On the Development of Cadastral Information System for Part of Kofare Government Residential Area of Jimeta-Yola in Adamawa State of Nigeria.

Orisakwe K.U. and Bakari G.(Nigeria)

Keywords: Parcel, Land Records, Cadastre, Database, Certificate of Occupancy (C-of-O)

SUMMARY

The emergence of the modern technology of Geographic Information System (GIS) has been viewed by many as the best that has happened to Surveying and Mapping both in theory and practice in recent times. The cadastre which had been in analogue form is not left behind. This paper, therefore, has to do with the development of a parcel-based Cadastral Information System (CIS) of part of Kofare Government Residential Area (GRA) of Jimeta – Yola. Analogue layout plan and the analogue topographical sheet of the study area were acquired, scanned, digitized and Georeferenced in Joint Photographic Expert Group (JPEG) format and imported into AutoCAD 2010 software. Universal Transverse Mercator (UTM) coordinates of four points in the area of study were obtained with a Global Positioning System (GPS) equipment. Parcel, Road and Boundary layers were created in AutoCAD environment. The Arcview 3.2a software was used to polygonize the parcel theme and converted to shapefile. Spatial and Attribute database were created and linked through a linkage mechanism with an identifier number. The database was integrated with some multimedia information. The system generated the c-of-o with photograph and some vital information of the plot owner. Queries were generated to evaluate and test the efficiency and showcase the efficacy of the CIS system. Useful recommendations were made to governments and agencies concerned in land administration and management to adopt the system and useful suggestions made on implementation strategies.

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1. INTRODUCTION

Most human activities and developmental efforts are based on land. Therefore, a systematic record of land and rights in land are vital for public administration, planning, land development and private transactions in land. The increasing growth in rural population and the massive migration of people to the cities (especially in the developing countries) have put increasing pressure on rural and urban lands. Therefore, a systematic record and rational use of the land should be of prime importance to planners and policy makers. Again, accurate and efficient land data records are a necessary tool for appropriate resources management and tackling of environmental problems. All these emphasize the need for proper records of land parcels and their ownership. (Dale and Mclaughlin, 1988)

An information system may be formally defined as a combination of human and technical resources, together with a set of organizing procedures that produces information in support of some managerial requirements (Dale and McLaughlin, 1988). Data are raw collections of facts. Data relating to Land may be acquired and held in alphanumeric form (for example written in notebook and surveyors' field books) or graphically (for example as maps or aerial photographs), or digitally (for example, using electronic methods). To become information, the raw data must be processed so that it can be understood by a decision or policy maker and administration.

The operation of a Land Information System (LIS) includes the acquisition and assemblage of data, their processing, storage, and maintenance; and their retrieval, analysis and dissemination. The usefulness of such a system will depend upon up-to-datedness, accuracy, completeness, and accessibility, and also upon the extent to which the system is designed for the benefit of the user rather than for the producer of the information (Dale and Mclaughlin, 1988).

A system of records or inventory of ownership and interest in land parcels is called a cadastre or cadastral system. A land parcel refers to an area of land which may be identified as a unit for information recording such as residential plot of land. A cadastre is supposed to provide statistics of all issues relating to ownership, use and status of landed property in a given geographical area. The American Congress on Surveying and Mapping (ACSM) in 1972 defined cadastre as an official register of real estate used in apportioning taxes. Zeimann (1975) defines cadastre as a complete and up-to-date official register or inventory of land parcels, containing ownership, location, area and land use information. According to Dale (1976), a cadastre is a general systemic and up-to-date register of information about land

parcels including details of their area, value and ownership. All these definitions point to the fact that land ownership information is an important mandate of a cadastre.

The principal function of a cadastre is the provision of data concerning such matters as land ownership, value and use. It may for example, provide the information component of land registration. This is the process whereby various rights in defined units of land are officially recorded. The information in a cadastre is collected, stored, referenced and retrieved primarily at the land parcel level. Other referencing systems, such as coordinates, may then be added to facilitate data manipulation and the exchange of information with other systems.

The cadastral records consist of maps and text, these are linked by a unique property identifier such as the postal address, the coordinates of the parcel's centroid or a sequential number assigned on a district by district basis. Frequent users of the cadastre range from existing or prospective land owners to lawyers, surveyors, valuers, real-estate managers, and other agencies at all levels of government.

The classical cadastre or method of keeping land records and land register using paper or cards has many inherent problems. It is not only inefficient but also cumbersome to operate. With the introduction of Cadastral Information System (CIS) which can simply be seen as Geographic Information System (GIS) can obviate most of the disadvantages of the classical method of keeping land records.

2. AREA OF STUDY

The study area, Jimeta, is located between latitude $9^0 10^{'}$ N to $9^0 15^{'}$N and longitudes $12^0 11^{'}$ E to $12^0 17^{'}$E. Jimeta, a twin city to Yola town, is the seat of Yola North local Government Headquarters and the Adamawa State capital of Nigeria (see fig. 1 below).
Like any other Nigerian city, Jimeta comprises of so many land use types ranging from institutional, commercial, and residential. The city is clearly stratified in terms of population densities. These are low, medium and high density areas. The low density areas are well planned units where government officials reside while medium and high density areas are made up of common people with little or unplanned buildings.

In recent times, Jimeta has risen as the premier commercial, industrial and transportation urban area of the north-eastern Nigeria. The rapid growth of Jimeta, particularly within the past 30 years, has made it one of the fastest growing metropolitan areas in Nigeria. The population of Jimeta was 73,080 as of 1991, the population increased significantly by 69% between 1973 and 1991 and 58% between 1991 and 2006 (NPC 2006).

The current city jurisdiction came into effect in 1996 as a result of the creation of Yola North Local government Area with eleven Political wards. These wards are Yelwa, Limawa, Ajiya, Alkalawa, Gwadabawa, Lugere, Demsawo, Jambutu, Nasarawo, Doubeli, and Karewa. It was discovered that Jimeta started growing faster as an urban centre from the middle of 1970s when Yola was made the headquarters of the defunct Gongola State in 1976. Even

though Yola has been the nominal headquarters of Gongola and later Adamawa State, but virtually all the government offices and other official buildings are found in Jimeta. That is to say the actual seat of Adamawa State is in Jimeta.

The city expanded from 33, 133 hectares in 1986 to 51,578 hectares in 2008 (Zemba *et al*, 2010). Most of the new developments took place in the suburbs as organized clusters for accommodating especially residential expansions, academic institutions, emerging settlements, warehouses, or external transportation facilities, in addition to rapid developments on the outskirts of the old city core. Karewa and parts of Gwadabawa were designated as GRA in the 1980s. This led to massive construction of offices and government quarters in these areas. New residential buildings quickly swelled up to reach these areas. By this time, new developments were mostly directed to the suburbs in order to contain the growth of the inner city.

Jimeta, being a state capital, it is a major transport hub with buses and taxis heading north to Mubi and Maiduguri, West to Numan, Gombe and Bauchi and South to Makurdi and Katsina

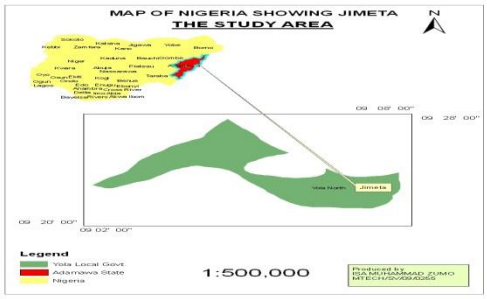


Fig. 1: Map of Nigeria showing the study area.

3. MATERIALS AND METHODS

Three types of data used for this study were spatial, attribute and non spatial data. The spatial data include maps/plans of the study area and UTM coordinates for geo-referencing, the attribute data are information about the plot owner, such as names address, sex, occupation, date of application, date of registration etc. obtained from the Ministry land files. The non spatial data are oral services and social surveys conducted through interviews on the tenants to ascertain the authenticity of the attribute data as obtained in the land files.
The cadastral plans of the study area were scanned and the images converted into JPEG and imported into AutoCAD environment. The plans were then geo-referenced using the UTM coordinates of four selected points in the layout shown in table 1 below.
Three layers created were parcel, road and boundary layers. The plan was then digitized on-screen and exported into ArcView software. The plan was automatically segmented and polygonized and the parcel layer converted to shapefile thus forming the **spatial database.** A

table automatically created by the ArcView software for the formation of attribute database, the table was edited by deleting unwanted fields and creating new ones where the attribute information were entered as obtained from land files, thus forming the **attribute database.** The two databases were linked together by identifier number to form a land information system for part of Kofare government residential area of Jimeta town. Queries were generated to test the efficiency and efficacy of the system. The Cartographic model of the methodology is showed in figure 2 below:

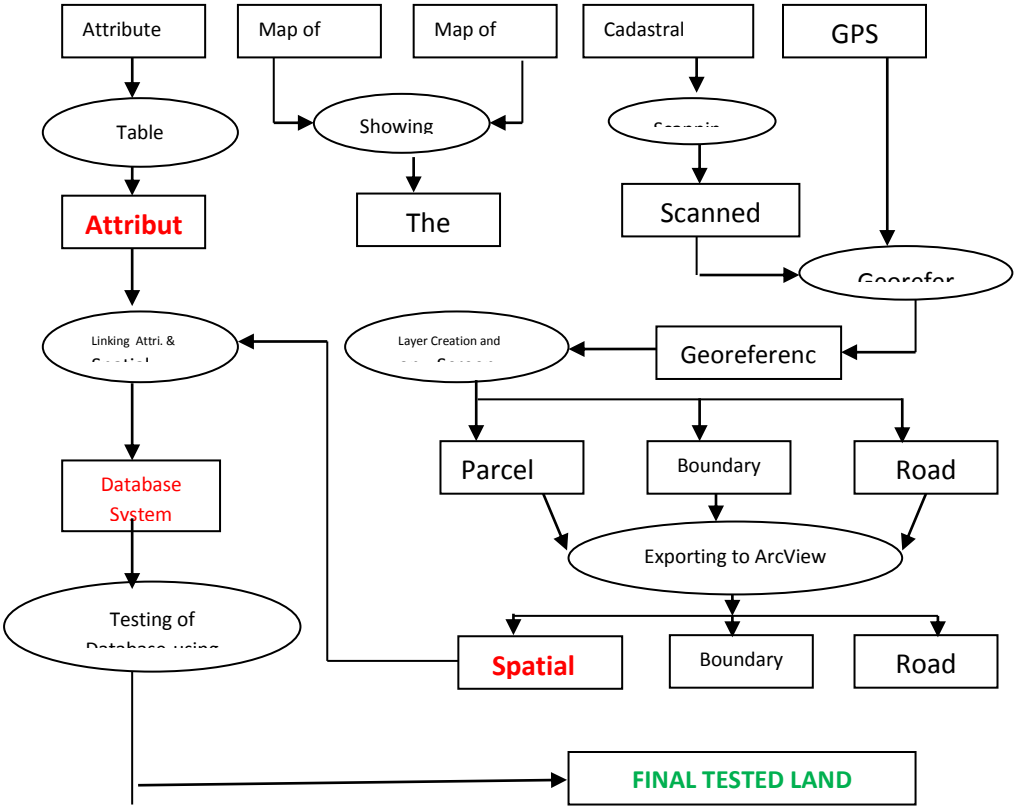


Fig. 2: Cartographic Model Showing the Methodology for the project

The table 1 below shows the GPS-obtained coordinates of area of study used for the georeferencing of the scanned maps.

Table 1: Geo-referencing coordinates

POINTS	EASTINGS(mE)	NORTHINGS(mN)
PBAD 3242	9678.62	13206.24
PBAD 3051	9764.43	13659.68
PBAD 3064	10232.15	13677.46
PBAD 3204	10187.65	13391.60

4. RESULTS AND DISCUSSION

Figure 3 below shows the digitized cadastral layout plan of the study area as polygonized in their various colours while figure 4 shows the digitized cadastral layout plan showing the plots by their beacon numbers and plot numbers. Table 2 below shows the Attribute of Parcels created in ArcView. Fig.5 below shows the Cadastral Plan of the Identity result of Parcel 2 of part of Kofare (ADSYP30). Fig.6 below shows the Cadastral Plan of attribute of all parcels within the Study Area.

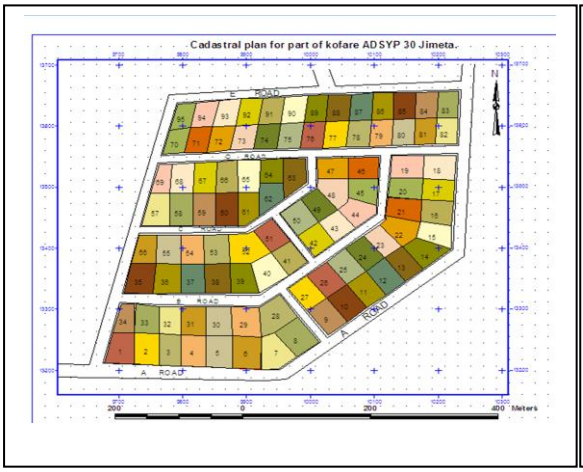


Fig.3*:* The digitized Cadastral Plan of Part of Kofare (ADSYP30)

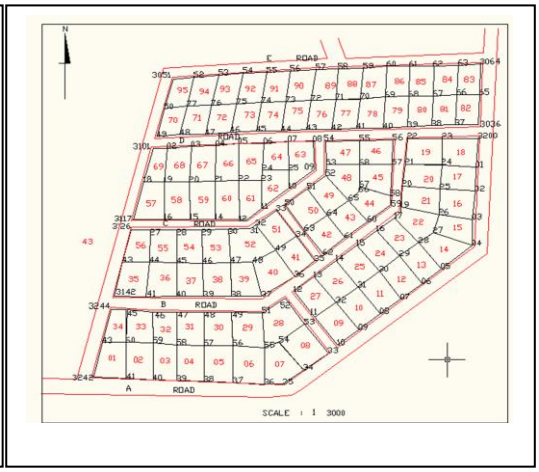


Fig. 4: Cadastral Plan of Part of Kofare (ADSYP30) with beacons and plots numbers.

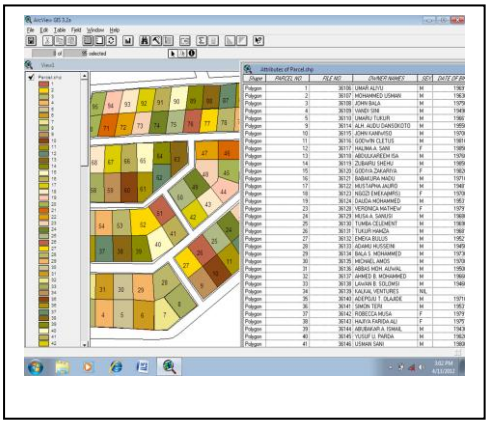


Fig.5*:* Cadastral Plan of the Identity result of Parcel 2 of part of Kofare (ADSYP30)

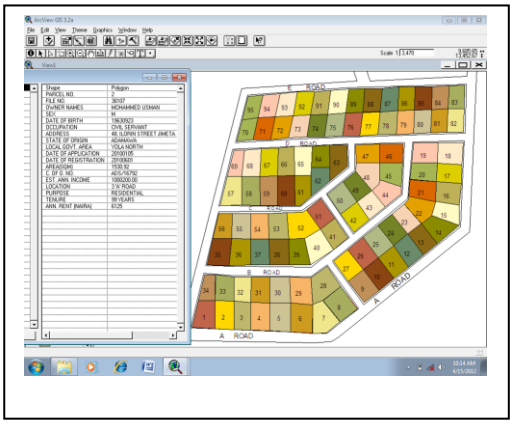


Fig.6*:* Cadastral Plan of attribute of all parcels within the Study Area

In addition, Figure 7 shows the Query by attribute of parcels owned by Female plot owners. They are altogether seven in number. Fig.8 below shows the query by attribute of parcels

owned by Adamawa state indigenes, while figure 9 shows the query by attribute of the parcels owned by indigenes of Yola North Local Government Area. Figure 10 below shows the Query by attribute of occupation of parcels owned by Farmers and they altogether seven in number.

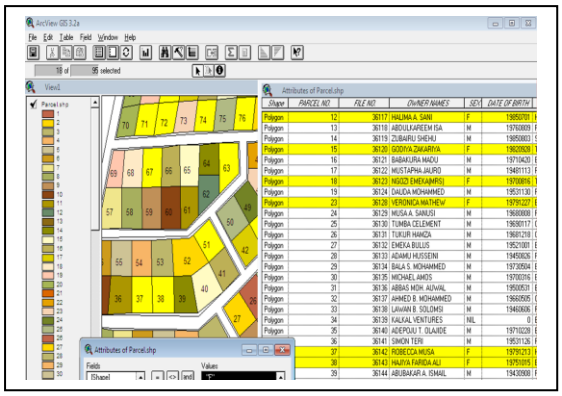


Fig. 7: Query by attribute of parcels owned by Female plot owners.

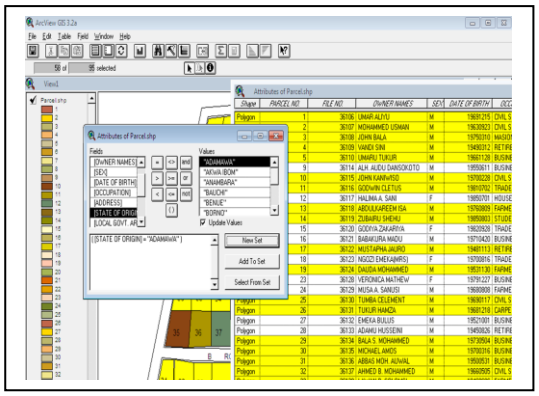


Fig.8: Query by attribute of parcels owned by Adamawa state indigenes

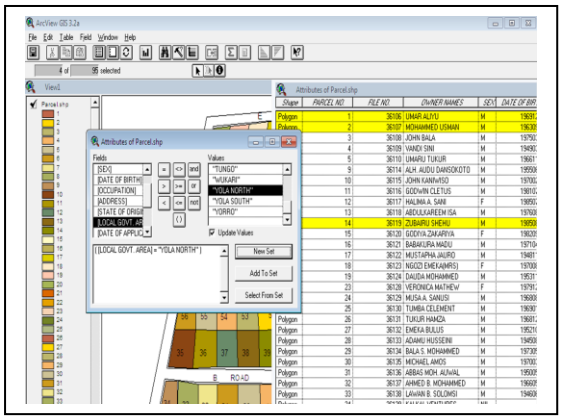


Fig.9: Query by attribute of parcels owned by Indigenes of Yola North Local Government Area.

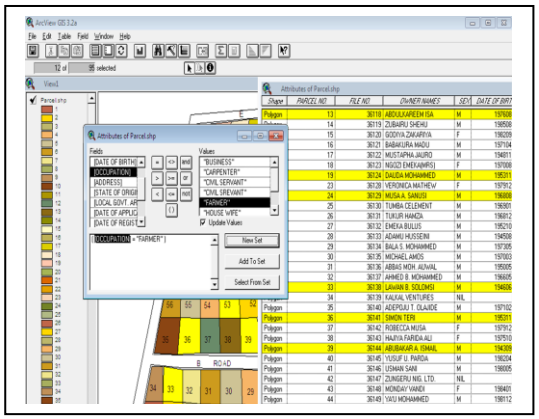
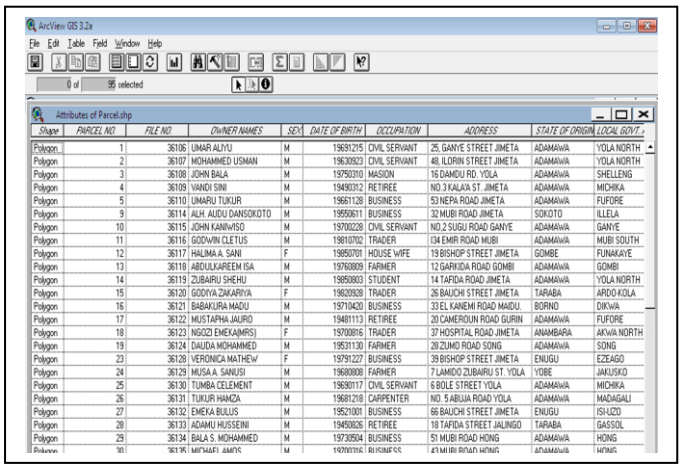


Fig. 10: Query by attribute of parcels owned by Farmers

Table 2: Attribute of Parcels created in ArcView.



Attributes of Parcel.shp

Shape	PARCEL NO	FILE NO	OWNER NAMES	SEX	DATE OF BIRTH	OCCUPATION	ADDRESS	STATE OF ORIGIN	LOCAL GOVT
Polygon	1	36106	UMAR ALIYU	M	19691215	CIVIL SERVANT	25, GANYE STREET JIMETA	ADAMAWA	YOLA NORTH
Polygon	2	36107	MOHAMMED USMAN	M	19630923	CIVIL SERVANT	48, ILORIN STREET JIMETA	ADAMAWA	YOLA NORTH
Polygon	3	36108	JOHN BALA	M	19750310	MASION	16 DAMDU RD. YOLA	ADAMAWA	SHELLENG
Polygon	4	36109	VANDI SINI	M	19490312	RETIREE	NO.3 KALA/A ST. JIMETA	ADAMAWA	MICHIKA
Polygon	5	36110	UMARU TUKUR	M	19661128	BUSINESS	53 NEPA ROAD JIMETA	ADAMAWA	FUFORE
Polygon	9	36114	ALH. AUDU DANSOKOTO	M	19550611	BUSINESS	32 MUBI ROAD JIMETA	SOKOTO	ILLELA
Polygon	10	36115	JOHN KANIWISO	M	19700228	CIVIL SERVANT	NO.2 SUGU ROAD GANYE	ADAMAWA	GANYE
Polygon	11	36116	GODWIN CLETUS	M	19810702	TRADER	134 EMIR ROAD MUBI	ADAMAWA	MUBI SOUTH
Polygon	12	36117	HALIMA A. SANI	F	19850701	HOUSE WIFE	19 BISHOP STREET JIMETA	GOMBE	FUNAKAYE
Polygon	13	36118	ABDULKAREEM ISA	M	19760809	FARMER	12 GARKIDA ROAD GOMBI	ADAMAWA	GOMBI
Polygon	14	36119	ZUBAIRU SHEHU	M	19850803	STUDENT	14 TAFIDA ROAD JIMETA	ADAMAWA	YOLA NORTH
Polygon	15	36120	GODIYA ZAKARIYA	F	19820928	TRADER	26 BAUCHI STREET JIMETA	TARABA	ARDO KOLA
Polygon	16	36121	BABAKURA MADU	M	19710420	BUSINESS	33 EL KANEMI ROAD MAIDU.	BORNO	DIKWA
Polygon	17	36122	MUSTAPHA JAURO	M	19481113	RETIREE	20 CAMEROUN ROAD GURIN	ADAMAWA	FUFORE
Polygon	18	36123	NGOZI EMEKA(MRS)	F	19700816	TRADER	37 HOSPITAL ROAD JIMETA	ANAMBARA	AKWA NORTH
Polygon	19	36124	DAUDA MOHAMMED	M	19531130	FARMER	28 ZUMO ROAD SONG	ADAMAWA	SONG
Polygon	23	36128	VERONICA MATHEW	F	19791227	BUSINESS	39 BISHOP STREET JIMETA	ENUGU	EZEAGO
Polygon	24	36129	MUSA A. SANUSI	M	19680808	FARMER	7 LAMIDO ZUBAIRU ST. YOLA	YOBE	JAKUSKO
Polygon	25	36130	TUMBA CELEMENT	M	19690117	CIVIL SERVANT	6 BOLE STREET YOLA	ADAMAWA	MICHIKA
Polygon	26	36131	TUKUR HAMZA	M	19681210	CARPENTER	NO. 5 ABUJA ROAD YOLA	ADAMAWA	MADAGALI
Polygon	27	36132	EMEKA BULUS	M	19521001	BUSINESS	66 BAUCHI STREET JIMETA	ENUGU	ISHUZO
Polygon	28	36133	ADAMU HUSSEINI	M	19450626	RETIREE	18 TAFIDA STREET JALINGO	TARABA	GASSOL
Polygon	29	36134	BALA S. MOHAMMED	M	19730504	BUSINESS	51 MUBI ROAD HONG	ADAMAWA	HONG

5. SUMMARY, CONCLUSION AND RECOMMENDATION

A parcel – based land information system of part of kofare layout was carried out successfully by encoding into a computer. The results which are mostly in digital form were queried using different criteria to test the efficiency and efficacy of the system.

Among the various results obtained are seven composite maps of part of Kofare ADSYP30, digitized cadastral map of same area showing beacons and parcels numbering as well as a sample of a parcel table created in Arc view. Other results presented is the attribute information from land files and the parcel table comprising the beacon numbers, coordinates and height of each corner point of a parcel of land including area in square meters of each parcel and their locations. The map comprised of 95 plots of Lands which are distinguished by different colours, the boundary of the map is clearly indicated in black colour. "CERTIFIED TRUE COPY", Certificate of Occupancy No., file No., the name and address of the plot owner, the plot location, plan number, term of grant, date of registration, rent per annum and other conditions stipulated there in. At the bottom of the certificate, a space was provided for Deed Registrar and the Executive Governor's signatures and dates. A seal in red circular colour was also stamped in between the spaces for the signatures. The exact format of the certified true copies of the certificate for the plot owner was automatically generated as shown as fig. 13 below. It is hereby concluded that the development of land information system was successful; the result indicated the efficiency of GIS/ geospatial information system in capturing, storing, analyzing and presenting data with reference to geographic location data. The result also demonstrated that, GIS is a powerful tool for collecting, storing, retrieving at will, transforming and displaying spatial data from the real world without loss or threat to the data. The system is so versatile in applicability where information on cadastral plots can easily be stored and retrieved by querying any plot of interest.

It is hereby recommended to Federal, State and Local Governments and Agencies responsible for land administration and management for its cost effectiveness and revenue generation capabilities among others.

ADAMAWA STATE GOVERNMENT OF NIGERIA

Statutory Certificate of Occupancy
K0000244
Certificate of Occupancy No**:ADS/16791**
File Number:**ADS/MLS/LAN/36106**

This is to satisfy that **UMAR ALIYU OF 25 GANYE STREET JIMETA** hereinafter called holder/holders is/are granted a right of occupancy in respect of the **Land No.1 'A' ROAD** described in the description schedule of the C of O and more particularly marked and delineated in the plan **ADSYP 30** attached to this certificate and there on bordered or verged **RED** for the term of **99(NINETY NINE)** years from the 01-06-2010 subject to the provision of the LAND USE ACT, 1978 and to the provision and conditions implied by virtue of the said Act and Regulations for the time being in force made under the said Act and to the covenants and conditions stipulated here under:

1) **To pay:** the proportion of rent at the rate N40,000.00 per hectare per annum from the said date of commencement to the thirty first day of December, 2010 within two months from the date of this certificate and thereafter.

2**) Rent per annum: N5816.64 (FIVE THOUSAND EIGHT HUNDRED AND SIXTEEN NAIRA SIXTY FOUR KOBO)** on the first day of January in each year.

3**) Revision period:** The rent hereby reserved shall be revised at the end of every 5 years of term of this grant.

4**) Description and value of building to be erected:** Building to the value of not less than : N578,000.00 to the satisfaction of and in accordance with plans approved by **Adamawa State Urban Planning and Development Authority** or such officer as the governor may appoint.

5**) Time within which such buildings are to be erected and completed fit for occupation and use:** within 2years from the date of commencement of the term of this certificate.

6**) Purpose for which the Land granted may be used: Residential**

This certificate of occupancy is issued subject to the following covenants and conditions being observed by the holder/holders:

a. Not to erect or built or permit to be erected or built on the land here by granted any any buildings other than those covenanted to be erected by virtue of this certificate of occupancy and the regulations under the said Act nor to make or permit to be made any

addition or alteration to the said buildings to be erected except in accordance with plans and specifications approved by the

Adamawa state urban planning and Development Authority of Adamawa state of Nigeria or as approved by the Governor.

b. To keep the exterior and interior of the buildings to be erected and all outbuildings and erections which may at any time during the

term here by created be erected on the land here by granted and all additions to such buildings and outbuildings and the walls,

fences and appurtenances there of in good conditions.

c. Not to use the buildings on the said land whether now erected or to be erected hereafter there on or any purpose other than that

specified in paragraph 6 above.

d. .Not to alienate the right of certificate of occupancy here by granted or any part there of by sale, assignment, mortgage, transfer of

possession, sublease or bequest or otherwise how so ever without the consent of the Governor first had and obtained.

e. Not to permit anything to be used or done upon any part of the granted premises which shall be noxious, noisy or offensive or be of

any inconvenience or annoyance to tenants or occupiers of premises adjoining or near thereto.

f. To maintain standards of accommodation and sanitary and living conditions conformable with standards obtaining in the

neighborhood.

g. To pay forthwith with or without demand before the issue of this certificate all survey fees and other charges due in respect of

preparation, registration and issuance of this certificate.

h. To install and operate water borne sewage systems within six months from the date the building erected on the plot are connected to

a piped water-supply.

I. To pay without demand within the month of January each year the rend as stipulated in paragraph 2 above or any other rent as may

be revised in future.

7. If the land covered by the certificate of occupancy is the subject matter of a conversion of customary title is affected by litigation or

there is a court ruling against the holder, the certificate of occupancy shall be revoked.

8. If the yearly rent for the time being payable in respect of the said land or any part there of shall be in arrears for the space of three

months, under any circumstances what so ever it shall become lawful for the Executive Governor at any time there after to re-enter

upon the said land or any part thereof in the name of the whole and hold the right to the land as if the right of occupancy had not

been granted.

This instrument is registered as No of page in volume Dated this day of

Of the certificate of occupancy Register in the land Registry at en under my hand
the day, month and year above written
O'clock am/pm on the day of, 20
Deeds Registrar……

HIS

EXCELENCY MURTALA H. NYAKO (GCON)

Executive

Governor of Adamawa State

Fig. 13: Showing the generated Certificate of Occupancy of one plot owner.

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