Adamawa State University Journal of Scientific Research
Volume 7 Number 1, April, 2019; Article no. ADSUJSR 0701021
ISSN:2705-1900(Online); ISSN: 2251-07030 (Print)
http://www.adsujsr.com

Geospatial Assessment of the University of Maiduguri Campus Master Plan

Charles Vashala, Ikusemoran Mayomi and Daura, M.M.
Department of Geography, University of Maiduguri, Borno State

Abstract

The recent funding of the Universities in Nigeria through Education Trust Fund (ETF), and latter Tertiary Education Trust Fund (TETFund) among others has brought about physical developmental projects such as buildings, roads, electricity and water on the campuses. Some of these projects were put in place without regard to the provision of the master plans which often results into the distortions of the master plan. This paper focused on the use of geospatial techniques in assessing the conformity of developmental projects with the University campus master plan from inception till January 2015. The 1984 master plan and the Google image of the University as at January 2015 were acquired, referenced and overlain. This enabled the actual locations of individual structures to be easily and conspicuously identified on the image. The planned landuse types were digitized from the 1984 master plan. The existing structures were also identified, delineated, digitized and calculated from the 2015 Google image. This assessment revealed that as at January 2015, a land area of 351.52 hectares has been developed from the total University's land area of 4131.07 hectares. From the 351.52 hectares, projects on distorted areas occupied a total land area of 79.04 hectares. This means that 22.5% of the already developed lands in the University campus are not in conformity with the master plan. Some of the planned roads were also discovered to have been distorted by physical structures. The proposed gate 3 in the 1978 master plan and the reviewed 1984, has been heavily bastardized because the current Gate 3 and the entrance road through the gate do not conform to the master plan. It was recommended that the University of Maiduguri master plan should always be taken into consideration before any new structure is erected. Regular review of the master plan was also suggested as the University master plan has not been reviewed since 1984. Lastly, it was suggested that all ongoing projects on gate 3 and the roads linking the gate to the University should be according to the master plan. It is hoped that the findings of this study will be useful for the physical planning unit of the University in particular to be conscious of the locations of future projects within the university campus in order to maintain sustainable utilization of the campus land.

Keywords: Distortion; Geospatial; University of Maiduguri; Master plan; GIS;

Introduction

The educational programs outlined by the Third National Development Plan (1975-1980) stressed the establishment of more Universities in Nigeria. Consequently, the Federal Government of Nigeria established the University of Maiduguri in 1975 along with six others situated at Kano, Ilorin, Sokoto, Jos, Port-Harcourt and Calabar. University of Maiduguri which is situated in the outskirts of Maiduguri along Bama Road took off in April 1976 by inheriting the facilities of the then North-East College of Arts and Sciences (NECAS) to become the mono campus of the university (University of Maiduguri Student Handbook 2013).

National University Commission (NUC 2004), in their publication on "procedures and guide for physical development manual for the Nigeria University system in Nigeria" came up with a general guide for the master plan development in Nigerian Universities as a policy for the development of university campuses through the master plan concept and physical development. Many Universities responded immediately, University of Maiduguri being one of them. The first master plan of University of Maiduguri was developed by CRS Design Association Inc in 1978 and revised by Dar AL-Handasah Consultant in 1984.

A master plan is a comprehensive long range plan intended to guide growth and development of a community or region. It is based on public input, surveys, planning initiatives, existing development, physical characteristics, and social and economic conditions (Mabogunje, 2001). According to Mabogunje (2002), the advantage of the master plan lies in its physical components, landuse; circulation, housing, provision of facilities, utilities and services; open spaces and urban design.

The University Master Plan considers the interrelationships of department and of faculties in the location and allocation of shared or of common facilities. The master plan is indeed a complete transaction of the university program in terms of space, (University of Ilorin, 1997). The master plan being based on the dynamic components of the environment requires a continuous review to keep abreast with any changes. This makes the production and implementation of a master plan to be a phased and lifelong exercise (Ogbazi, 1992). Furthermore, Okeke (2002) argues that changing socio-economic conditions in the country has encouraged the review of the University master plans, and that NUC has recommended strategic planning as an alternative planning approach to restructure the university system to match the prevailing circumstances. Therefore, periodic review and evaluation of the stages of development for conformity to the master plan in Nigerian universities cannot be overemphasized, and, when non conformity and its effects are assessed, appropriate measures are expected to be taken by the concerned authorities for sustainable development.

University of Maiduguri Campus is a very large campus where the location and reallocation of structures, road network and drainage in the University campus are put in place. Moreover, recently the Education Trust Fund (ETF) has been contributing a lot to developmental projects in all tertiary institutions in the country. This has led to numerous developmental projects in University of Maiduguri campus such as construction of hostels, faculties, centers, staff quarters and roads. It is therefore necessary to study the conformity or the distortion of the master plan by the ever increasing developmental projects in the University campus for subsequent campus planning and management. The distortion, as found in this study covers all the existing structures in the University from the inception till January 2015. Therefore, all structures that were erected in the University campus after January 2015 were not considered in this paper. Concentrations were made on the distortion of mainly physical structures especially buildings on the campus master plan while other features such as drainage and sewage system of the University master plan for instance, were not considered. The aim of this paper is to assess the distortions on the University of Maiduguri Master Plan by physical structures since inception. While the specific objectives include:

- **(i)** To identify the major modifications of the reviewed 1984 University of Maiduguri master plan over that of the 1978 master plan.
- **(ii)** To identify the major distortions by developmental projects on the University of Maiduguri campus master plan.

Materials and Methods

The Study Area

The University Campus is located between latitude 11°49′7.68″ and 11°47′49.92″ North and longitude 13°11′12.48″ and 13°12′43.2″ East (Figure 1) with average height of about 350m above sea level (Fieldwork 2015). It is situated along Bama road in Jere Local Government Area (LGA) of Maiduguri. According to Yelwa (2012), the inhabitants of University of Maiduguri are basically composed of the staff and students with residential quarters, hostel accommodation, religious centers, staff schools, clubs and sporting, neighborhood, socialization, among others.

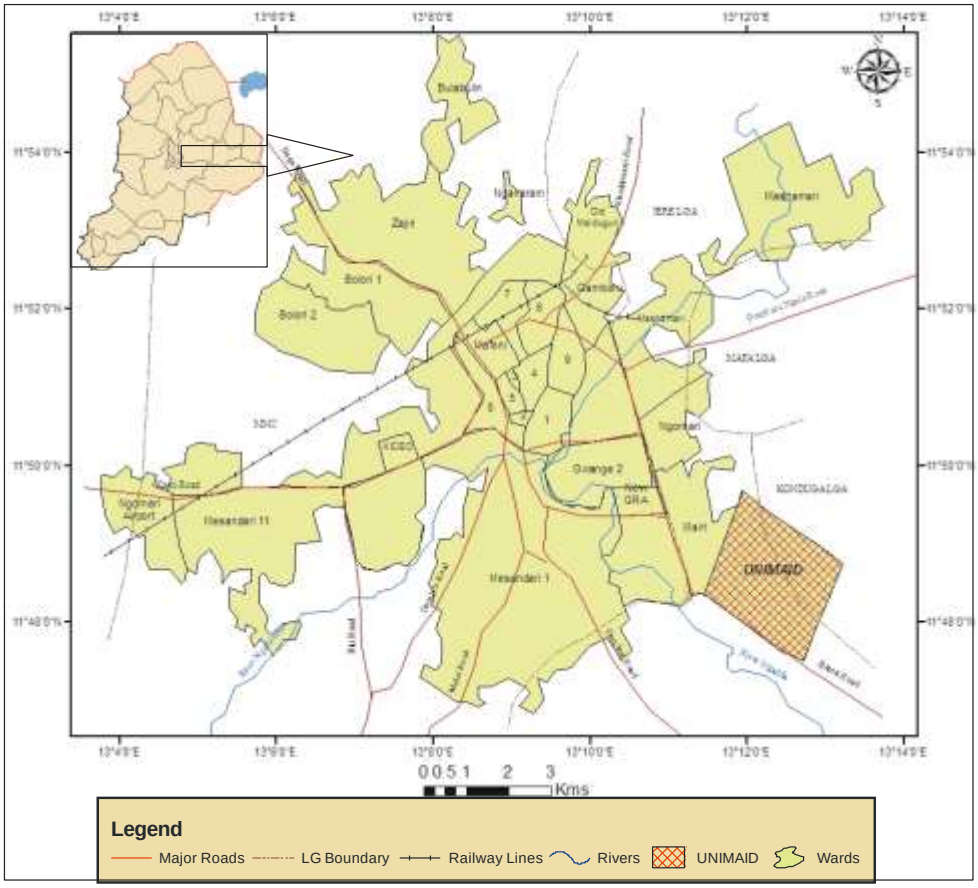
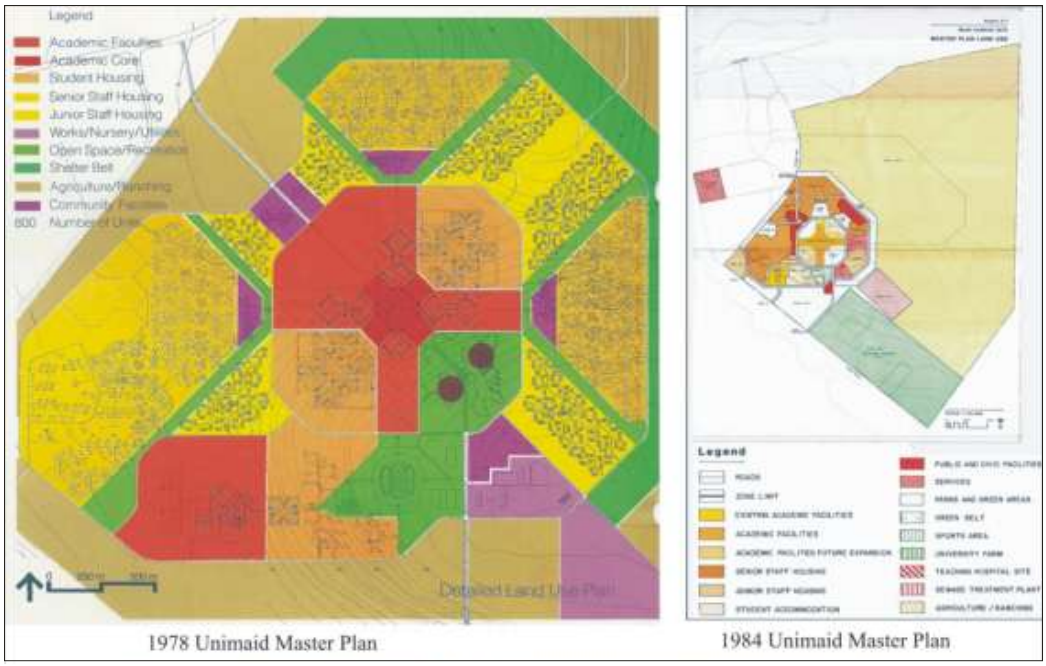


Figure 1: The Study Area

The three main data that were used for this paper were: (i) The 1978 University of Maiduguri campus master plan (Plate 1a). (ii) the 1984 reviewed master plan of the University of Maiduguri campus (Plate 1b) and (iii) the 2015 (January) Google image of the University of Maiduguri campus (Plate 2). While the first two were obtained from the Physical Planning Unit of the Works Department of the University of Maiduguri, the third was derived from Google Earth Pro (online).

The map obtained from the Google was referenced to the existing 1984 reviewed master plan and was resampled to that of the 1978 so as to enable the maps to have same number of rows, columns and other parameters that will make them overlay on each other. Roads and other features of interests were then digitized from the Google map.

The reviewed master plan of 1984 formed the base map for this study. Each item of the master plan such as senior or junior housing, shelter belt, academic facilities, sewage among others were digitized from the two maps. The generated vector maps were then rasterized in order to allow transparency of the two maps and enable the distorted areas to be visible. The areas of each landuse and the distorted areas were then calculated using the area module of the ArcGIS software.



1978 Unimaid Master Plan

1984 Unimaid Master Plan

Plate 1a: Unimaid Master Plan (1978) **Plate.1b:** Unimaid Master Plan (1984)

January 2015 Google Image of Unimaid campus

Plate 2: Google Image of Unimaid Campus in Jan.2015

Results and Discussions

Modifications in the reviewed 1984 master plan

Some modifications were found to have been made from the 1978 master plan in the reviewed 1984 master plan. The identified modifications include:

Shelter belts and Land size

The following modifications were identified in the 1984 revised master plan over that of the 1978. Reduction in area landcover in the previous land for shelter belt, academic facilities and junior staff housing, while senior staff housing were allocated increase in land area. Sewage treatment plant and university farm which were not in the 1978 master plan were allocated in 1984 as shown in Fig. 2.

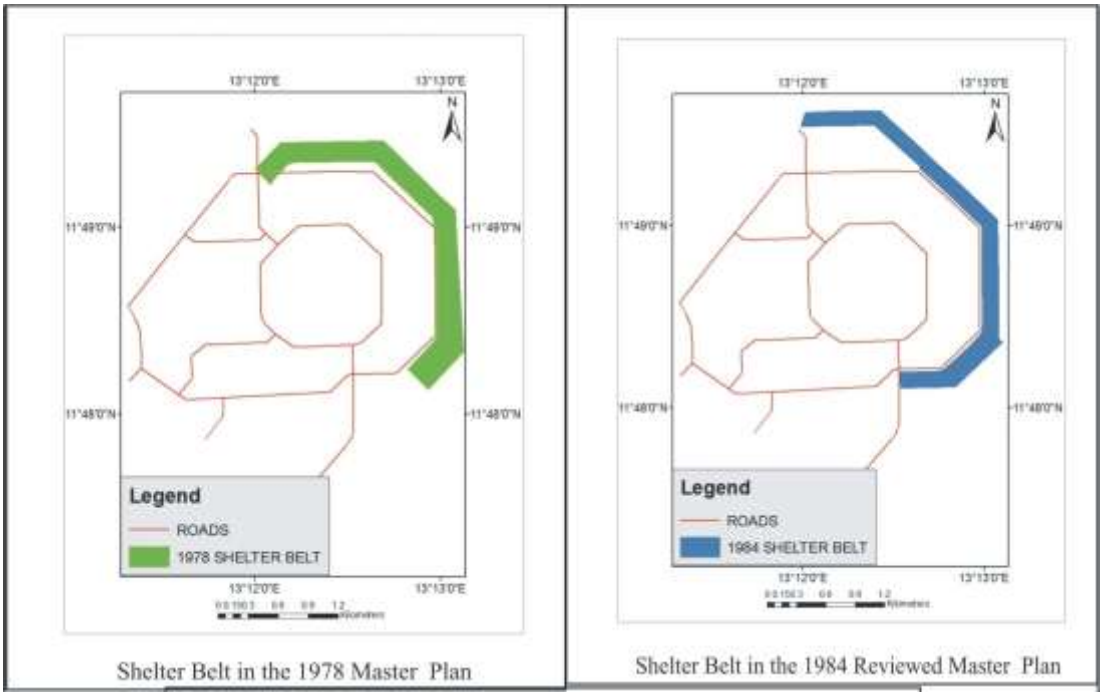


Figure 2: Shelter belt areas in 1978 and 1984 master plans

The land area for shelter belt in the 1978 master plan was calculated to be 87 hectares while the land area for shelter belt in the reviewed 1984 master plan was found to have decreased to 73.79 hectares. The difference in land area for shelter belt between the 1978 master plan and the reviewed 1984 master plan was calculated as 13.21 hectares. Hence, it was concluded that the 1978 master plan placed more importance to shelter belt than the 1984 revised University of Maiduguri master plan.

Land area for Academic facilities

Figure 3 shows the land area designated for Academic facilities in the 1978 and the revised master plan of 1984.

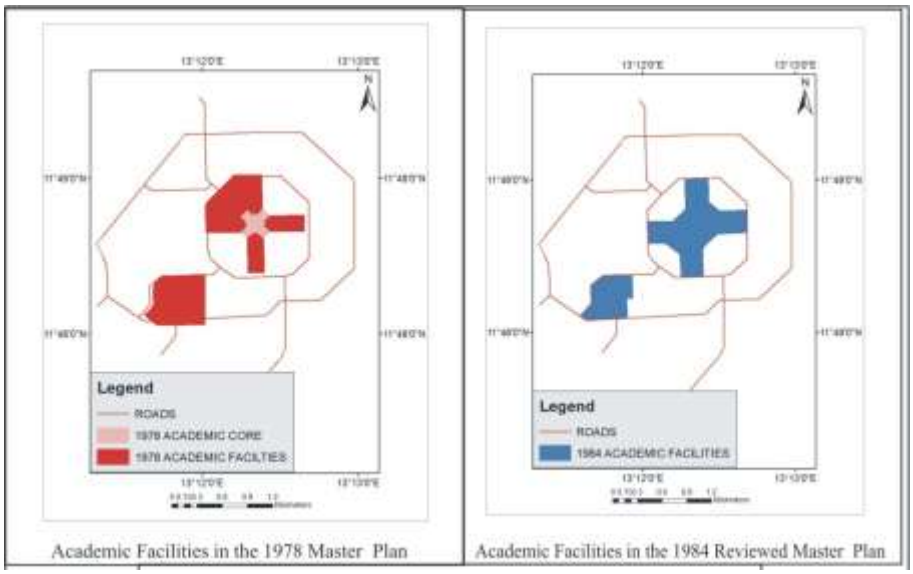


Figure 3: Academic facilities land areas in 1978 and 1984 master plan

The land area for academic facilities plan on the 1978 master plan was 96.37 hectares while that of the reviewed 1984 master plan decreased to 88.10 hectares. The difference in the land area for academic facilities plan between the 1978 and the reviewed 1984 master plan was 8.27 hectares. This might result into difficulty in the expansion of academic structures in the future as the allocated land for such might be insufficient.

Junior staff housing land area

Figure 4 shows the land area designated for junior staff housing in both the 1978 and the revised master plan of 1984.

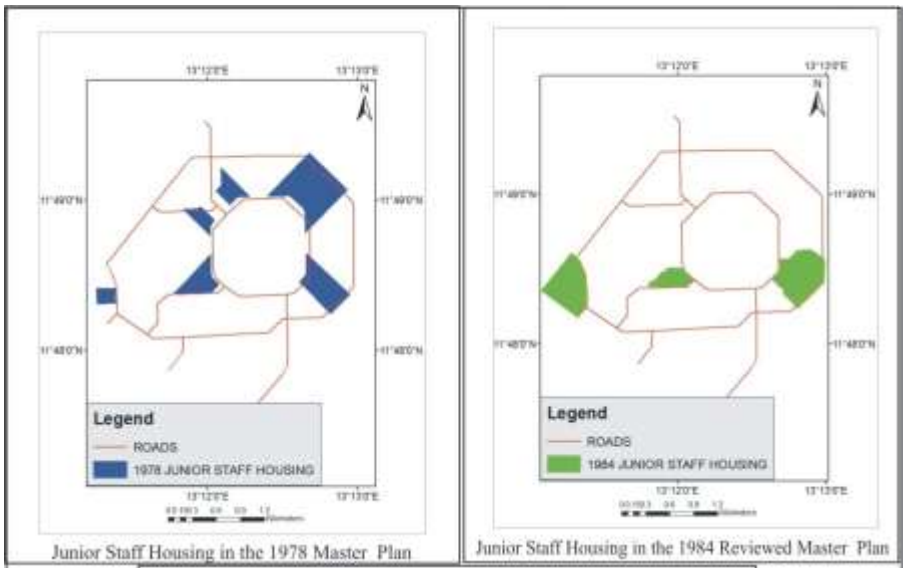


Figure 4: Junior staff housing land areas in 1978 and 1984 master plan

As shown in Figure 4, the land area for Junior Staff housing plan on the 1978 master plan was 90.53 hectares while that of the reviewed 1984 master plan decreased to 65.81 hectares. Hence, the difference in the land area for Junior Staff housing plan between the 1978 and the reviewed 1984 master plan was 24.71 hectares. This shows that the land area for 1984 revised master plan is less than the 1978 master plan. This decision might be to the disadvantage of the university especially at this period when most staff of the university prefer to stay within the campus for security reasons as a result of insurgency. Hence more land area for residential purposes are required.

Senior staff housing Land area

Figure 5 shows the land area designated for senior staff housing in both the 1978 and the revised master plan of 1984

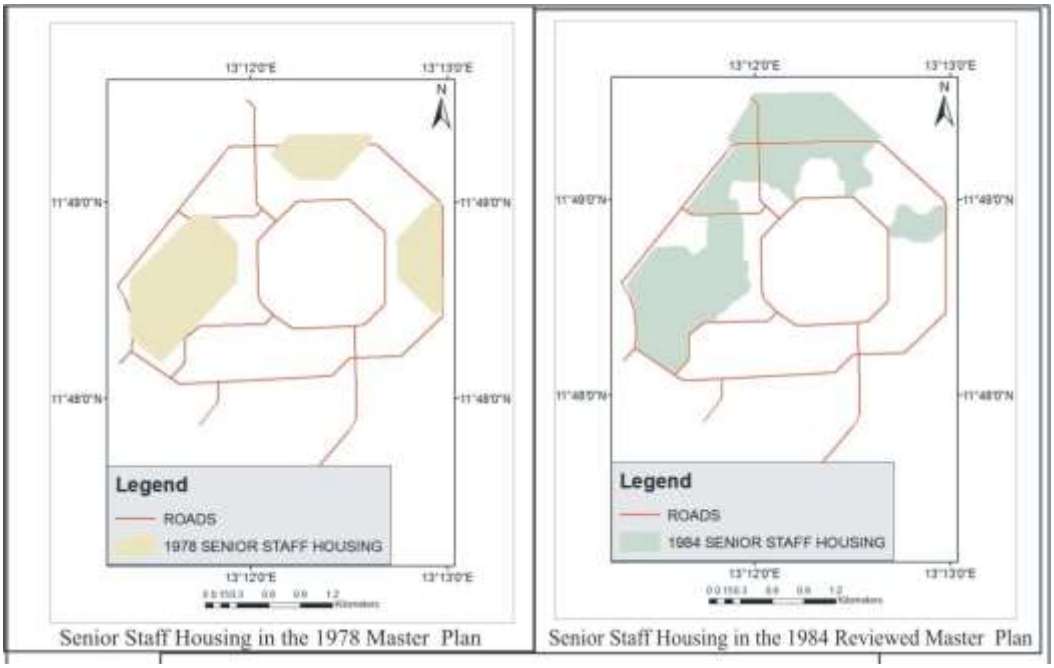


Figure 5: Senior staff housing land areas in 1978 and 1984 master plan

In Figure 5 the land area for Senior Staff housing on the 1978 master plan was 150.23 hectares while that of the reviewed 1984 master plan increased to 225.52 hectares. This means that a total land area of 75.29 hectares have been added to Senior Staff housing plan on the reviewed 1984 master plan. The implication is that more land area is available for senior staff housing development to meet the housing needs of the senior staff housing demand. For instance, ten (10) Professorial quarters and thirty six flats were constructed to house many senior staff of the university since the beginning of insurgency.

Sewage Treatment Plant and University Farm Land Area

It was obvious in the 1978 University of Maiduguri master plan that no provision of land area for sewage treatment plant and university farm was made. However, the reviewed 1984 master plan created 78.84 hectares of land for sewage treatment. The University farm around gate three covering a land area of 528.49 hectares was also created as shown in Figure 6.

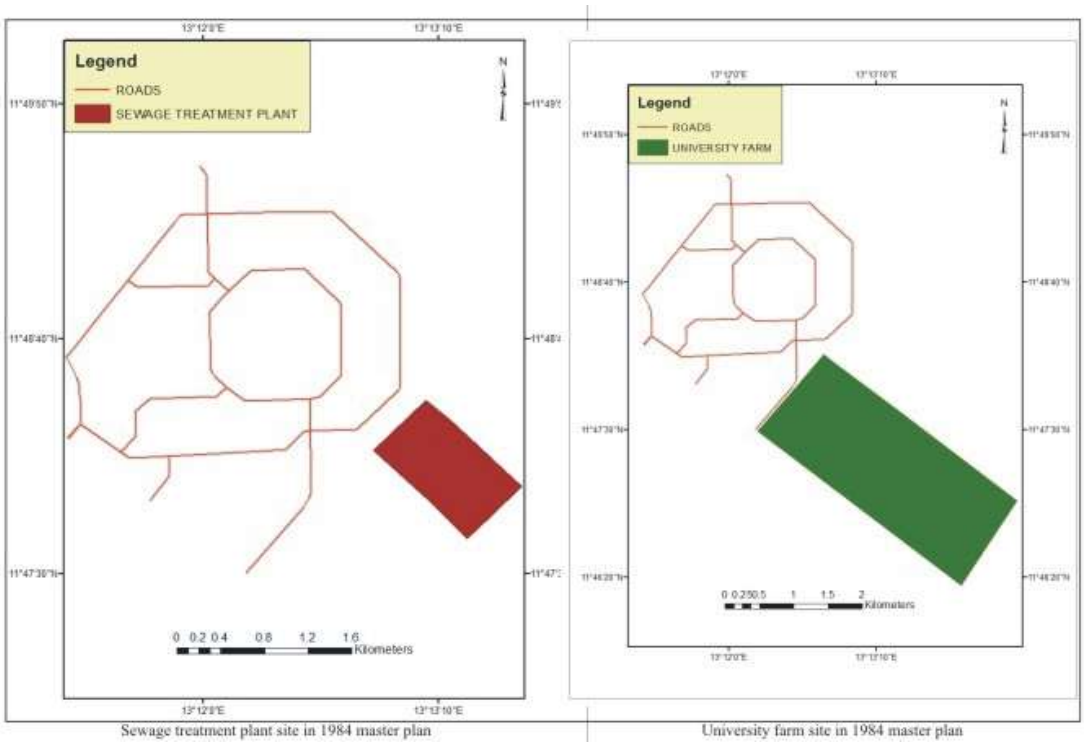


Figure 6: Sewage treatment plant and university farm land areas in 1978 and 1984 master plan

Summary of Modifications of the Master Plan

Table 1 shows the summary of the modified landuse types as well as the area in hectares in the 1984 reviewed master plan.

Table 1: Summary of the modifications of the reviewed 1984 from the 1978 Master Plan

Land Use	1978 Area (Ha)	1984 Area (Ha)	Remark
Shelter Belt	87	73.79	Reduction in Land Area
Academic Facilities	96.37	88.10	Reduction in Land Area
Junior Staff Housing	90.53	65.81	Reduction in Land Area
Senior Staff Housing	150.23	225.52	Increase in Land Area
Sewage Treatment Plant	0	78.84	New Land Area
University Farm	0	528.49	New Land Area

Major Distortions on the landuse of University of Maiduguri Master Plan

Some parts of the master plan have been distorted by the physical developments in the campus.

Distortion of Academic Facilities and Green Belt

Figure 7 shows the major distortions that were found on the academic facilities plan area.

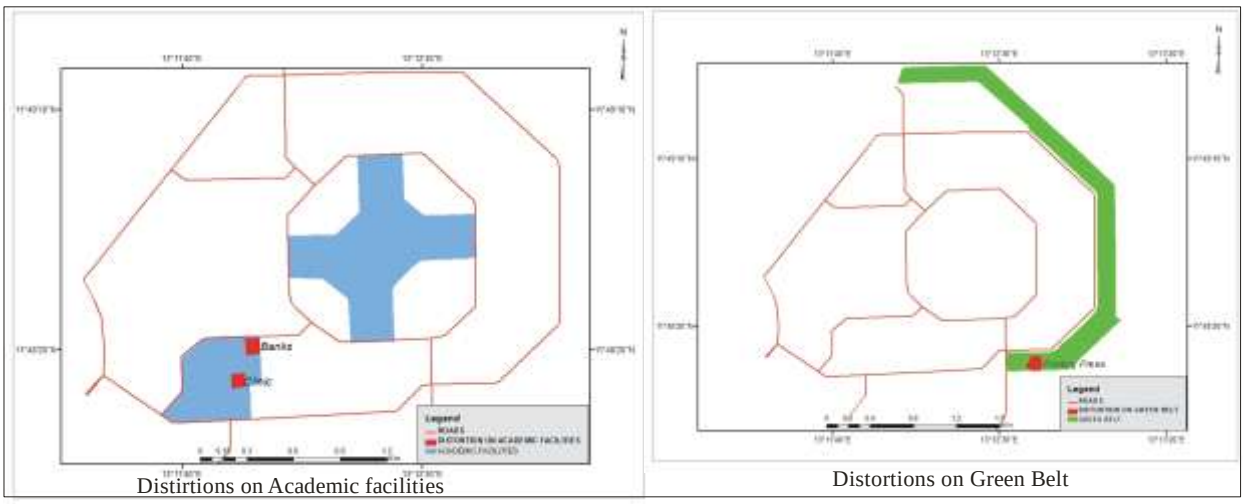


Figure 7: Distortions of Academic and Breen Belt areas as at 2015

The following distortion on the area for academic facilities were identified (Fig. 7): (i) the University of Maiduguri Health Care Center (Clinic) (located at old academic area, close to the Department of English) (ii) Banks: Eco Bank, Fidelity Bank, and Skye Bank which are all located along the major road that leads to the complex area, opposite Junior Staff Quarters before the Central Mosque. The land area planned for academic facilities was 88.10 hectares and the distortions on it covered 1.56 hectares of land.

The only distortion on the Green Belt was the University of Maiduguri Printing Press which is located along the road to the Works Department. The land area planned for green belt covered 74 hectares and the distortion on it (University of Maiduguri Printing Press) was 1.52 hectares. This finding conforms to Idowu (2012) who used GIS techniques to map green area in Ahmadu Bello University main campus. The findings revealed that green areas were disappearing due to improper planning.

Distortions of Senior and Junior Staff Housing Land Area

Figure 8 shows the distortions on the senior and junior staff housing areas.

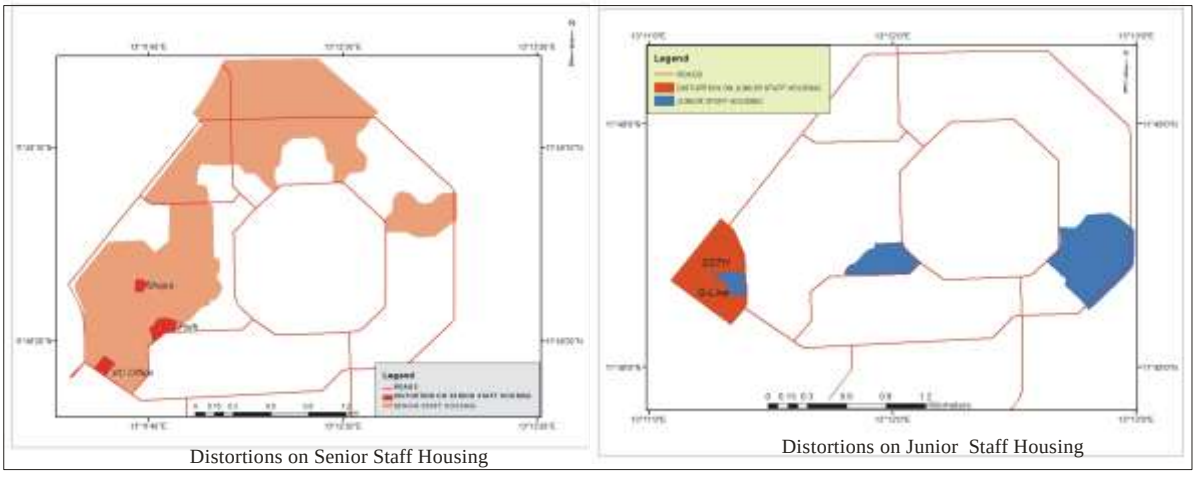


Figure 8: Distortions on senior and junior staff housing land areas as at 2015

Out of the 225.52 hectares of land planned for Senior Staff housing, 4.4 hectares was distorted by the following:

1. Park (Love Garden) located opposite Fire Service Unit, around SSTC staff quarters.
2. Alliance France′ situated opposite H-Line and surrounded by commercial shops.
3. Vice-Chancellor's Office complex located close to Gate 1 roundabout.

Figure 9 shows that the only distortion on the area planned for Junior Staff Housing was the Senior Staff Quarters (SSTH and G-LINE situated around Gate 1 and Gate 4 respectively). The Senior Staff Quarters covered 18.63 hectares of the 65.78 hectares that was planned for Junior Staff Housing.

Distortions of Sports Arena and Students' Accommodation Area

Figure 9 indicates the distortion on the land area designated for Sport Area and students' accommodations

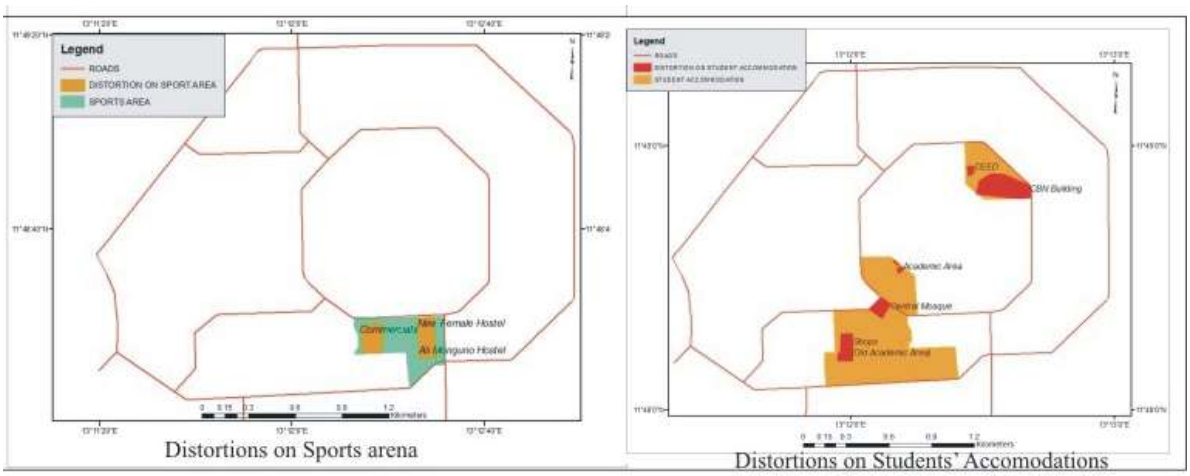


Figure 9: Distortions on sports arena and students' accommodation land area as at 2015

The distortions found on Sports land area are:

1. Shettima Ali Monguno Female Hostel and New Female Hostel (under construction), they are both situated opposite Sardauna Male Hostel.
2. Students Commercial Area located beside Sports Complex.

The distortion on area that was planned for Student Accommodation (Figure 9) includes:

1. New building (under construction) behind Center for Arid Zone Studies by CBN.
2. Center for Entrepreneur and Enterprising Development located behind the Faculty of Engineering.
3. Central Mosque situated opposite Junior Staff quarters near Fidelity bank.
4. Commercial Shops at Old Academic Area.
5. Part of Academic Area at Complex around MPH.

Distortion on Recreation/Park/Garden Area

The recreation/park/garden was one of the planned areas that were heavily distorted as shown in Figure 10. The land area planned for recreation/park/garden covers 239.47 hectares and the distortion on it covers 38.78 hectares. The distortions on recreation/park/garden are bound to affect the structural standard which the university planned to achieve. Simeon, Adeboye and Oloke (2013) had emphasized the need for sustainable university campus design to fit environmental space, boost social and economic growth sustainably in the contemporary Nigeria. Charles (2015) noted that indiscriminate vehicular and walkways, commercial centers and other structures that are not in conformity with the 1984 revised master plan has deformed the aesthetic outlook of the University of Maiduguri Campus.

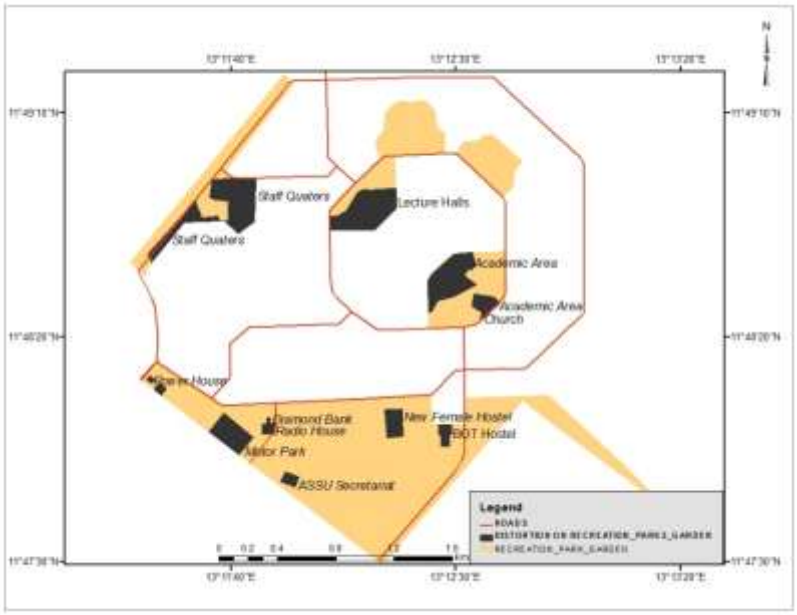


Figure 10: Distortion on Recreation/Park/Garden as at 2015

The distortion on the areas planned for Recreation/Park/Garden (Figure 10) include: (a) Old and new power house at Gate 1, (b) Department of Mass Communication Radio House, (c) New Female Hostels (on construction by TETFUND), (d) BOT Female Hostel, (e) Part of NH Quarters, (f) New Staff Quarters around Gate 5, (g) Part of the churches, (h) Diamond Bank, (i) University of Maiduguri Motor Park, (j) ASSU Secretariat, (k) TTB Lecture Hall, (l) Center for Disaster and Risk Management, (m) Fishery ponds and offices around the pond, (n) Department of Geography, (o) GIS laboratory/Weather Station (behind the Department of Geography), (p) Department of Geology, (q) ETF 2005 and 2009, (r) MBK lecture Hall, (s) Nursing/Radiography lecture Halls.

Distortion of University farm and road networks

Figure 11 indicates that the distortion on the area planned for University farm and road network.

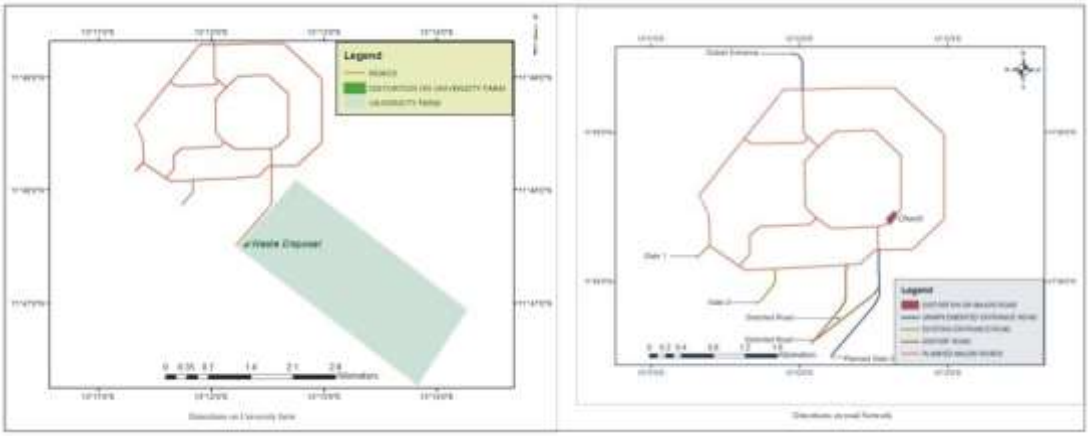


Figure 11: Distortion on University farm and road network as at 2015

The only distortion on University Farm is the waste disposal site around Gate 3. According to the 1978 master plan, the entrance road for vehicles into the University of Maiduguri campus was supposed to be through Gubari around Gate 5 and Gate 3 on Bama road. However, today the vehicular entrance into the University of Maiduguri campus is through Gates 1, 2 and 3 which are all located along Bama road. The current Gate 3 as shown in Figure 12 does not conform to its actual location in both the 1978 and 1984 University of Maiduguri master plan. The planned Gate 3 road (shown with blue line in Figure 11) supposed to run from Bama road and link the road that passes through the churches. However, the existing Gate 3 starts from Bama road with two arms. The first runs to the right and join the planned Gate 3 road, while the left arm joins the road that runs from Gate 1 towards Works Department just adjacent to Murtala Hall (Girls Hostel). Another distortion found on the planned major road was the churches built around the Chapel of Grace. The distortion blocks the major road that leads to Center for Entrepreneur and Enterprise Development from the Church Junction.

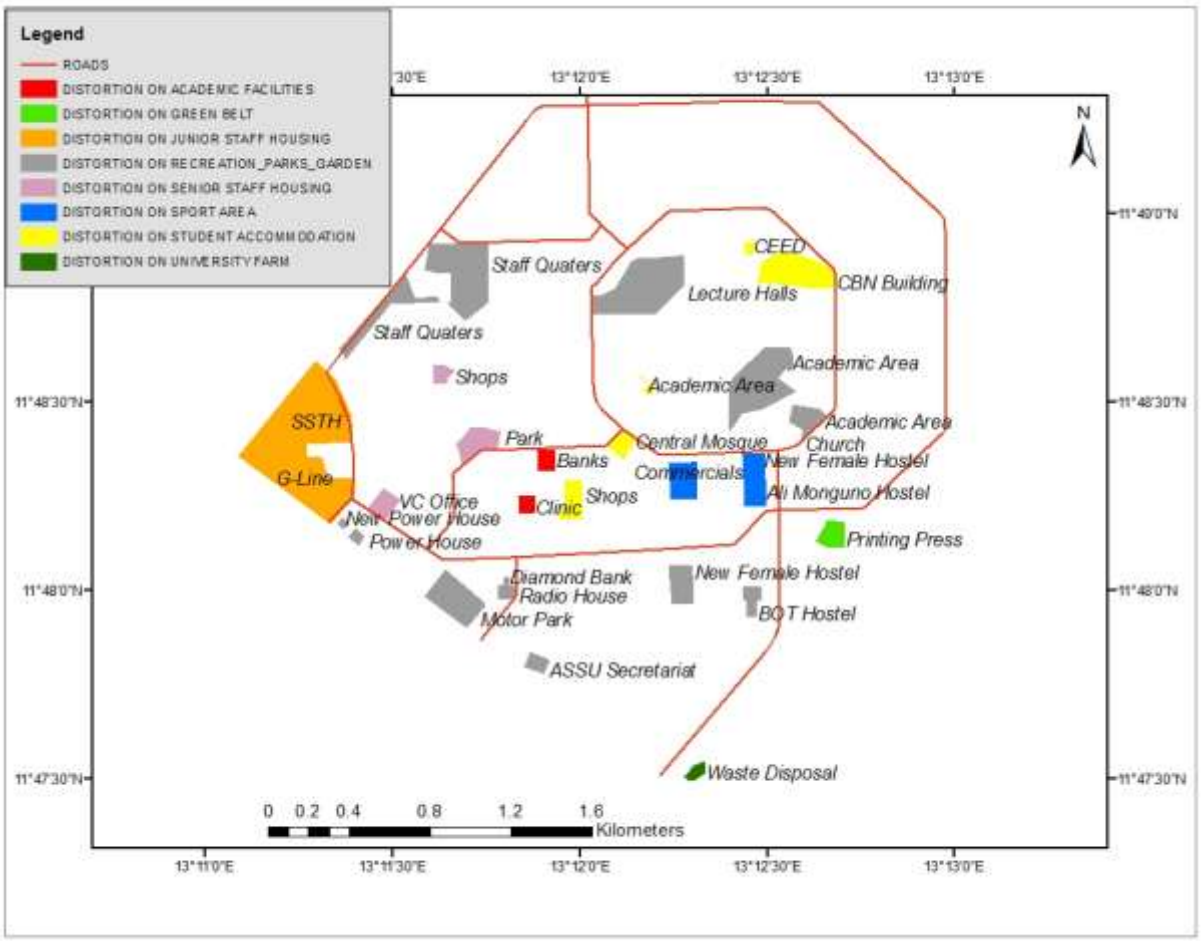


Figure 12: All Distortion on University of Maiduguri Master Plan as at 2015

Table 2: Level of Distortion on Planned Land Areas

S/N	Name	Planned Area (Ha)	Planned Area (%)	Distorted Area (Ha)	Distorted Area (%)
1	Academic Facilities	88.10	2.13	1.56	1.77
2	Green Belt	74	1.79	1.52	2.05
3	Junior Staff Housing	65.78	1.59	18.63	28.32
4	Public and Civic Facilities	33.37	0.81	0	0
5	Recreation-Park-Garden	239.47	5.81	38.78	16.19
6	Senior Staff Housing	225.52	5.46	4.4	1.95
7	Sport Area	15.69	0.38	5.28	33.65
8	Student Accommodation	59.34	1.44	8.31	14.00
9	University Farm	528.49	12.77	0.56	0.11
10	Services	61.03	1.48	0	0
11	Sewage Treatment Plant	78.84	1.91	0	0
12	Agric-Open Space	2661.44	64.43	0	0
	TOTAL	**4131.07**	**100**	**79.04(1.91%)**	

Source: Calculated from Google Earth Pro Image (2015) based on the University of Maiduguri Reviewed 1984 Master Plan

As presented in Table 2, the University of Maiduguri campus has about 4131.07 hectares of land. The total landuse that were distorted in the campus covered 79.04 hectares which is almost double the findings of Yelwa (2012) who reported that 43.14 hectares of land area of University of Maiduguri had been distorted as at 2012. Moreover, sports arena suffered the most distorted land area, while junior staff housing, recreation and parks as well as students accommodation areas have also been highly distorted. The rapid rise of distorted areas might be attributed to the rapid developmental projects in the University campus which are mostly sponsored by ETF/TETfund. Figure 12 and Table 2 clearly show that the landuse plan with the highest level of distortion was the Recreation/Park/Garden (38.78 hectares) followed by the Junior Staff Housing (18.63 hectares). Landuse plan like Public/Civic Facilities, Services, Sewage Treatment Plant, and Agric/Open Space did not record any distortion.

Reasons for Distortion of the Master Plan

Personal interview was conducted with the Physical planning Department to find out the reasons for the distortion, and the following among others were identified:

(i) Distortion on Maiduguri City's Master Plan

Some distortions that were made on the city of Maiduguri master plan have forced the University's master plan to be distorted. For instance, Bama Road was planned to pass through the present University's Gate 5 at where the University's main gate was to be established. Therefore, the Main Gate of the University has to be shifted to current Bama Road due to changes in the city's master plan.

(ii) Delay in the Review of the University Master Plan

The inability of the University to review the master since 1984 has made some of the decisions on the master plan to be obsolete. Some structures were planned to be choked up in specific areas without considering the effects on the environment, safety and aesthetics. The senate building for instance was to be sited between the Faculties of Social Sciences and Agriculture which is already choked up. Moreover, the place is considered too close to academic areas which may not be too secured for such purpose. Lecture theaters were also constructed strategically to be close to the faculties and student's hostels so as to reduce the distances from staff offices and hostels as against what was obtained in the master plan.

(iii) Security Challenges

The University's master plan was made when there was no security challenges in Maiduguri city. However, due to these challenges in the city since 2007, some of the structures that were constructed within this period have to be sited in places that were considered safer than their initial planned locations. For instance, banks, places of worships and students' hostels were sited close to each other to collectively beef up security in their vicinities.

Conclusion

While it is a thing of joy to have developmental projects such as hostel accommodation, staff quarters, lecture theaters/classrooms, buildings for centers and faculties among others in the campus, it was however revealed in this study that most of the projects are not in conformity with the master plan of the university. As at January 2015 land area of 351.52 hectares has been developed from the total University's land area of 4131.07 hectares. Out of the 351.52 hectares, projects on distorted areas occupied a total land area of 79.04 hectares. This means that 22.5% of the already developed lands in the university campus are not in conformity with the master plan. Some of the planned roads were also discovered to have been distorted by physical structures. The planned Gate 3 has been heavily bastardized because the current Gate 3 does not conform to the master plan. It is however uneconomical to demolish all the structures that distorts the master plan, but since the existing road linking Gate3 to the University has not been fully developed, the planned Gate 3 road can still be maintained by removing the existing Gate 3 and construct a new one according to the plan. Future researchers should embark on the distortions of sewage, drainage system, vegetation and roads that are not in conformity with the University of Maiduguri master plan.

Recommendations

The use of GIS techniques for decision making in environmental monitoring and planning has become a necessity for environmental planners as demonstrated in this study. The following recommendations are made:

1. The University of Maiduguri management should encourage some staff from the Department of Works, Physical Planning and Development Unit to acquire GIS training which will assist in constant monitoring, planning and management of structural developments in the University of Maiduguri campus.
2. The University of Maiduguri Master plan should always be consulted before any new structure is erected so that every new structure will be built according to plan.
3. There is need for regular review of the University of Maiduguri master plan in line with the previsions in the University Development Plan. This should be done in order to meet the needs of modern world as the University master plan has not been reviewed since 1984 which is about 31 years ago.
4. It is suggested that all ongoing projects on the current Gate 3 and the roads linking the gate to the University should be executed as specified in the master plan.

Reference

Agwu E.I.C. (1998). '*Politics and master planning in Nigeria*' in Ilesanmi, F.A (ed); Master planning approach to physical development: The Nigerian experience, Paraclete pub., Yola.

Charles, V. (2015): Distortions on University of Maiduguri master plan: GIS approach. An unpublished dissertation for bachelor degree in science, Department of Geography, University of Maiduguri.

Hewitt, M. A. (2008). *Biography: Denise Scott Brown.* Microsoft @ Student 2008 (DVD). Redmond WA: Microsoft corperation, 2007. Retrieved Jan 5, 2016

Idowu E. O. (2012), Green area mapping of Ahmadu Bello university main campus, Zaria, Nigeria using remote sensing (Rs) and geographic information system (GIS) techniques. *Journal of geography and regional planning.* . 5(10);pp. 287-292. DOI: 10.5897/JGRP12.024. ISSN 2070-1845.

Jiriko K. (2008). *Urban master planning paradigm in Nigeria: what future? In* Development control standards and regulations for development in the Jos-Bukuru metropolitan area. Plateau state, Nigeria. Jos metropolitan development board. 2008. prints+graphics Jos. P 378.

Mabogunje A.L. (2001). *Abuja*: The dream, concept and the product, in ministry of Federal Capital Territory, The review of Abuja master plan. Abuja.

Mabogunje A.L. (2002). *Knowledge, planning effective urban governance, proceeding of the N.I.T.P*. Annual conference, Ilorin, October/November.

Nigeria University Commission {NUC} (2004). *Procedures guide and physical development manual for the university system in Nigeria.* Physical planning and development department. National universities commission, Abuja. Pg. 178-208.

Okeke D.C. (2002). *Urban master planning approach in Nigeria*; A case for reconsideration, in Amole et al (eds) the city in Nigeria: Perspectives, issues, challenges and strategies, proceedings of a National Conference, Faculty of environmental design and management, O.A U. Ile-Ife, October.

Ogbazi, J. U. (1992) *Comprehensive planning and master plan making.* In Umar, A. A., Hardo,

N. U. Terhemba J. and Machoko, E. U. (2005). Updating of University of Maiduguri base map. Undergraduate project of geography department, Faculty of social sciences, University of Maiduguri.

Simeon, R.T., Adeboye, A.B., and Oloke, O.C . (2013): Campus design and symbolic order in contemporary Nigeria: A case study of Covenant University Campus, Nigeria *Scottish journals of arts, social sciences and scientific studies.*1(1);17-24

University of Ilorin (1977) *Master plan. Ilorin University* – National Universities Commission;CONCARPLAN ENPLAN Group. Pg. 3.P. 9&10.

University of Maiduguri Student Handbook 2013. University of Maiduguri Printing Press.

Yelwa M. (2012), *Assessment of the university of Maiduguri campus master plan implementation using GIS Tool*. M. Sc. Thesis. Department of Geography; Faculty of social sciences, University of Maiduguri.