



# DEVELOPMENT OF A WEB BASED CADASTRAL INFORMATION SYSTEM FOR LAND USE CHARGES COLLECTION IN AKURE METROPOLIS

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## ABSTRACT

*The management of a cadastral information system has prompted considerable research. This study attempts to develop a web-based cadastral information system to deliver efficient land markets (land taxes) and support land economy within Akure metropolis. Therefore, land Charges rate to be collected from property Owners were provided by the Ondo State Board of Internal Revenue (OBIR). A Georeferenced high Resolution satellite Image was digitized and form a basis of web map used in the system. The Ondo state land use charges law of 2014 was used to develop the model to be adopted in the system. Therefore, an integration of georeferenced high resolution satellite images, Ondo State Board of Internal Revenue land charges rate, land use charges database develop and 2014 Ondo State land use charges law were used to develop web based cadastral information model. Developed model was analyzed using (query) and various results were generated according to the area classification and land used. The system provides the basis of ranges of solution to issues relating to existing system for land used charges collection in association with the development of a cadastre in a digital and internet enabled environment. Furthermore, findings from the study leads to the easing of the task of the land use charges authority as they will not need to meet property owners physically all the time. The research will serves as a guideline for other research work for the generation of revenue for the government.*

**Keywords:** Cadastral, Land Registration, Land Use Charges, Web Map Georeferenced

## 1.0 INTRODUCTION

In the last few decades, the increase in population density has a great effect on land use. This has caused the way people relates to land and brings recording land geometry, land precise location and its attributes such as land ownership, land tenure and the date of registration, This record that contains this kind of information is referred to as ‘Cadastre’(Dale and Mclaughlin,1988). According to International Federation of Surveyors (FIG, 1995), Cadastre is a parcel based and up-to-date land information system consists of record of interests in



land, rights, restrictions and responsibilities RRRs. The importance of establishing appropriate land administration system as a basis for generating economic development, social coherent and environmental sustainability has been recognized by the World Bank (Opaluwa *et al.* 2014). Cadastre Information system (CIS) is a subset of spatial information that is concerned with identifying and maintaining legal boundaries of properties (Babalola and Kardam, 2012). Land is the solid substance that comprises of the material part of the earth, Babalola *et al* (2015) considered in its entirety; especially the exposed surface of the earth and where man, animals, plants and organisms stand on. It is approximately 1/4 of the earth surface, while water takes over the remaining three-quarter. Therefore, land administration is the process by which land is managed and put to good effects as the most basic, vital and valuable resource that supports human activities. (Didigwu and Olakanmi, 2016).

Traditionally, cadastres were designed to assist in land taxation, real estate conveyancing, and land redistribution Akeem *et al* (2017). Cadastre framework provides land transactions with relevant information and help to improve the efficiency of those transactions and security of tenure in general Mikir (2019). They provide governments at all levels with complete inventories of land holdings for taxation and regulation. But today, the information is also increasingly used by both private and public sectors in land development, urban and rural planning, land management, city space management, and environmental monitoring (FIG, 1995). The Cadastre in Nigeria are mostly the usage of papers to keep land records Babalola *et al* (2017). This has minimized the collaboration of the Land Taxation Authority which are supervised by the state board of internal revenue and the Land Record Bureau because of the difficult accessibility of data to collect tax on the land and property effectively and efficiently. The Governors of the state is responsible as the appropriate authority vested with the power of Land Use charges collection in Nigeria and the Land Record Bureau is a department under the Ministry of Lands for the keeping of land records. The rate at which land is use presently is alarming, there are now residential estates, industrial layouts, commercial buildings and even multipurpose estates that serve the functions of more than a purpose Mohammed *et al* (2012). The charges to be collected on these different usage of land can be carefully managed by a well-designed, up to date, digitized cadastral that is specifically made to serve the purpose. Land use, property valuation, register building and dwelling register need to be organized to form a network of realtime integrated subsystems connected to the cadastral maps server. However, other documents required in electronic land



registration and transactions rely on encrypted digital signatures identifying the stake holders, registration/ transactions documents are created and modification online, land use charges rate applicable information retrieved from a centrally located land use database automatically inserted (Opaluwa *et al* 2014). Therefore, there is a need for online land records of Akure metropolis that can easily be accessed and managed for the collection of tax on land and property on it.

This study developed a web-based cadastre that will serve the purpose of collecting the land use charges from the property owner which will contribute to the knowledge of surveying and Geoinformatics as this will ease the bottleneck or cumbersome nature of land transactions and land use charges rate collection as every process will be done online with the aid of internet facility. Taxes are known to be levies paid by citizens of a community for the services provided such as town halls, markets, roads, electricity as so on FAO (2002). Taxes have existed since in Akure like other ancient communities where people pay either tribute or sweat tax to the local chiefs. The history of Akure was traced to Oduduwa, the ancestors of the Yoruba race. Akure has grown over time, it has function as the headquarters of the former Ondo province in the old western state, the headquarter of Akure south local Government, the capital of Ondo state. Akure is also the home of all federal government departments in the ondo state. These functions have contributed to the growth and development of Akure which affected the rate at which the land are used. The estimated population of Akure in 2006 was 353,211 (NPC, 2006). The rapid increase of the population of Akure since the creation of Ondo state in 1976 has affected the land use rates. The rate at which people use land for various use (such as Residential, commercial, industrial, Agricultural) is as a result of the rapid development.

Since the discovery of crude oil in the early 1960's in Nigeria, the government has depended on it as the main source of revenue thus overlooking other sources such as agriculture and taxation. Recently, the Ondo state government has turned its attention towards intensive revenue generation through taxation which includes property taxation which is said to be one of the most stable forms of taxation.

The Food and Agriculture Organization FAO (2002) defines property tax as an annual tax imposed on real property that is calculated according to the value of the property. Such taxes have been in existence for millennia and their benefits are well known Mantey and Tagoe



(2012). They are transparent, cheap to administer, efficient to collect and well understood by the taxpaying public. They are administratively feasible in virtually any circumstances and, being locationally fixed, are particularly suitable as a source of locally generated revenue for local governments (Igwe *et al*, 2017).

According to Ondo State Land Use charges Law, 2014, Real Property includes;

- i. A parcel of Land
- ii. An Improvement
- iii. A parcel of land and Improvement
- iv. A wharf or pier.

In the case of this study, the Ondo State Land Use Charges Law, 2014 was adopted to define the regulations of the collection of land use charges in the study area. The study will also involve the creation of a dynamic web based cadastre for the study area to enhance the accessibility to information for the collection of the land use charges and for further analysis. The study will also give room for query and it will also improve the management of land administration in Akure, the state capital of Ondo State which is located in South Western part of Nigeria. It is approximately bounded with latitude 7° 13'N to 7° 19' North of the Equator and longitude 5° 07'E to 5° 14' East of the Greenwich Meridian on a relatively flat plain within the Western Nigerian plain and is about 250 m above sea level.

## **2.0. METHODOLOGY**

This define the research methods used in the study. It explains how research objectives and necessary data were acquired, processed and presented and analyzed for the study. This also discuss the system development which are Web Application Development and Website Development which are later integrated to create a cadastral information web based system for land used charges collection in Akure metropolis.

## 2.1. Data Acquisition

### Title 1. Types and sources of data

S/N	NAME OF DATA	TYPE OF DATA	SPATIAL/ATTRIBUTE	SOURCE OF DATA
1.	SAS planet Satellite Image	Primary	Spatial	SAS planet
2.	Property Identification number	Primary	Attribute	Field observation
3.	Land Use charges rates	Secondary	Attribute	Ondo State Board of Internal Revenue
4.	Property Owner Information	Secondary	Attribute	User Registration
5.	Land Use charges law	Secondary	Attribute	Ondo state Board of Internal Revenue



AREA CLASSIFICATION	LAND USE	AMNESTY & RATES 2017/2018
High Value Zone	Residential Buildings	N20,000.00 - N10,000.00
	Commercial Rental Per Apartment	N20,000.00 - N10,000.00
	Hotels	N30,000.00-N40,000.00
	Event Centres	N20,000.00-N30,000.00
	Industrial Property/Petrol Station	N20,000.00-N30,000.00
Medium Value Zone (and all other areas in urban locations)	Hospitals, Schools etc	N20,000.00-N30,000.00
	Residential Buildings	N5,000.00
	Commercial Rental Per Apartment	N5,000.00
	Hotels	N10,000.00-N20,000.00
	Event Centres	N10,000.00-N20,000.00
Base Value Zone	Industrial Property/Petrol Station	N15,000.00-N25,000.00
	Commercial Rental Unit	N5,000.00
	Rental/Industrial/Business	N8,000.00
	Hospitals, Schools etc	N10,000.00-N20,000.00
	Residential Buildings	N1,000.00
Financial Institution	Commercial Rental Per Apartment	N1,000.00
	Hospitals, Schools etc	N5,000.00 - N10,000.00
Miscellaneous	Commercial Bank	N100,000.00
	Micro Finance Bank	N30,000.00
	Areas not mentioned e.g. quarry etc.	N20,000.00-N30,000.00

Plate 1: Sample of Property Identity Number.  
 Source: Field Study

Plate 2: Ondo state Land Use Charge Rates  
 Source: Ondo state Board of Internal Revenue

According to field observation, Property Identification Number were placed on the fence of parcel of land and not compulsorily there must be building on the land. In a situation where there are two or more building on a parcel, the buildings will carry the same Property Identification Number except if they are fenced separately. Therefore the amount to be paid on the parcel is the same.

Processing of the data involve: Image digitizing; and automate attributes data collected.



### **2.1.2 Digitizing**

Digitizing in GIS is the process of converting geographic data either from an image into vector data by tracing the features. During the digitizing process, features from the traced map or image are captured as coordinates in either point, line, or polygon format. After the image was geo-referenced, digitizing was performed. The roads in the image was digitized as lines and each parcel of buildings was digitized as polygon. Parcel boundaries were extracted manually by pointing and tracing the cursor along parcel boundaries and this process was done using ArcMap 10.4.1.

### **2.1.3 Creation of attribute field**

Fields for feature classes and tables were created based on data obtained and this was carried out in ArcMap 10.4.1. Some special fields which had domain which include: Property Identification Number (PIN), Building name, Building type, Building use, Area class, Land use, Address. All these fields were populated using some of the information obtained from the field as indicated in plate 1 and the information derived from SAS planet satellite imagery. After the development of the whole system, the creation of another attribute table is essential to accommodate the information provided by property owners which are not in the first attribute table created. Property for individuals have domain such as the Property address, Name (Surname, First name, Middle name), Date of birth, E-mail address, Phone number, Occupation, place of work address, type of use, username and password. Property for Organisation have domain such as the: Property address, Organisation Name, Registration number, E-mail address, Contact number, type of use, username and password.



Table

Aule\_Building

building	BDG_Name	BDG_Type	BDG_Class	Street	Local_Govt	State	BDG_Floors	Country	id_Numbers	Area_Class	Shape_Length	Shape_Area
yes		Urban Housing	Residential	Aule Rd	Akure South	Ondo State	0	Nigeria	00900011279	Medium Value Zone	0.000479	0
yes		Urban Housing	Residential	Aule Rd	Akure South	Ondo State	0	Nigeria	00900011280	Medium Value Zone	0.000396	0
yes		Urban Housing	Residential	Aule Rd	Akure South	Ondo State	0	Nigeria	00900011281	Medium Value Zone	0.000494	0
yes		Urban Housing	Residential	Aule Rd	Akure South	Ondo State	0	Nigeria	00900011282	Medium Value Zone	0.000782	0
yes		Urban Housing	Residential	Aule Rd	Akure South	Ondo State	0	Nigeria	00900011283	Medium Value Zone	0.000488	0
yes		Urban Housing	Residential	Aule Rd	Akure South	Ondo State	0	Nigeria	00900011284	Medium Value Zone	0.000557	0
Unclassified		Unclassified	Unclassified	Aule Rd	Akure South	Ondo State	0	Nigeria		Medium Value Zone	0.000307	0
Unclassified		Unclassified	Unclassified	Aule Rd	Akure South	Ondo State	0	Nigeria		Medium Value Zone	0.000245	0
yes		Urban Housing	Residential	Aule Rd	Akure South	Ondo State	0	Nigeria	00900011287	Medium Value Zone	0.000424	0
yes		Urban Housing	Residential	Aule Rd	Akure South	Ondo State	0	Nigeria	00900011288	Medium Value Zone	0.000457	0
yes		Urban Housing	Residential	Aule Rd	Akure South	Ondo State	0	Nigeria	00900011289	Medium Value Zone	0.000467	0
yes		Urban Housing	Residential	Aule Rd	Akure South	Ondo State	0	Nigeria	00900011290	Medium Value Zone	0.000607	0
yes		Urban Housing	Residential	Aule Rd	Akure South	Ondo State	0	Nigeria	00900011291	Medium Value Zone	0.000545	0
yes		Urban Housing	Residential	Aule Rd	Akure South	Ondo State	0	Nigeria	00900011292	Medium Value Zone	0.000687	0
yes		Urban Housing	Residential	Aule Rd	Akure South	Ondo State	0	Nigeria	00900011293	Medium Value Zone	0.000509	0
yes	Filing Station	Filing Station	Commercial	Aule Rd	Akure South	Ondo State	0	Nigeria	00900011294	Medium Value Zone	0.000457	0
yes		Urban Housing	Residential	Aule Rd	Akure South	Ondo State	0	Nigeria	00900011295	Medium Value Zone	0.000402	0
yes		Urban Housing	Residential	Aule Rd	Akure South	Ondo State	0	Nigeria	00900011299	Medium Value Zone	0.000339	0
yes		Urban Housing	Residential	Aule Rd	Akure South	Ondo State	0	Nigeria	00900011300	Medium Value Zone	0.00048	0
yes		Urban Housing	Residential	Aule Rd	Akure South	Ondo State	0	Nigeria	00900011301	Medium Value Zone	0.000481	0
yes		Urban Housing	Residential	Aule Rd	Akure South	Ondo State	0	Nigeria	00900011303	Medium Value Zone	0.00066	0
yes		Urban Housing	Residential	Aule Rd	Akure South	Ondo State	0	Nigeria	00900011304	Medium Value Zone	0.000552	0
yes		Urban Housing	Residential	Aule Rd	Akure South	Ondo State	0	Nigeria	00900011309	Medium Value Zone	0.000406	0
yes		Urban Housing	Residential	Aule Rd	Akure South	Ondo State	0	Nigeria	00900011310	Medium Value Zone	0.000442	0
yes		Urban Housing	Residential	Aule Rd	Akure South	Ondo State	0	Nigeria	00900011311	Medium Value Zone	0.000345	0
yes		Urban Housing	Residential	Aule Rd	Akure South	Ondo State	0	Nigeria	00900011312	Medium Value Zone	0.000444	0
yes		Urban Housing	Residential	Aule Rd	Akure South	Ondo State	0	Nigeria	00900011313	Medium Value Zone	0.0003	0
yes		Urban Housing	Residential	Aule Rd	Akure South	Ondo State	0	Nigeria	00900011314	Medium Value Zone	0.000427	0
yes		Urban Housing	Residential	Aule Rd	Akure South	Ondo State	0	Nigeria	00900011316	Medium Value Zone	0.000649	0
yes		Urban Housing	Residential	Aule Rd	Akure South	Ondo State	0	Nigeria	00900011317	Medium Value Zone	0.000441	0
yes		Urban Housing	Residential	Aule Rd	Akure South	Ondo State	0	Nigeria	00900011318	Medium Value Zone	0.000515	0
yes		Urban Housing	Residential	Aule Rd	Akure South	Ondo State	0	Nigeria	00900011319	Medium Value Zone	0.000368	0
yes		Urban Housing	Residential	Aule Rd	Akure South	Ondo State	0	Nigeria	00900011320	Medium Value Zone	0.00034	0
yes		Urban Housing	Residential	Aule Rd	Akure South	Ondo State	0	Nigeria	00900011321	Medium Value Zone	0.000819	0
Unclassified		Unclassified	Unclassified	Akure South	Ondo State	0	Nigeria			Medium Value Zone	0.000296	0
Unclassified		Unclassified	Unclassified	Akure South	Ondo State	0	Nigeria			Medium Value Zone	0.000414	0
Unclassified		Unclassified	Unclassified	Akure South	Ondo State	0	Nigeria			Medium Value Zone	0.000499	0
Unclassified		Unclassified	Unclassified	Akure South	Ondo State	0	Nigeria			Medium Value Zone	0.000787	0
Unclassified		Unclassified	Unclassified	Akure South	Ondo State	0	Nigeria			Medium Value Zone	0.000276	0
Unclassified		Unclassified	Unclassified	Akure South	Ondo State	0	Nigeria			Medium Value Zone	0.000140	0

1 (0 out of 5005 Selected)

Alagbaka\_Building Aule\_Building

Plate 3: Attribute table

## 2.1.4 System development

The system development was carried out using the processed data and other relevant information. This is consist of website development and web map application development.

## 2.1.5 Website Development

For this study, web Technology was adopted which include the use of HTML, CSS (Cascading Stylesheet) because it is responsible for the web color and all the interface of the web application. The system of LUC (Land Use Charges) required a database. Therefore, relational database management systems (RDBMS) was used to store and manage the huge volume of data. The relational database works in a way that data are stored into different tables and relations are established using primary key which is the Property Identifications Number (Property ID) and foreign keys such as property owner, Property address.

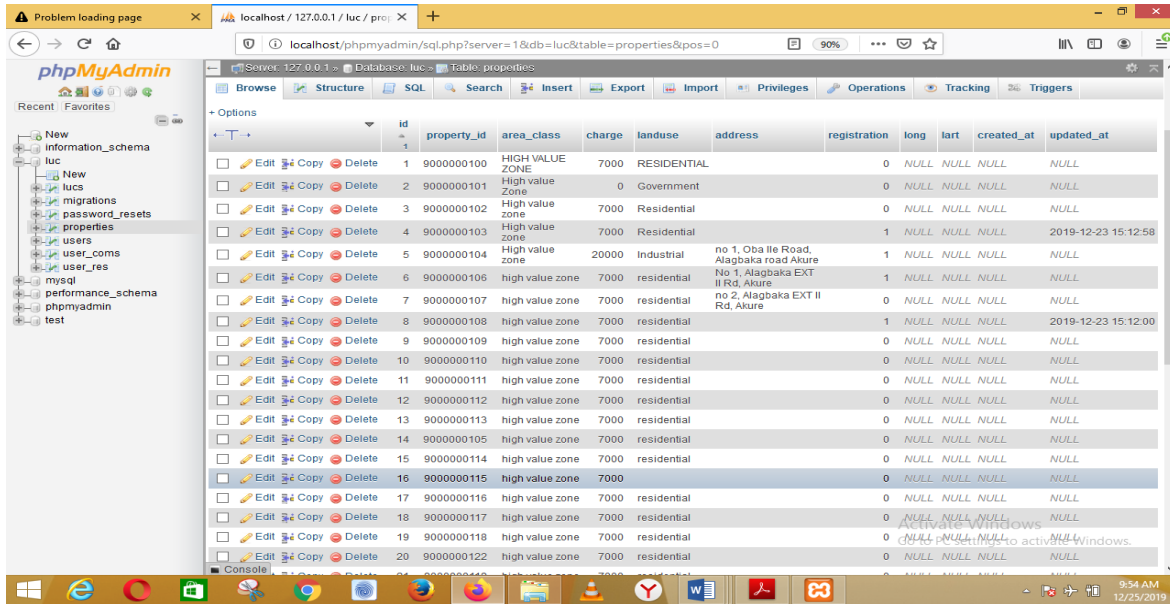


Plate 4: Prototype database design

### 2.1.6. Web Map Application Development

Leaflet is a popular open-source JavaScript library used to create mapping applications on the web. The plugin **qgis2web** or **qgis2leaf** offers simple tool to export map in QGIS and turn it into a map-based web Leaflet. This plugin is an effective tool which start working with the web mapping and create an interactive web map from GIS Layer static. There are basically two data types in the database:

Polygon: Which represents all the buildings of Aule and part of Alagbaka Estate

Line: Which represents all the roads of Aule and part of Alagbaka Estate

Since the data were created from ESRI ArcMap 10.4.1. The Database were exported to QGIS 2.18 and which created a web map leaflet of buildings in Akure Metropolis.



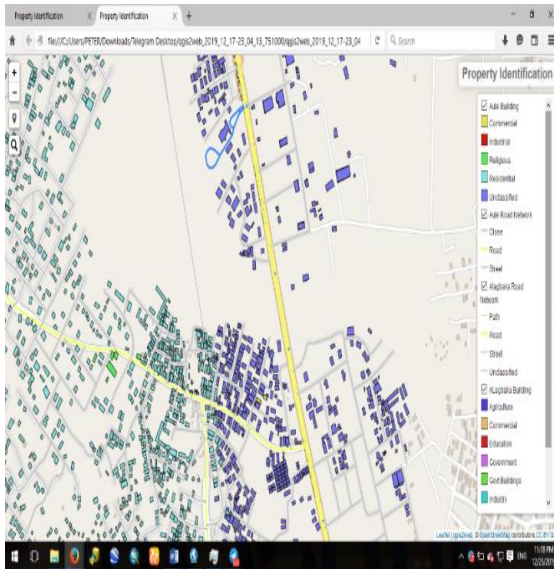


Figure 1: Web map on a web browser

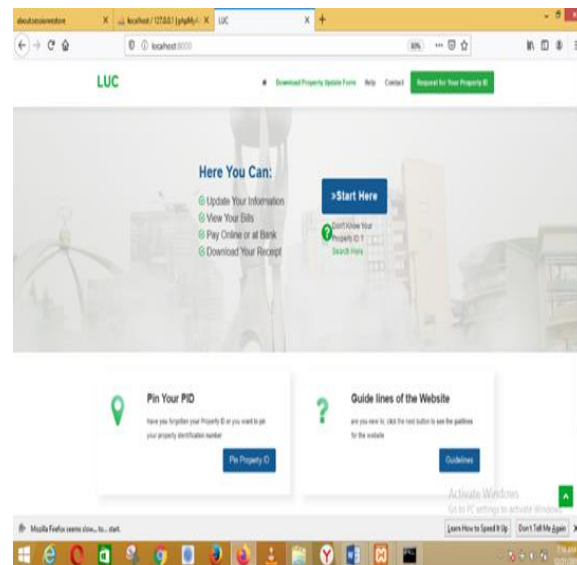


Figure 2: Home page. (Source: Author)

### 3.0. RESULTS AND DISCUSSION

This presents the results of the web based cadastral system and its discussion. It presents the processes such as Website, Webmap, Registration user interface, Login interface, Dashboard which are all involved in using GIS in testing the effectiveness and efficiency of the web based cadastral map. The processes involved queries, searches and identification among others.

#### 3.1 Presentation of the Website

The website is developed for the purpose of collecting land use charges in Akure metropolis. The website can also be used by the admin to know the property owner that have pay the land use charges or not. The targeted audience for the website include: individual property owner, organization property owner which can be residential, commercial-rent per apartment, industrial, religious, financial institution, educational land use. The website accommodate room for Miscellaneous which according to Ondo State Board of Internal Revenue (OBIR) means areas not mention or not in the category stated above. The website home page includes Introduction, guidelines to the website, help, contacts, about us, Frequently Asked Questions, start here. The home page is shown above in figure 2. This menu refer user to the web map

where the Property Identification Number will be searched for and results of the query search for the web map is shown in figure 3.

### 3.1.1 The web Map

The web map work in such a way that a new or existing user must first know the Property Identification Number tag placed in front of the property. When the Property Identification Number is known, then the property can be located on the web map. The example of this can be show in figure 4. The location of the property can be clicked on which will open another page. This new page is dynamic because it will open a registration user interface for new users while login in user interface will open for existing user.

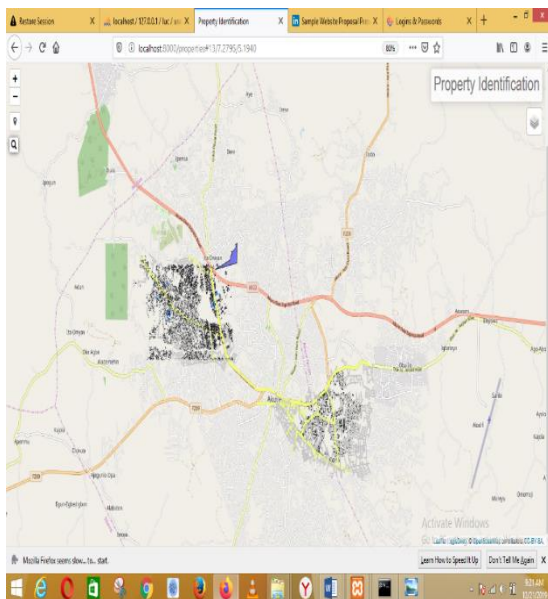


Figure 3: Web map. (Source: Author)

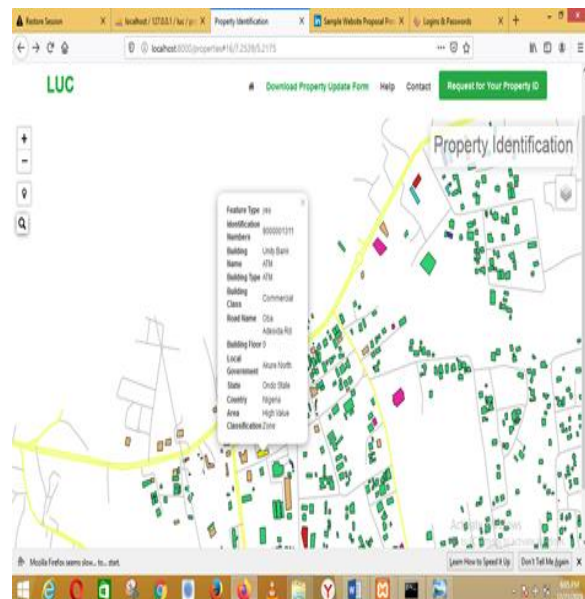


Figure 4: Property showing its attributes

### 3.1.2 Registration User Interface

Registration page is a page designed for user's property registration. It is divided into various sections, the individual and organization section. The individual section contains group of form field which are to be filled one of the field is selection field where user will select its

Property Identification Number (pin) and it also includes filed like property address, title, date of birth, surname, first name, middle name, email address, phone number, place of work, occupation, and password to be used to login by the property owners as shown in Figure 5. The organization section also contains groups of form filed which include property Id, property address name of organization, registration number, contact number, email address, use of property and password figure 6 shows the user interface (UI) for users commercial, industrial and financial institution section registration which after a successful registration will redirect user to login page.

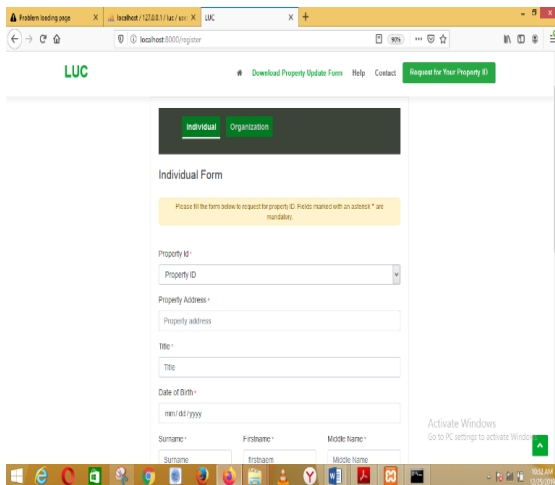


Figure 5: User Interface (individual registration)

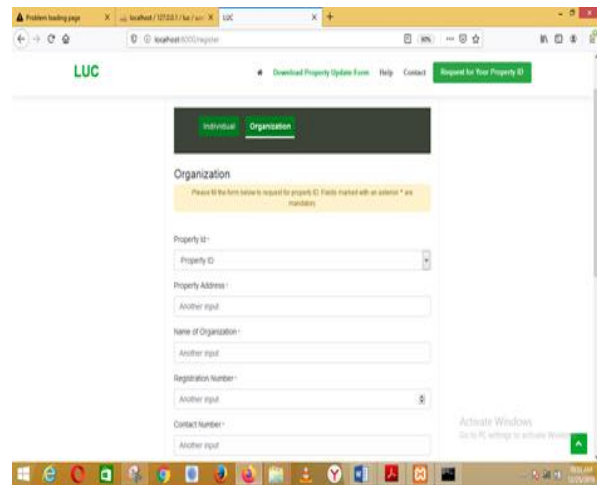


Figure 6: User Interface (organization registration)

(Source: Author)

### 3.1.3 Login User Interface

Login user page allows registered users to login to their dashboard where land use charge on their registered property can be made. It comprises of two field the Property ID field and the password field as created in the registration field which will redirect user to his or her property dashboard where the profile and the status of the property will be displayed if the submitted credentials are correct. The example of this can be seen in figure 8.

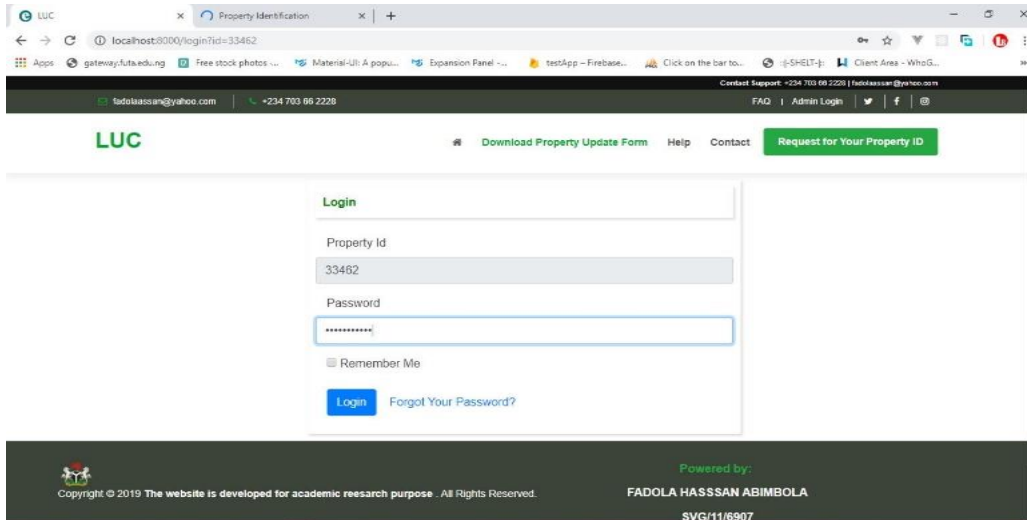


Figure 8: User interface user property login page

### 3.1.4 Property Dashboard Interface

Property dashboard page is a page where user will be redirected to after a successful login. It displays information about the property, the user profile and the payment status of the property as shown in figure 9a and 9b. Here payment can be made by clicking *pay now button* which will redirect user from to Remita where the payment will be made if payment has not been made on the property.

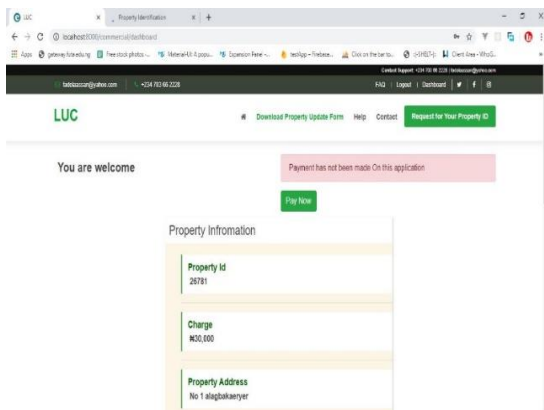


Figure 9a: User interface dashboard page  
(Source: Author)

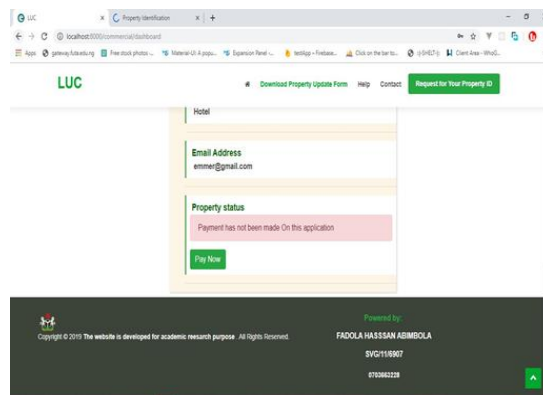


Figure 9b: User interface dashboard page

Clicking on the “Pay Now”, the page will load into the Remita payment Platform where details of the user credit card will be required to make payment as shown in figure 9c.

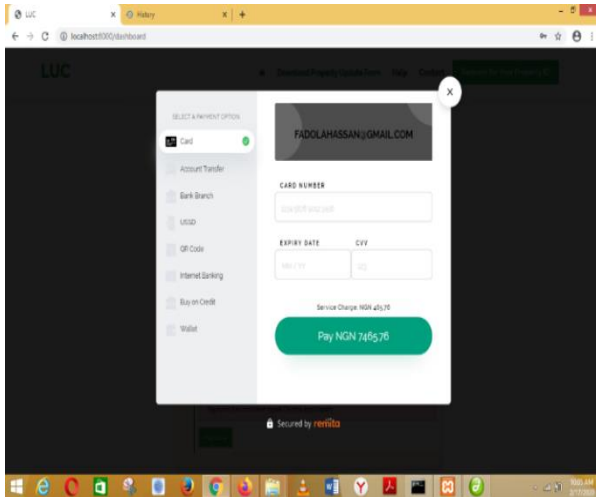


Fig 9c: Remita page

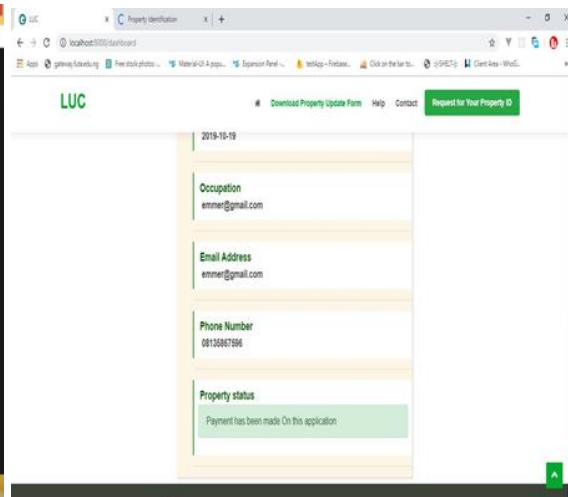


Figure 9d: User interface dashboard page

The status of the property owner will change to *Payment has been made on this application* after payment has been made as shown in figure 9d.

### 3.1.5 Property Invoice Page

Invoice page is a page that user will be redirected to after a successful payment. It shows the information about the payment and enable user to print the invoice of their payment by clicking on print button indicated in figure 10.

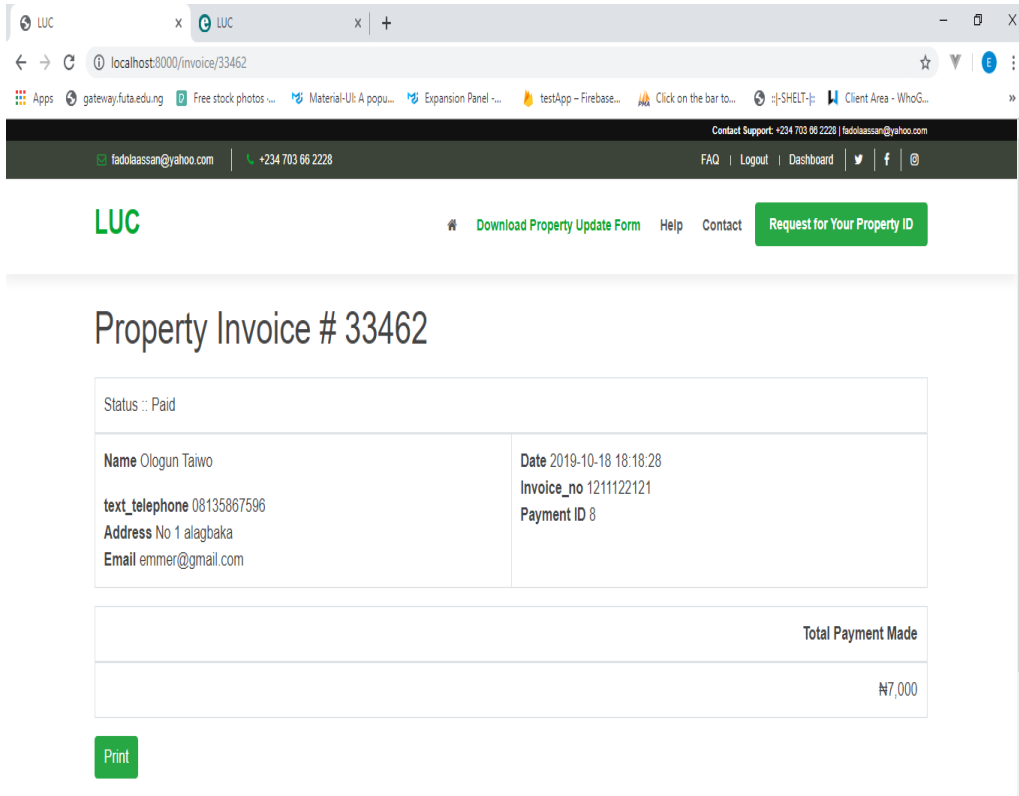


Figure 10: User interface of Payment

### 3.1.6 Administrator

This is the one that have the access to the back end of the website. The administrator have access to all information entered by users in the database. Admin login is a page where the officials in charge of land use charge will login to their dashboard. It comprises of two input field the username and the password field which are required to redirect the admin to the admin dashboard if the credentials are correct as shown in figure 11.

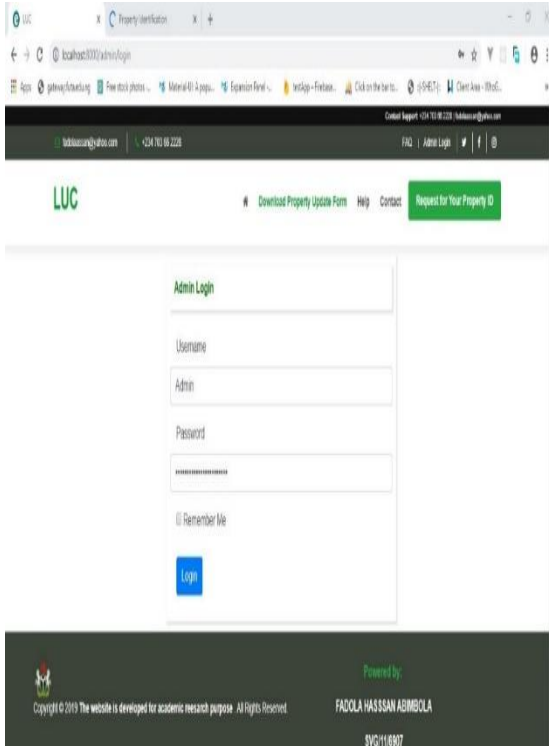


Figure 11: Admin login

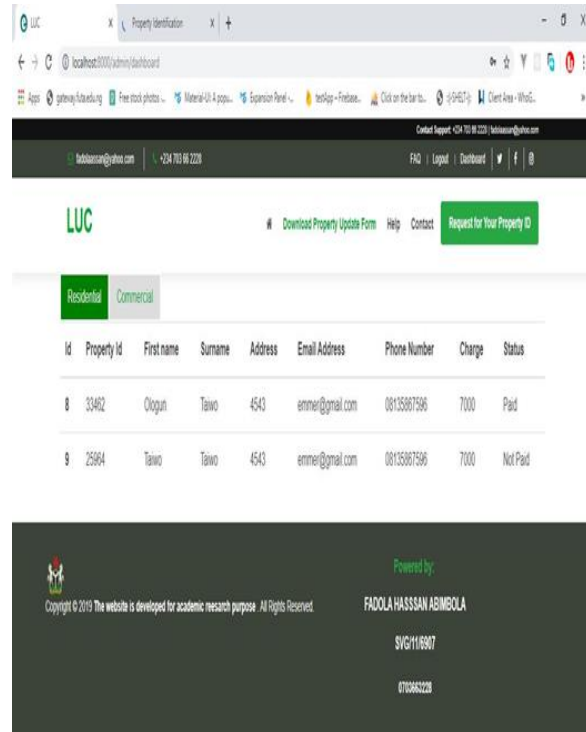


Figure 12: Admin dashboard

(Source: Author)

### 3.1.7 Admin Dashboard Interface

The admin dashboard is a page that can only be accessed by an authorized admin. It's a page where all the profile of users and property status can be accessed by the admin in order to know those properties that payment has been made on. Typical examples are shown in figure

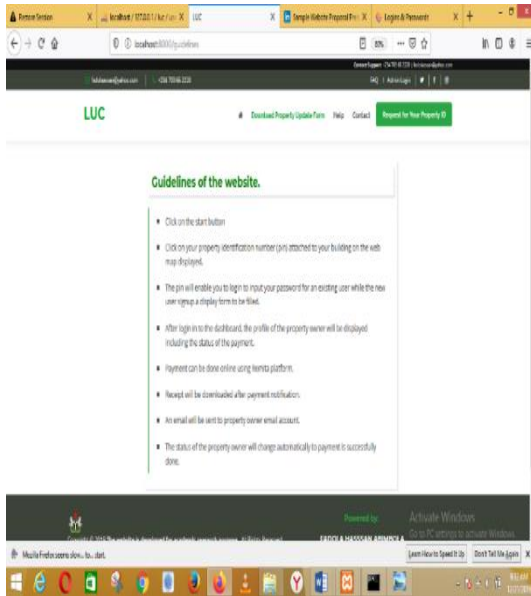


Figure 13: Guidelines and Help page

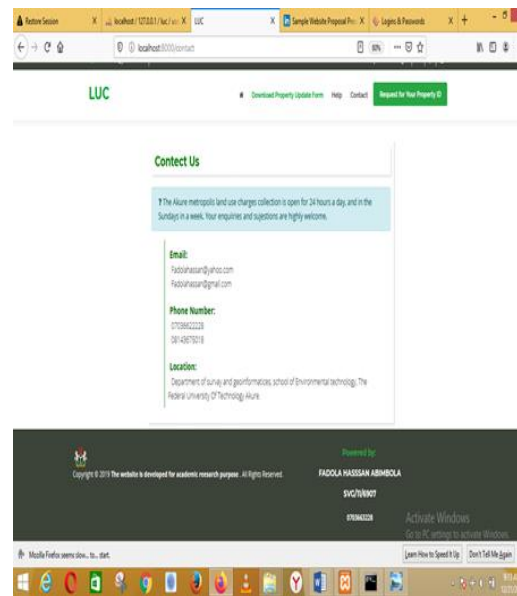


Figure 14: Contact us page

(Source: Author)

### 3.1.9 Contact us Page

The Contact us page is design for easy communication to the administrators by the user in case of any information as regards any development or changes in the user account. The contact us page is shown in figure 14

## 4.0 CONCLUSION

The research focused on applying the Internet technology into Land Information System (LIS) in Akure metropolis to facilitate the collection of land use charges from property owners in the areas. The technique and general procedures for developing the web based cadastral system have been fully described in the study. The study also show how the digital technology system has come to play a vital role in easing the application of the Ondo State Land Use charges law of 2014. However, this research had contributed to the body of knowledge in Surveying and Geoinformatics and other related disciplines by bridging the gaps in literature and practice of collecting Land Use charges from the property owner in Akure Metropolis with the aid of a cadastral map. The study will ease the task of the Land Use charges authority as they will not need to meet property owners physically all the time





and the property owners. The study will also serve as a guideline for improvement of generation revenue for the government through Cadastral Information System technology.

## REFERENCES

- Akeem, A., Babatunde, M., Oyekola, A. & Adewuyi, G. K. (2017). "Analysis of Multi-Purpose Cadastral Using Geo-Spatial Techniques: A Case Study of the Polytechnic Ibadan, Oyo State, Nigeria", *Journal of Resources Development and Management*, An International Peer-reviewed Journal, 32(1), ISSN 2422-8397, [www.iiste.org](http://www.iiste.org)
- Babalola, S. O. & Kardam, M. S. (2012). "Developing a cadastral Information system for part of Fadaman-mada area of Bauchi metropolis for sustainable development", *Journal of Environment Technology, Abubakar Tafawa balewa University Bauchi, Nigeria*. 4(1), 105-116.
- Babalola, S. O., Abdul Rahman, A. I, Choon, L. T. & Van Oosterom, P. J. (2015). "Possibilities of LADM implementation in Nigeria", *ISPRS Annals of the Photogrammetry, Remote Sensing & Spatial Information Sciences, Joint International Geoinformation Conference 2015*, Kenalalumpur, Malaysia, October 28th – 30th 2015.
- Babalola, S. O., Abdul Rahman, A. I., Choon, L. T. & Tata, H. (2017). "Dynamic web for online delivery of cadastral services for Land Registration in Nigeria", *The 3rd International Conference of Science, Engineering & Social Science, Universiti Teknologi, Malaysia*, 3rd - 10th March.
- Dale, P. F. & Mclaughlin, J. D. (1988). "Land Information management: An introduction with spatial Reference to cadastral problems in the third world countries", Oxford, Clarendon press.
- Didigwu, A. U. S. & Olakanmi, O. M. (2016). "The importance of cadastral survey information for effective land administration in Nigeria", *International Journal of Environment and pollution research*, 4(1), 6 – 32.
- FAO, (2002). "Rural property tax system in central and Eastern Europe", Canberra, Australia. ISBN 92-5-104851-7
- FIG, (1995). "The FIG statement on the Cadastre", Technical Report Publication, No.11, Federation International des Geometres, Commission 7.



Igwe, C. P., Emengini, E. J. & Agbogu, N. (2017). “The Role of Geographic Information Science in Property Rating Administration in Nigeria” *International Journal of Scientific & Engineering Research*, ISSN 2229-5518, 8(9), 8-26.

Mantey, S. & Tagoe, N. D. (2012). “Geo-Property Tax Information System - A Case Study of the Tarkwa Nsuaem Municipality, Ghana”, Paper presented at FIG Working Week, Rome, Italy, 6th -10<sup>th</sup> May, 2012.

Mikir, K. Z., (2019). “Development of cadastral Information system using Geographical Information system (GIS): A case of Tepi Town, south western region, Ethiopia”, *Journal of Geosciences and Geomatics*, 7(4) 184 -190.

Mohammed, Y., Mnguu, Y. O., Mwatawaca, H. & Mandara, C. G. (2012). “Assessment of property tax collection in Information settlement using GIS and RSG Technology in Temeke municipality a case of Keko ward, Tanzania”,

Land use charges law of Ondo state 2014

NPC (2006). “Population of Ondo state”, Archive of National Population Commission.