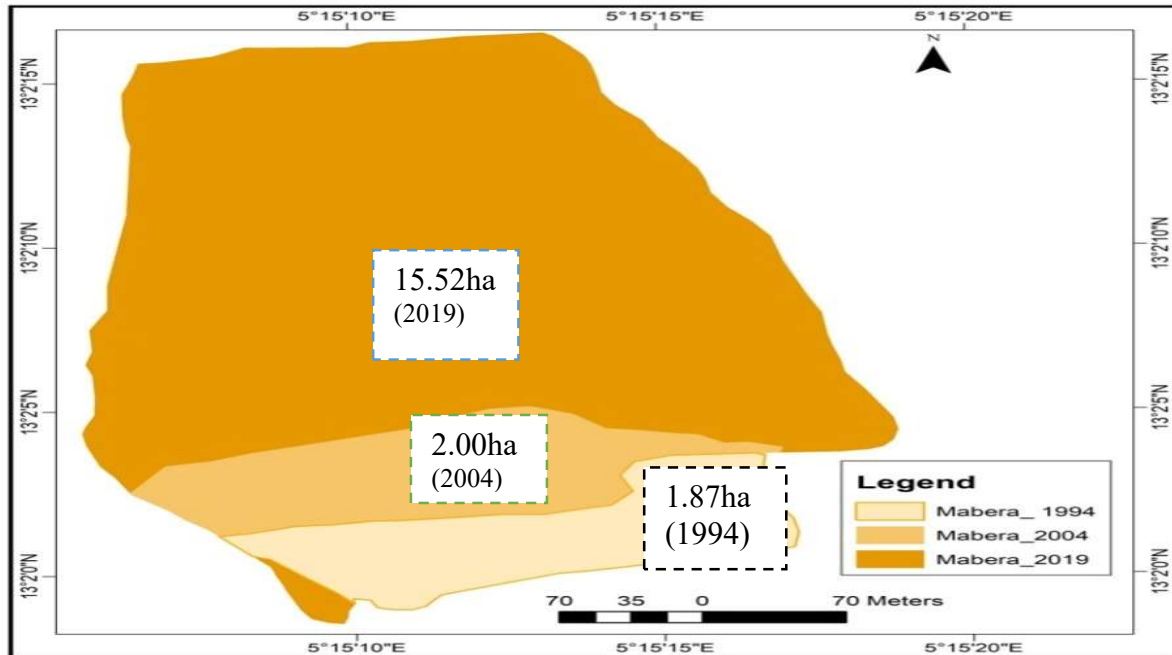


Figure6: Mabera (Kantin Sani), 2019
Source; Author's Fieldwork, 2019

Mabera has witnessed accelerated formation and rapid expansion because of dualization of major roads in other part of the State. Access to cheap land and properties, proximity to some social amenities among others paved way for its growth and expansion.

Gidan Sauro

The acreage of Gidan Sauro is 0.20Ha, 0.94Ha and 8.60Ha for the year 1994, 2004 and 2019 respectively. The period between 2004 -2019 experienced most of rapid expansion in the area.

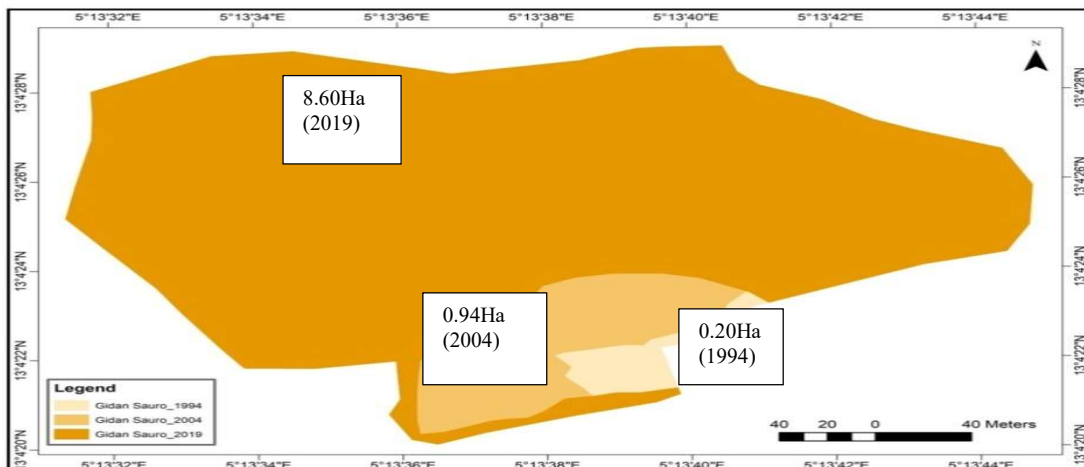


Figure 7: Gidan Sauro, 2019
Source; Author's Fieldwork, 2019

According to the Traditional Ward head of Gidan Sauro, the growth of the area was as a result of increased in the entire population of Sokoto metropolis, the dualization of the eastern bypass road and access to cheap land. The increased in the population, coupled with the dualization of eastern bypass road has pushed people to look for nearby and cheap land to resettle. The people living in this area are poor and at the same time want to maintained their families within the city since they don't have anywhere to go, therefore, they took the risk of resettling in the Fadama and floodplain area.

Gidan Rana

Gidan Rana is another slum area covering an area of 0.27Ha, 0.47Ha and 2.42Ha for the year 1994, 2004 and 2019 respectively. The establishment of Gidan Rana was fueled by the construction of a major drainage in the area which divided Sagin Lemu and Gidan Rana (Figure 4.2). The area is considered the smallest slum among the six slums identified by this study. The reason for having small area coverage may not be unconnected with the absence of vacant land for expansion.

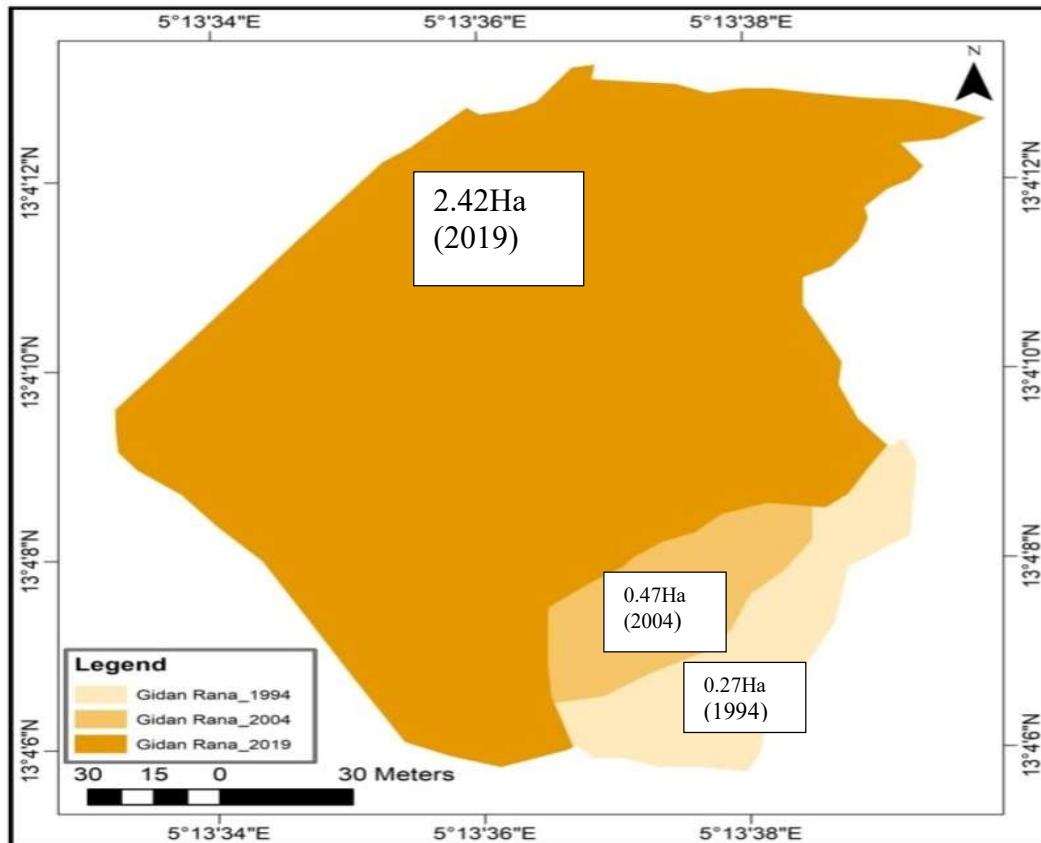


Figure 8: Gidan Rana, 2019
 Source; Authors Fieldwork, 2019

In contrast to previous attitudes towards slums, which characterized them as illegal settlements to be eradicated, the 2009 edition of the World Development Report views slum growth as an inevitable 'growing pain' of economic development (World bank 2013). Recently, the United Nations developed a ' Sustainable Development Goal 11 with sole aim to make cities and safe, inclusive, resilient and sustainable in direct recognition of the fact that slums are a development issue that needs to be faced. Typically, slums emerge in developing countries as unplanned

informal settlements where access to services is minimal to non-existent and where overcrowding is the norm (UN- HABITAT, 2006).

The majority of slum dwellers are recent migrants from rural areas, many of whom live without the social networks and kinship ties that can provide emotional, physical and financial support in times of crisis (UN-HABITAT, 2006). Social cohesion is limited among such groups, as is a sense of shared responsibility. In this environment, shared sanitation facilities become degraded due to lack of responsibility for proper operation and maintenance.

Undoubtedly, the results of the spatio- temporal analysis of growth and development of slums reveal changes and perhaps expansion of slums in Sokoto metropolis. The major growth and development of slums in the study area was observed between 2004 and 2019, particularly at Nufawa (8.04Ha), Sabon Garin Mai-Kwabo (3.26Ha), Mabera (15.52Ha), Gidan Sauro (8.60Ha) Gidan Rana (2.42Ha). That was the period when infrastructural development in Sokoto metropolis was at its peak. It's pertinent to note that these areas are not direct beneficiaries of this infrastructural development but, resettled zones for those affected by the dualisation and construction of major roads within the metropolis. However, there was a difference under this phase (2004 and 2019) at Sagin Lemu showing little growth of just half of a hectare. This was partly because of the limited space to extend further. The growth taking place in this area is the natural growth of human population through high birth rate. It is obvious that the city is growing; the growth of slums in the study area reflects the absence of state control of the use of land and building activities in the pattern of urban developments.

Conclusion

It is obvious from the foregoing discussion that there is a proliferation of slums with monumental expansion in Sokoto metropolis, and it is distorting the urban fabrics. The whole scenario could said to be as a result of planning failure. Sokoto Master Plan has expired since 1983, and no supplementary provision was made for the new extension areas which were emerging without proper planning regulations. Slums formation and expansion in the study area could be said to have been caused by the joint action of four principal factors: Locational Choice, low income and lack of government commitment. Cities as centers of production and opportunities needs to be safe and resilient to make them sustainable and this could only be achieved by provision of basic infrastructure, adherence to planning rules and regulations, reduction of urban poverty and enhancement of social inclusiveness.

Recommendations

This study has the following recommendations:

- i. Government should embark on massive urban renewal of the slums areas so as to provide them with basic facilities, utilities and infrastructure for healthy living, by so doing will go a long way in reducing their suffering and expenses.
- ii. Sokoto Urban and Regional Planning Board (S.U.R.P.B) should be up and doing in ensuring orderly growth and development of Sokoto Metropolis.
- iii. The government should ensure the development of new master plan to guide present and future development of the metropolis.

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