

PROLIFERATION OF INFORMAL SETTLEMENTS IN THE PERMANENT SITE OF USMANU DANFODIYO UNIVERSITY, SOKOTO, NIGERIA

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Abstract

This study examined the Proliferation of informal settlements in the permanent site Usmanu Danfodiyo University Sokoto from its inception to 2021. The data used for this study were gathered through geo-spatial analysis. GIS technique was used to examine the spatiotemporal growths of the settlements within the university Landsat imageries. Major findings reveal that ten (10) new settlements emerged in the University after its inception. Analysis further shows that between 1985- 1995 the magnitude of the settlement's growth was 92.80 hectares, from 1995- 2005 the magnitude was 228.3 hectares. Furthermore between 2005- 2015 the magnitude was 86.75 hectares and 280.75 hectares between 2015 - 2021. While the annual rate of the settlements growth between 1985 to 1995 was 9.28 hectares, 1995 to 2005 was 22.8, 2005 to 2015 was 8.68, and 2015 to 2021 was 46.79 hectares. The study recommends among others, the need to compensate and relocate all villages and settlement within the university in order to safeguard it and prevent the lingering crisis over land ownership and control from exploding.

Keywords: *Informal Settlement, Proliferation, Land Right,*

Background

Shelter is one of the basic requirements of mankind from time immemorial. It is often a parameter used in gauging people's status or position in society (Mabogunje, 1968). Since the advent of the Agricultural Revolution settlements have been growing in size and numbers globally (Mabogunje, 1968). With an increase in global population from a figure of one billion around the 18th Century to about 7.6 billion as of 2019 land for housing development becomes an essential and competitive commodity. World comprises different types of settlements ranging from hamlets, villages, towns, and cities and all these are growing at an unprecedented rate. (Revi, 2017). This population growth resulted in the emergence and proliferation of settlements.

Since the Independence of Nigeria in 1960 Federal Government of Nigeria established a lot of educational institutes to educate and train the manpower needs of the country in the areas where already settlements are situated (Mabogunje, 1968). In the year 1975, the Federal Government of Nigeria created some universities among which are Sokoto, Jos, Port Harcourt, Calabar, Maiduguri, Ilorin, and Bayero University Kano. To secure a befitting site for the Universities, land must be compulsorily acquired from communities and villages within the area proposed as the site for the Universities (Mamman, 2000). The same thing in Sokoto, a vast land was acquired to

sufficiently accommodate the facilities and the infrastructure of the new University. In most societies, there are rules governing access to land and its management worldwide. The Land Use Decree of 1978 also known as the Land Use Act of 1979 is the supreme land law in Nigeria. In Nigeria, land is vested in the Governor of the state who is expected to hold it in trust for the benefit of the citizens of the country or indigenes of the state where they are domiciled. Only the Governor or his representative can allocate land in the whole of the country. Similarly, section 28 of the Land Use Act empowers the Governor to take over land from individuals and communities for the use of the general public by invoking the overriding public interest clause in the Land Use Act (Federal Government of Nigeria, 1978). It is in line with the provisions of the section stated above that the Sokoto State Government acquired about 5,630 hectares of land from villages and communities for the establishment of the permanent site of the University of Sokoto. The whole perimeter of the University's earmarked land is about 30.6 Kilometers.

In a normal situation, the ideal situation is for the communities within the University to relocate to other areas to continue their livelihood having been compensated and technically displaced but the ideal scenario did not prevail. Up till this moment, many settlements still exist within the University's earmarked land area and they have been growing both in size and number to the extent of challenging the rights of the university over the land. As it stands, there exists a total of 66 settlements within the university with some having a close proximity of less than 100 meters from the academic core. This trend poses of a serious challenge to the university administration and requires research of this nature to unearth the dynamics of the proliferations of informal settlements within the university land with a view to determine the extent of the growth, its magnitude and the danger it portends for the university. It is based on this premise that this paper examines the proliferation of these settlements in the permanent site of the University.

Materials and Methods

The Study Area

The Permanent site of Usmanu Danfodiyo University, Sokoto, falls between Latitudes $13^{\circ} 1' .N$ to $13^{\circ} .9' N$ and Longitude $5^{\circ} .13' E$ to $5^{\circ} .18' E$ in Wamakko Local Government Area of Sokoto State. UDUS Master Plan (1975). It covers a landmass of 5630 hectares see the appendix for the detail of the earmarked area of the permanent site. The population of the study is approximately about 15,000 people (Survey Unit UDUS, 2021). UDUS borders the Rima River and its extensive flood plain to the South, Illela road to the East, and a sequence of flat-topped hills made up of laterite, gently sloping on either side with sparse vegetation to the North. To the West, the University shares a border with a network of hills known as Dangoroji Hills (Gwandu And Mamman, 2000). Usmanu Danfodiyo University Sokoto is separated from the city by an expansive flood plain of the Rima River which is intensively cultivated for its rich Fadama soil. There is a three-kilometer road linking the town to the university across the floodplain, (Gwandu and Mamman, 2000).

Methodology

Sources of Data

Data for the study sourced through both primary and secondary sources. Primary Data obtained through the administration of questionnaire to sampled respondents residing within the University, as well as an intensive tour of the study area for direct and physical observation. The questionnaire was design with closed ended questions to ease the collection of information from the respondents. Secondary Data were sourced from the Department of Physical Planning of the University, Published documents of the University and the State Ministry of Lands and Housing, Sokoto. Other vital materials were sourced from published materials in Journals, Textbooks and

the Internet. Also Satellite imagery of 1985 to 2021 was used to identify the extent of settlements growth within the University perimeter. Furthermore, Three session of Focus Group Discussions were held with traditional/religious leaders and elected representative of the population of the study area in respect to the study. Each session to one district in the study area. This had viewed in findings the vital information on the history of the settlements and how they grow over time, nature of land tenure and challenges they are currently encountering. In the event of data collection, most of the respondents do not understand English; therefore the questions were translated to the respondents. Four research assistants were used during the interview. These help the researcher covered the sampled population in good time in time.

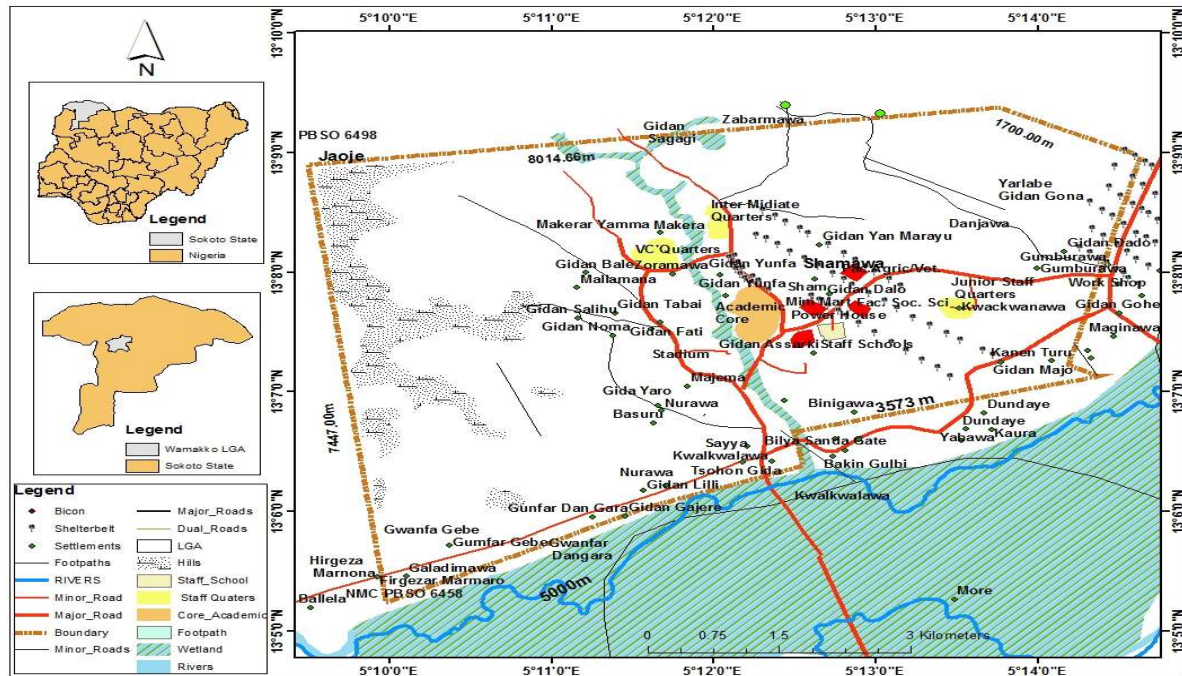


Figure 1 Map showing the Location of the Study Area.

Source: UDUS Master Plan (1975).

Instruments of Data Collection

Different Landsat Data were used for this study this include.

Landsat Imagery. Five Landsat imageries were Used to obtain the Data needed for this study. Table 1 shows the Five Landsat imagery that were Used and Characteristics.

Table 1 Characteristics of the Landsat Imagery

Satellite	Sensor	Acquisition date	Band used	Spatial Resolution	Processing
Landsat 5	Thematic Mapper (TM)	1985 -1 – 11	Visible (B1, B2, B3)	30m	Level 1 (L1)
Landsat 5	Thematic Mapper (TM)	1995 – 1 -11	Visible (B1, B2, B3)	30m	Level 1 (L1)
Landsat 7	Enhanced Thematic Mapper (ETM)	2005 -1 -13	Visible (B1, B2, B3)	30m	Level 1 (L1)
Landsat 8	Operational Land Imager (OLI)	2015 – 1 -11	Visible (B2, B3, B4)	30m	Level 1 (L1)

Landsat 8 Operational Land Imager (OLI) 2021 -2 – 19 Visible (B2, B3, B4) 30m Level 1 (L1)

Source: United State Geological Survey (USGS) 2021

The Landsat satellite images (path 185; row 052) include Thematic Mapper Plus (TM), and Operational Land Imager (OLI). All images were geometrically corrected and acquired in level 1T (L1T). They were acquired from the United States Geological Survey (USGS) website

Table shows the Landsat scenes used in the study. To properly compare the NDVI differences, all the images were acquired between January and February, as this is the time of year where different kinds of vegetation are all at a stable stage. In addition, the time gap between all the satellite images was more than 16 days, because of cloudiness or technically damaged scenes.

Two criteria were followed to choose the satellites images in this analysis

- i. The satellite images must have less than 10% cloud coverage (If possible, cloud free);
- ii. The images satellite series should be available for a long time series.

Land-Cover Classification Scheme

To prepare the LULC map from satellite imageries, a classification scheme which defines the LULC classes was considered. The numbers of LULC classes are preferred based on the requirement of a specific project. Four major LULC classes were identify for the entire study area viz; Agricultural land; Vegetation; built-up land; and Rock outcrop (Table 2). Area under irrigated agricultural land was included as agricultural land while area under agroforestry was included under vegetation due to the similar spectral response of tree cover in agroforestry systems to vegetation.

Table 2: Description of different LULC categories.

S.N	LULC CATEGORY	GENERAL DESCRIPTION
1	Built-Up	Settlements and Roads
2	Agricultural	Irrigated land area and agricultural land fallow
3	Vegetation	Dense Forest, Land with tree canopy density more than 40%. Open forest shrubs area under agroforestry and land with tree canopy density between 10-40%
4	Rock Outcrop	Exposed Rock

Source: Author's Fieldwork (2021).

Post processing supervised classification.

After the preparation of classification scheme one of the most widely used image classification technique, i.e., maximum likelihood classification was adopted for mapping all the land use/cover classes. Before the selection of training samples, empirical analysis of satellite imagery; Google earth images and Toposheet of the study area were investigated carefully.

For most of the classes, a minimum number of training samples were 100. Selecting training samples for water was tough because of the dense canopy of forests along with the river channel and lack of water in the river channels since the acquisition date of imagery was in January - February and at that time most of the rivers or stream in the study area carry less water as compared to the rainy season

Landsat 5 Thematic Mapper was used for both 1985 and 1995. Landsat 7 Enhanced Thematic Mapper (ETM) for 2005 and Landsat 8 Operational Land Imager – Thermal Infrared Sensor (OLI – TR) for 2015 and 2021 with spatial resolution of 30m. (Table 3.1) showed the detailed. The

Landsat data are multi spectral with the scene of the study are corresponding to 191/051 path raw as archived in the United State Geological survey (USGS). The data for the Landsat were all accessed through the Google earth (GE) Literature evidence confirmed that most of the Landsat data were already collected and archived with the USGS and have already been geometrically corrected and therefore do not required any further correction or image co- registration (Maria et al 2020) and (Anderson et al . 1976). Top of the Atmosphere (TOA) Landsat data set were however selected as they were already preprocessed for removal of radiometric errors.

These satellite imageries were used for identification of spatiotemporal growth of the settlements. The settlements growth and development in the study area from 1985 to 2021 also was calculated geometrically on Ten years interval (1985 to 1995, 1995 to 2005, 2005 to 2015 and 2015 to 2021). Overlay analysis was adopted to show the extent of the settlement growth. While magnitude and rate of settlements growth were calculated using the formula below.

Magnitude = reference year – based year (e.g. 1995 – 1985)

Rate = magnitude / Number of years.

Pixel Digitizing and signature Extraction

Respective pixels for the land use were access on the high resolution (0.5) satellite image. These facilitated in the development of signatures for all identified LULC in the study area. Out of these LULC classes, built- up area was selected for this study. In development of signatures for the built-up area also high resolution (0.5) satellite imageries were used. These helped in identified, digitized and separated the settlements built – up area and University built –up area. Both were calculated geometrically. Olusola et al (2021) was adopted.

After extraction of signature, the Google Earth Images of the study area were investigated carefully. To prepare the map of Build - up area. From Landsat imageries. All the maps were prepared based on the requirement of this study

Results and Discussion

Figure 2 shows the map of the settlements that exist within the earmarked area of the University. Mamman (2000) stated that at the inception period of the University most of these settlements were small in nature in terms of size and structures.

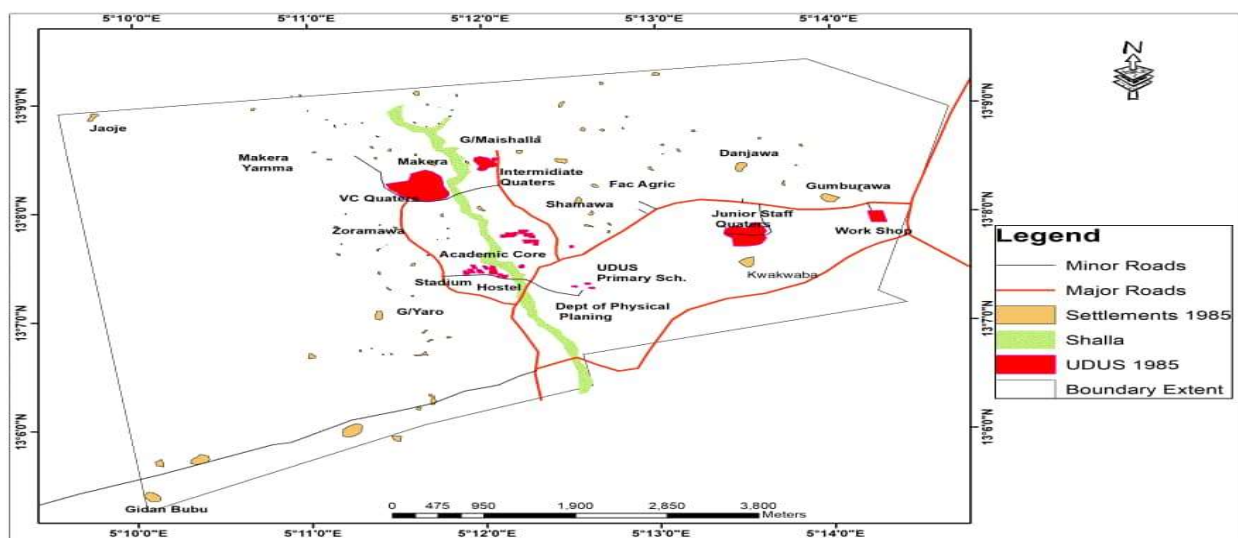


Figure 2 Settlements within the UDUS Main Campus at the inception period

Source: Author's Fieldwork (2021)

It is revealed that three (3) settlements have existed for about 200 years before the establishment of the University. These settlements are Gidan Yaro, Gidan Bubu and Gumburawa. They were established as war camps by disciple of Usmanu Danfodiyo in the person of Malan Muhammadu Yaro, Shehun Nur and Malan Amadu Sambo during the Danfodiyo jihad. After the jihad other settlements and villages emerged as the result of the good plain land for agriculture. This indicates that people have settled within the area for more than a century before the establishment of Usmanu Danfodiyo University.

Settlements that Emerged after the Establishment of the University

Table 3 shows the location of the new settlements that emerged after the establishment of the University. Field data shows that ten (10) new settlements emerged in the University. These Settlements include Sabon Garin Gidan Miya, Sabon Garin Tudun Wada, Sabon Garin Zoramawa, Sabon Garin Gidan Bulwa, Sabon Gidan Hantsi, Sabon Gidan Tukur, Mai yaga Sabuwa, Sabon Gidan Takalmawa, Sabon Gidan Wuntu and Sabon Gidan Tankari. These Settlements emerged at result of the University relocation exercise of 2012. Many people that were urged to relocate deviated and created new settlements at different locations within the earmarked area of the University. The Gidan Miya, community emerged as a new settlement at the eastern part of Mallamawa, Tudun Wada community emerged at the eastern part of Gidan Hame, Zoramawa community emerged at the eastern part Mallamawa, Gidan Bulwa community emerged at southern part of Shama, Gidan Hantsi emerged at southern part of Shama, Gidan Tukur community emerged at the south Eastern part of Majema, Takalmawa I, II, and III community emerges at the eastern part of Magema, Gidan Tankari community emerged at the eastern part of Sabon Garin Tudunwada, and Mai-yaga community emerged at the south eastern part of Majema.

Table 3 Settlements that emerged after the establishment of the University

S/N	Community where new settlements emerged	Name of the newly emerged Settlements	Year of Emergence	Location
1.	Gidan Miya	Sabon Garin Gidan Miya (Eastern Mallamawa)	2012	Lat.13.131800 Long.518699100
2.	Tudun Wada	Sabon Garin Tudun wada (Eastern Gidan Hame)	2012	Lat. 13.145070 Long 5.205096
3.	Zoramawa	Sabon Garin Zoramawa (Southeastern Mallamawa)	2012	Lat. 13.13135 Long. 5.187539
4.	Gidan Bulwa	Sabon Garin Gidan Bulwa (Northern Shama)	2012	Lat.13135534 Long.5209454
5.	Gidan Hantsi	Sabon Gidan Hantsi (Northern Shama)	2012	Lat. 133527 Long. 5.209769
6.	Gidan Tukur	Sabon Gidan tukur, mai yaga (North/Eastern of Majema)	2012	Lat.13.117243 Long. 5.198059
7.	Takalmawa I, II, and III	Sabon Gidan takalmawa (Eastern Majema)	2012	Lat.13117762 Long. 5.197885

8.	Gidan Wuntu	Sabon Gidan Wuntu (North Eastern G. Yaro)	2012	Lat. 13.119541 Long. 5.192340
9.	Gidn Tankari	Sabon Gidan Tankari (Eastern sabon Garin Tudunwada)	2012	Lat.13.145070 Long. 205090
10.	Mai-yaga	Mai-yaga Sabuwa (North/Eastern of Majema)	2012	Lat.13.117243 Long. 5.198059

Source: Author's Fieldwork (2021)

Figure 3 shows the settlements that emerged in the study area after the establishment of the University. The extent of these settlements was 3.84 hectares in 2015 and 8.05 hectares in 2021. These shows that the emergence of these settlements has increases both the number and size of settlements in the study area. Presently seventy-one (71) settlements exist within the earmarked area of the University.

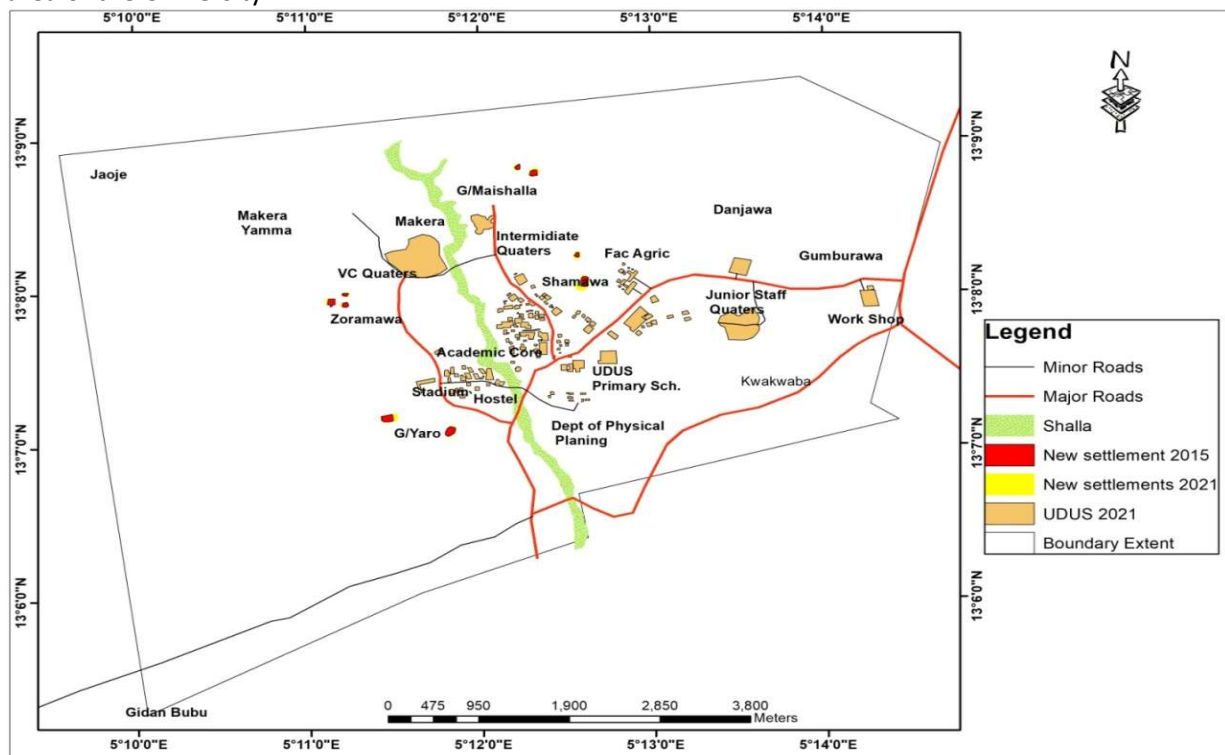


Figure 3 Emerged Settlements after the establishments of the University

Source: Author's Fieldwork (2021)

Settlements Growth in the Main Campus of the University from 1985 – 2021

A supervised settlements growth of the study area was performed within Google earth. The map of the settlement's growth was generated for years 1985, 1995, 2005, 2015, and 2021. Figures 4a, 4b, .4c, 4d, and 4e show the map of the area indicating the extent of the settlements extracted from the images while figure 5 shows the overlay analysis of the settlement's growth in the study area.

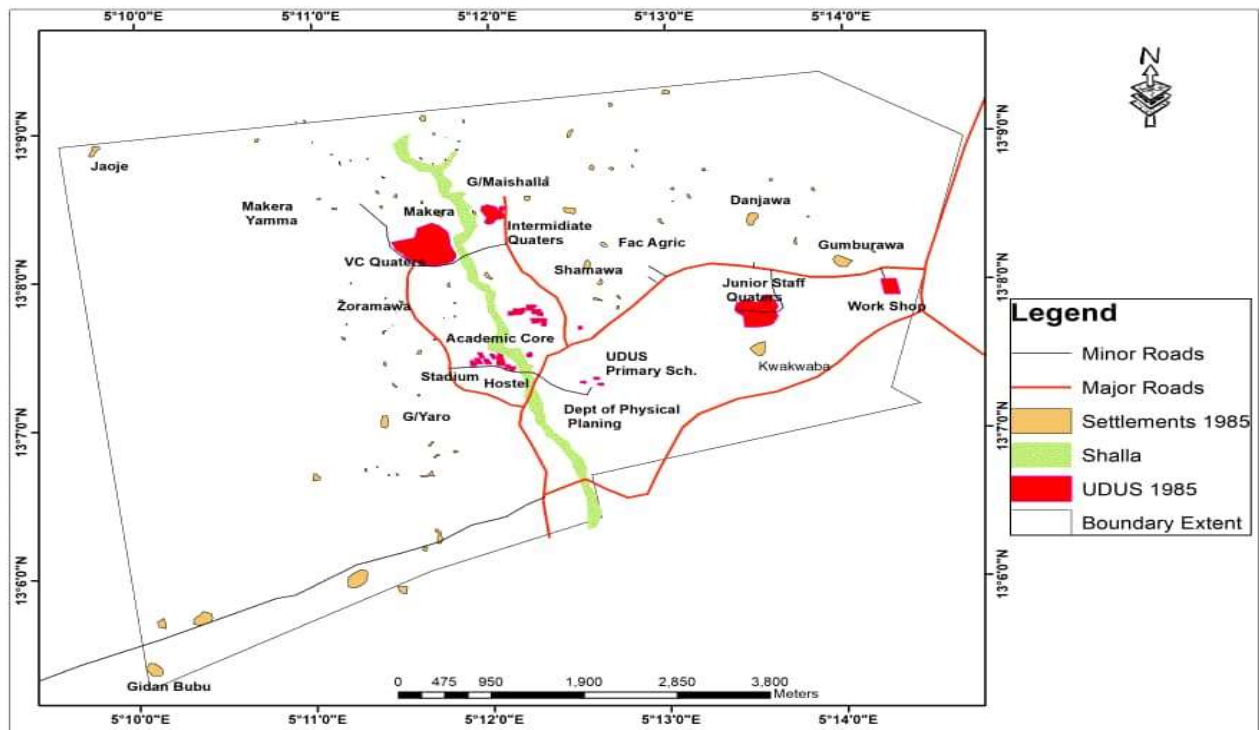


Figure 4a Area covered by the settlements in 1985

Source: Author's Fieldwork (2021)

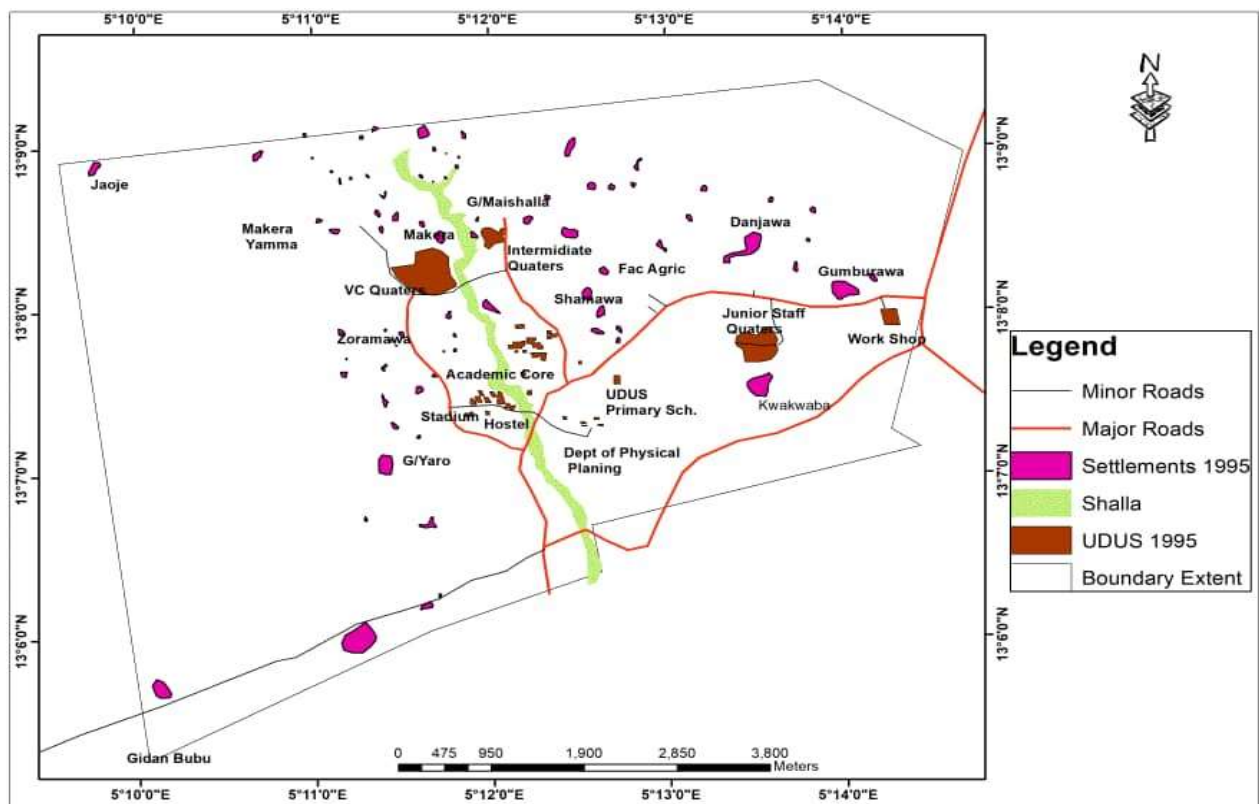


Figure 4b Area covered by the settlements in 1995

Source: Author's Fieldwork (2021)

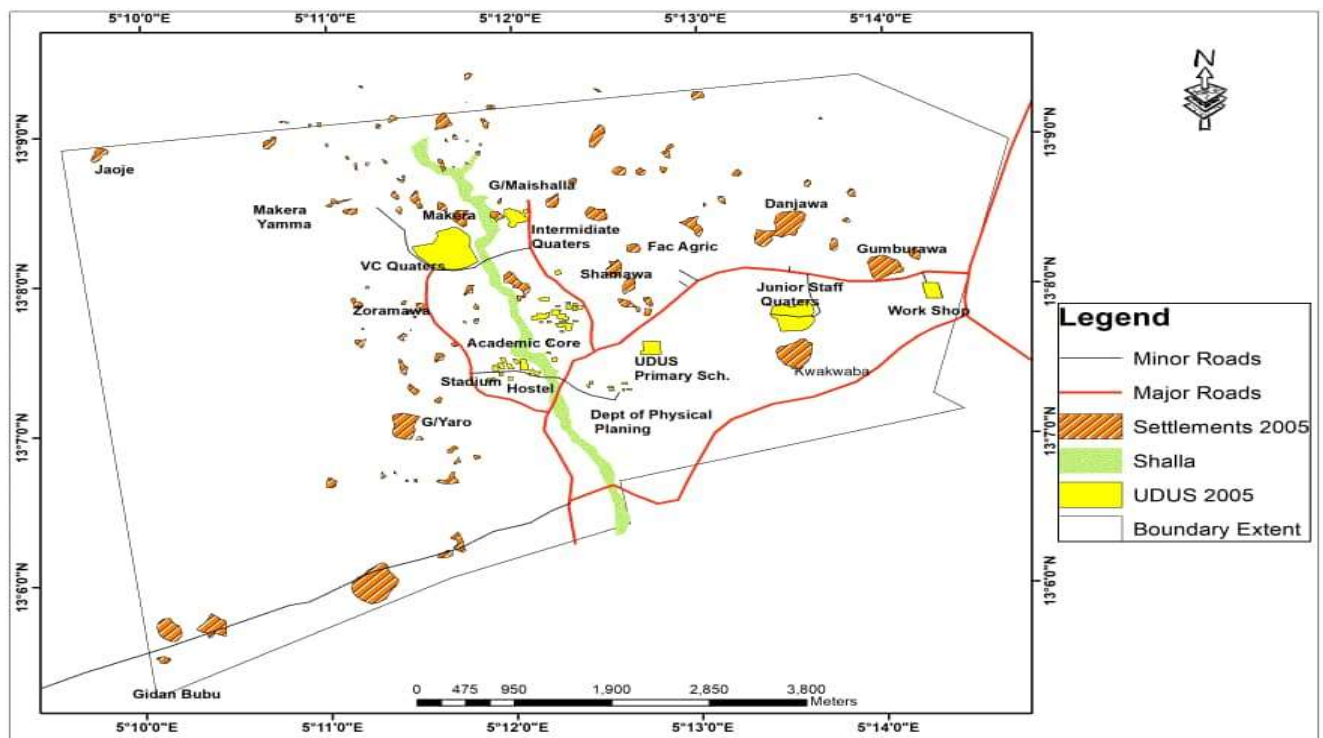


Figure 4c Area covered by the settlements in 2005

Source: Author's Fieldwork (2021)

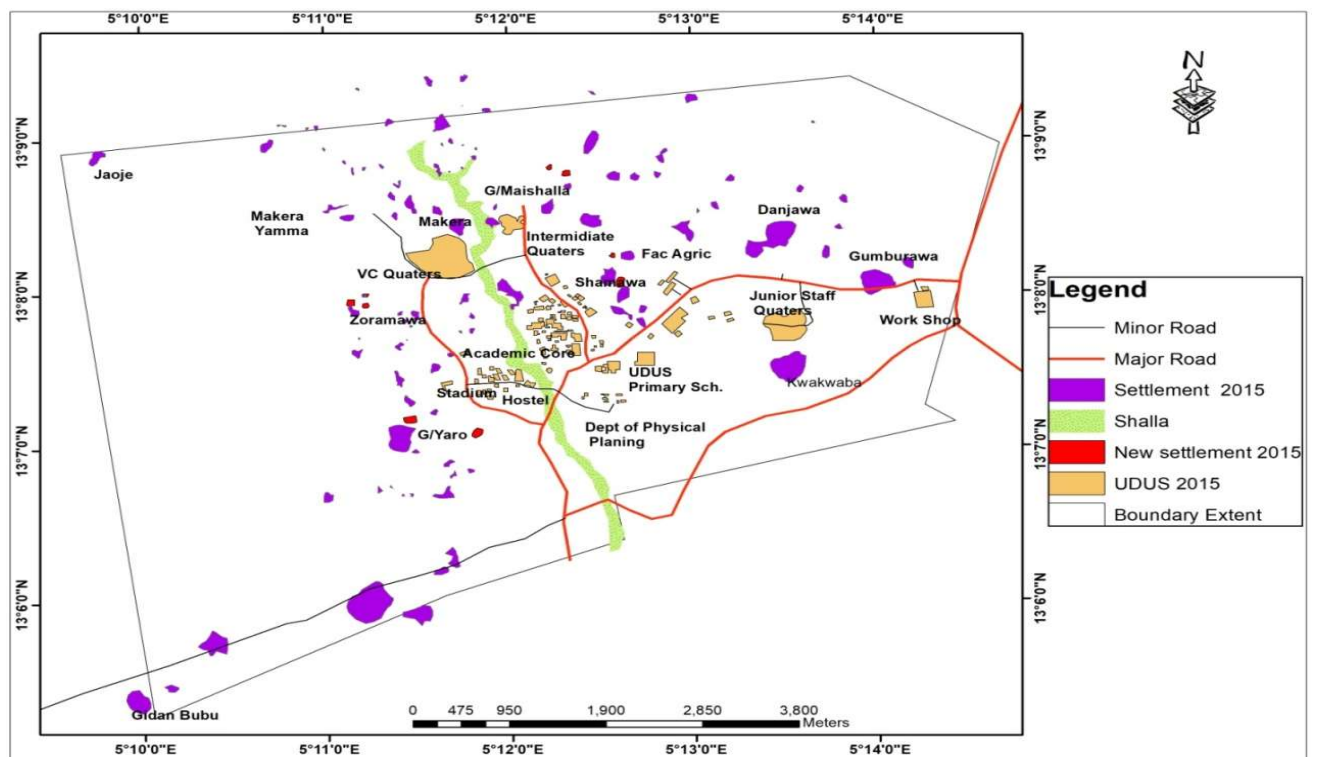


Figure 4d Area covered by the settlements in 2015

Source Authors Fieldwork (2021)

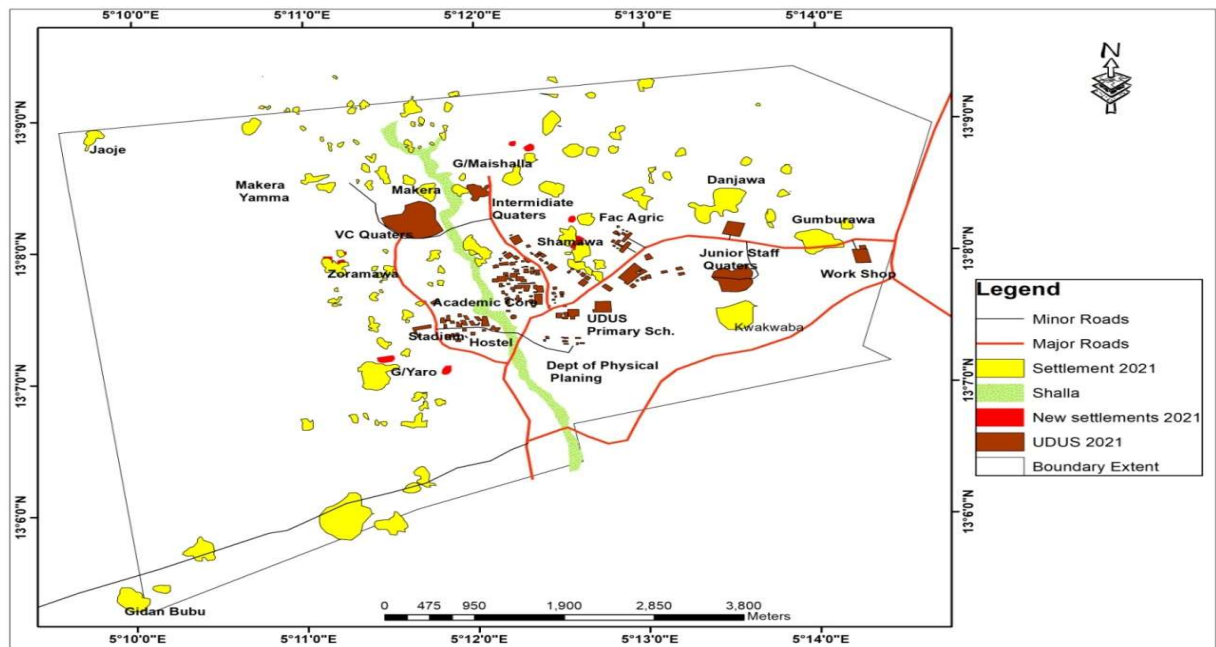


Figure 4e Area covered by the settlements in 2021
 Source Authors Fieldwork (2021)

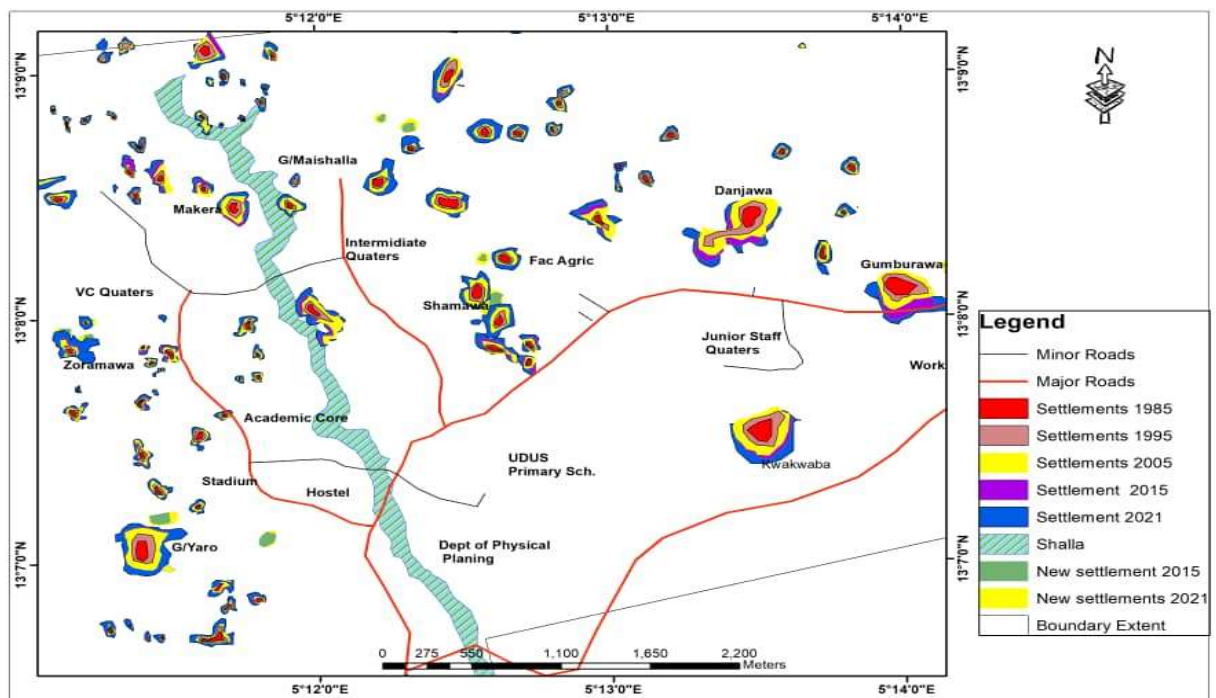


Figure 5 the overlay of the settlements growth from 1985- 2021
 Source: Author's Fieldwork (2021)

Spatiotemporal Analysis of the Settlements within the Main Campus

Figure 6 shows overlay analysis of how the settlements grow over time from 1985 – 2021, while Table 4 shows the level of settlements built-up area and University Built-up area in hectares within

the earmarked area of the University. In 1985, a total of 120.10 hectares of University land was covered by settlements, in 1995 it covers 212.90 hectares, in 2005 441.20 hectares, in 2015 527.95 hectares and in 2021, 808.70 hectares of University land was covered by the settlements.

Table 4 Spatiotemporal Growth of the Settlements in UDUS main campus from 1985 – 2021

Area covered	Built-up Area in(ha) 1985	Built-up Area in(ha) 1995	Built-up Area in(ha) 2005	Built-up Area in(ha) 2015	Built-up Area in(ha) 2021
Settlements	120.10	212.90	441.20	527.95	808.70
University	47.09	50.41	54.79	73.64	81.59
Total built-up area in the University	167.19	263.31	495.99	601.59	890.29
Vacant Land of the University	5,462.81	5,366.68	5,135.01	5,028.41	4,739.70
Total UDUS land	5,630	5,630	5,630	5,630	5,630

Source: Author's Fieldwork (2021)

However the Percentage of the total area covered by the settlements of the University from 1985 – 2021 was depicted in figure 6. In 1985, 2.13% of university land was covered by settlements, in 1995 it was 3.78%, in 2005 it 7.83%, in 2015 9.38% and in 2021, 14.36%.

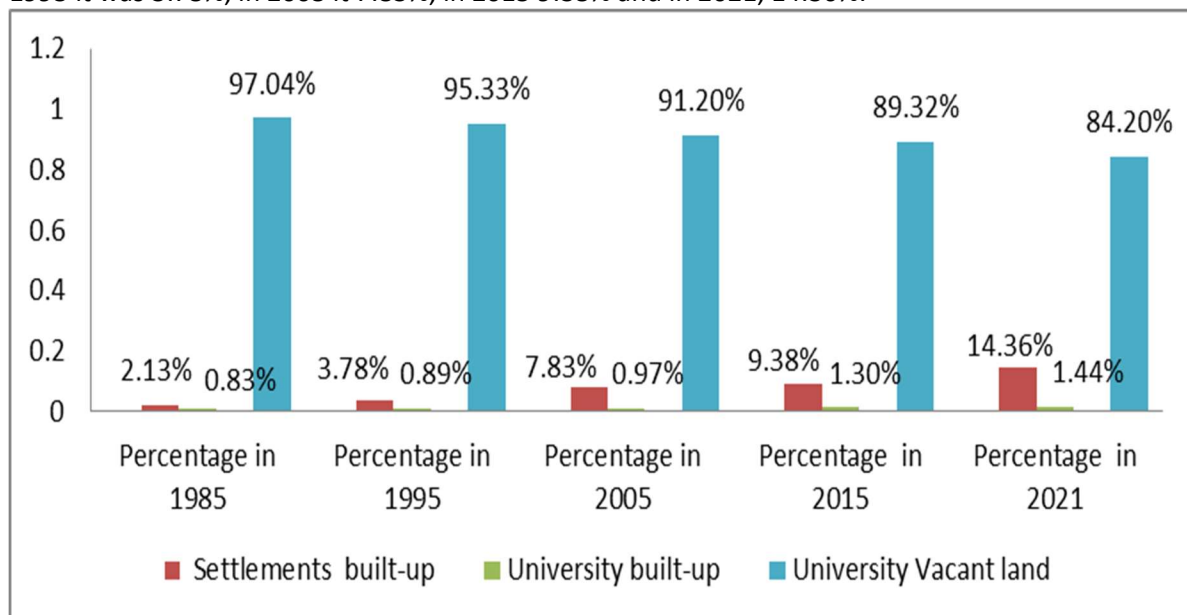


Figure 6 Percentage of the total area covered by the Settlements

Source: Author's Fieldwork (2021)

Magnitude and Rate of Settlements growth in the study area

To assess the magnitude and rate of the settlement's growth, the post-comparison method was employed for each interval of years. 1985 – 1995, 1995 -2005, 2005 – 2015, and 2015 – 2021. The main objective is to quantify the magnitude and rate of settlement growth within the time under review. Table 5 shows the changes in the growth of the settlements in the study area over the years 1985 – 2021. Between 1985- 1995 the magnitude of the settlements was 92.80 hectares,

from 1995- 2005 the magnitude was 228.3 hectares. Furthermore between 2005- 2015 the magnitude was 86.75 hectares and 280.75 hectares between 2015 - 2021 While the annual rate of the settlements growth between 1985 to 1995 was 9.28 hectares, 1995 to 2005 was 22.8, 2005 to 2015 was 8.68, and 2015 to 2021 was 46.79 hectares. These shows how the settlements have been growing within the earmarked area since the establishment of the University

Table 5 Summary of magnitude and rate of settlements growth from 1985 -2021

Years interval	Magnitude in (ha)	Rate per annum in (ha)
1985 -1995	92.80	9.28
1995 -2005	228.30	22.80
2005- 2015	86.75	8.68
2015- 2021	280.75	46.79
1985-2021	688.6	19.10

Source: Author's Fieldwork (2021)

Conclusion and Recommendations

Going by the findings on the growth and proliferation of informal settlements on the university land, it is evidently clear that the university is fast losing grip of its own land. This brought the land right question to the fore. The communities are still contesting the ownership of the land by the university despite the invocation of the compulsory land acquisition clause of the 1979 Land Use Act and the fact that some communities were actually compensated. If this is allowed to continue, the university will sooner or later be embroiled in a series of land related crises, disputes, litigation and violence.

The following recommendations are hereby put forward.

- i. The university management should as a matter of urgency halt all sort of informal development withing the university. Inventory of existing properties within the informal settlements should be taken with a view of earmarking them for compensation.
- ii. No new structure should be allowed to be constructed on the university land. This would help in halting the growth and proliferation of settlement of new structures.
- iii. All form of land sales within the university to outsiders and even staff of the university should be banned. This should be achieved through sensitizing the public of the dangers associated with purchase of university land.
- iv. The university should come up with a time table of gradual relocation of all settlements within the university. Attention should first be focused on those settlements within the academic core areas.
- v. As a matter of urgency, the University authority and Sokoto State Government should find a way of relocating the remaining indigenous people residing within the University permanent site with immediate effects. This will reduce the tension and prevent land crises on the both side and it will prevent conflicts in the future.

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