

Database Creation for Tenement Rate Collection: The Role of GIS.

Caleb O. Oluwadare, M.Sc.* and Olatoye Ojo, Ph.D.

Department of Estate Management, Obafemi Awolowo University, Ile Ife, Nigeria.

E-mail: olucal1@yahoo.com*
olatoye_ojo@yahoo.com

Telephone: +2348035920575*
+2348035031679

ABSTRACT

Property tax is a reliable source of revenue for any government. However, it is found that government expectations on revenue generation from property tax are often a delusion due to the crude means of its collection. Hence, government's intention to provide adequate infrastructure for the wellbeing of the citizenry has turned out to also be a disillusion. Accordingly, this paper provides a means of acquiring property tax records and creating a database which can be managed for efficient, effective, and enhanced collection of property taxes in the developing world. Olorunda Local Government Area of Osun State in Nigeria was used as the study area. Global Positioning System (GPS) was used to acquire the geographic positions of the properties. Attribute data of the properties were sourced partly from the Rating Authority and from property owners.

Base maps of the area were obtained from the Google Earth®, geo-referenced, and digitized. Database was created comprising the commercial properties in the area. Residential properties were excluded from the database because Olorunda Local Government Council did not include them in the list of properties meant for rating. Various analyses were carried out using Query technique to know the status of tax payment by each property owner and to guide decision makers on best action to take regarding tax defaulters. The paper found that inadequate knowledge of spatial distribution of properties and the haphazard manner in which the property tax record is being kept contributed to the huge amount of revenue being lost by the government. The study also revealed that only financial institutions are up-to-date in the payment of property tax probably due to the fear of losing customers in case they are

prosecuted. The study concluded that government can meet up with its financial obligations if necessary steps are taken in line with the findings of this study, by establishing GIS Unit for accurate management of property tax records.

(Keywords: database creation, property tax, tax collection, GIS)

INTRODUCTION

Tax is a fee charged by a government on a product, income, or activity. It can be levied directly on corporate income or indirectly on goods and services. The sole aim of taxation is to finance government expenditures. According to Tesfay (2008), the existence of a solid infrastructure is required for national development, which cannot be achieved without good infrastructure that affects all sectors. Proceeds from tax form part of the revenue for the provision and maintenance of public services like roads, markets, hospitals, electricity, etc.

In Nigeria, Local Government Authorities are empowered to obtain tax from twenty four (24) various sources which include shops and kiosks, tenements, street naming, parking fees, etc. (FRN, 1999). Out of these sources, tenement rating, also known as property tax, has been judged to be the most promising and reliable source of revenue for Local Government Councils (Rabiu, 1998). In countries like Sweden, Australia, and Austria, 70% of local expenditure are met from tenement rate while about 5% of their expenditure is from Federal Government grants (Olowu, 1989). Olowu (1989) also described property rates as taxes levied on all immovable property by a Local Government

Authority. Such properties may be land, buildings, and /or both.

The advantages derivable from this source of revenue are still not felt in the administration of tenement rate in most Local Government Areas in Nigeria, possibly due to the crude means of administering it.

In order to realize maximum yield from tenement rate, collection and management has to be properly administered. Proper administration here involves ensuring adequate geographical coverage in the discovery of ratable tenements, full identification of each tenement, accurate and equitable valuation preparation, dispatch of ratepayers and comprehensive collection of revenue, proper management, and constant updating of rating information (Olaleye *et al.*, 2005). Considering the magnitude of land related data required to be processed with the associated urgency and accuracy calls for putting in place land information system that is amenable to constant updating and flexibility.

The benefits that come from improved land information products such as the utility maps, base maps and property maps are numerous. Conversely, the defects of existing land information products result in revenue loss through incomplete tax collection on property or land related taxes.

In most Nigerian Local Councils, it is the manual or analogue system of administration that is common. The current manual method of administering property tax is very cumbersome, ineffective, and inefficient and it is incapable of meeting up with the numerous challenges posed as a result of the demands for parcel or property related information. Also, the manual system is often characterized by omissions and discrepancies.

In some cases the appraisal of some tenements are never in existence in tax registers and this translates to loss of revenue to the Local Government Council. The manual system of preparing bills is slow, especially where the quantity of data to deal with is so large and complex. The storage of tenement records in files is clumsy and not well arranged. All these greatly account for the delays in the collection of rates. In most cases, the Local Government Council collects rates largely in arrears.

However, for rates to be properly administered, having a comprehensive, accurate, timely, and easily accessible reservoir of geographic or spatial data (along with their associated attribute data), is indispensable. This is because property taxation is largely a spatial activity that can best be captured and managed using Remote Sensing/GIS.

For the system to be seen as suitable, that is, effective and efficient, it must have the capacity and capability of being used to easily and accurately capture, edit, store, retrieve, update, query, manipulate, analyze, display, and output property data in various formats, and it has to do all this objectively and at a cheaper and faster rate (Olaleye *et al.*, 2005).

There is a strong case for improving the indigenous revenue base of urban authorities. However, the problem is how to raise revenue from this property rating in an efficient and effective manner such that it will win the trust and confidence of the citizens that pay the tax.

The aim of this paper is to explore the potentials of Geographic Information Systems (GIS) for improving the revenue base of Olorunda Local Government Authority through modern approach to the administration of tenement rates. The specific objectives of the paper are to:

1. determine the geographic location of each property and their attribute data;
2. create a database for effective collection of tenement rate on properties in the study area; and
3. analyze the variations in payment status of ratable properties in the study area.

After the introduction, the paper undertakes a review of various authors who had looked at the potentiality of property tax as viable source of revenue generation. It also looks at the use of GIS tools for property tax. We show the study area, reveal the methodology adopted in the research and present a finding of GIS techniques of analysis. In the last section, recommendations are made on the modalities for GIS applications in property tax.

LITERATURE REVIEW

Dilinger (1992) postulated that property tax is a potentially attractive means of financing Municipal Governments in developing countries. Dilinger believes that property tax, as a revenue source, can provide Local Governments with access to a broad and expanding tax base, and can promote broader efficiency objectives by linking the provision of municipal services with price. He therefore suggested reforms which include improvement in the system used to discover and identify property and improving collection efficiency by establishing a system of collection monitoring that readily identify major delinquents. He further argued that the yield of urban taxes in developing countries is extremely low and its contribution to municipal revenue is less than 20%. He noted that the low yield could be attributed to failure in its administration. He agreed with Ntamere (1982) who is of the view that a large proportion of properties are missing from the tax rolls, properties on the tax rolls are inaccurately valued and collection efficiency is extremely poor.

Olu-Ajayi (1991) has a strong conviction that if the collection of tenement rates alone is aggressively pursued; local governments may come to be less dependent on either state or federal governments thereby strengthening their efforts in their attempts to be autonomous.

Egunjobi (1996) recognized property rate as a solution to Local Government insolvency. He suggested: the establishment of appropriate machinery, evolving realistic and enforceable regulations, provision of necessary infrastructure such as good mapping and information base and public participation.

Malme (1990 and 1991) suggested the use of tax maps and property data among others as a tool for location and valuation of property. The author stressed further that these would enable identification and description of property characteristics for accurate measurements.

However, none of the authors mentioned has applied Geographic Information Systems (GIS) in the administration of property tax. Ayeni (2003) defines GIS as a computerized database management system for the capture, storage, retrieval, analysis and display of spatial data. This tool has the capacity to inter-relate data sets and assist in their analysis as well as in the

presentation of the results (Ajala, 2000). Ndukwe (2001) defined a database as an organized collection of integrated and logically related non-redundant data stored so as to be capable of use by relevant application software with data being accessed from different logical paths. Ayeni and Adewale (2006), in a recent study carried out in Lagos Mainland Local Government Area Nigeria, used GIS tools to evaluate tenement rate administration but focused mainly on residential properties. Oluwadare (2010) also applied GIS tools in property rate administration with a focus on commercial properties in another geographic setting.

THE STUDY AREA

The study area is Olorunda Local Government Area of Osun State, Southwestern Nigeria (Figure 1). The Local Government Area is one of the 30 Local Government Areas in Osun State which was carved out of Osogbo Local Government Council. While Olorunda Local Government Area covers Osogbo North, Osogbo Local Government Area extends toward Osogbo South. Igbonna, is the administrative headquarters of Olorunda Local Government Area. Olorunda LGA lies within the rain forest belt between latitudes 7° 20' 42"N and 7° 34' 42"N and between longitudes 4° 25' 57"E and 4° 45' 56"E. The town with an annual rainfall of about 0.6 meters lies mainly in the deciduous forest area which spreads towards the grassland belt of Ikirun, north of Osogbo. The population is about 131,649 people comprising 66,684 males and 64,965 females (NPC, 2006).

The Local Government Area is made up of 11 wards. Eight of the eleven wards are located in the central business district (CBD), while the remaining three are located outside the CBD. The wards in the CBD are Agowande, Aruru Balogun Agoro, Akogun, Atelewo, Ogidi, Owode, Abaku and Anglican Grammar School. Others located in the districts are Oba Ile, Oba-Oke and Ilihe. The properties in the CBD were selected because most of the commercial activities take place there. Some of the properties that are categorized as commercial include banks, eatery, medical hospital, etc. The predominant activity in the districts is agriculture.

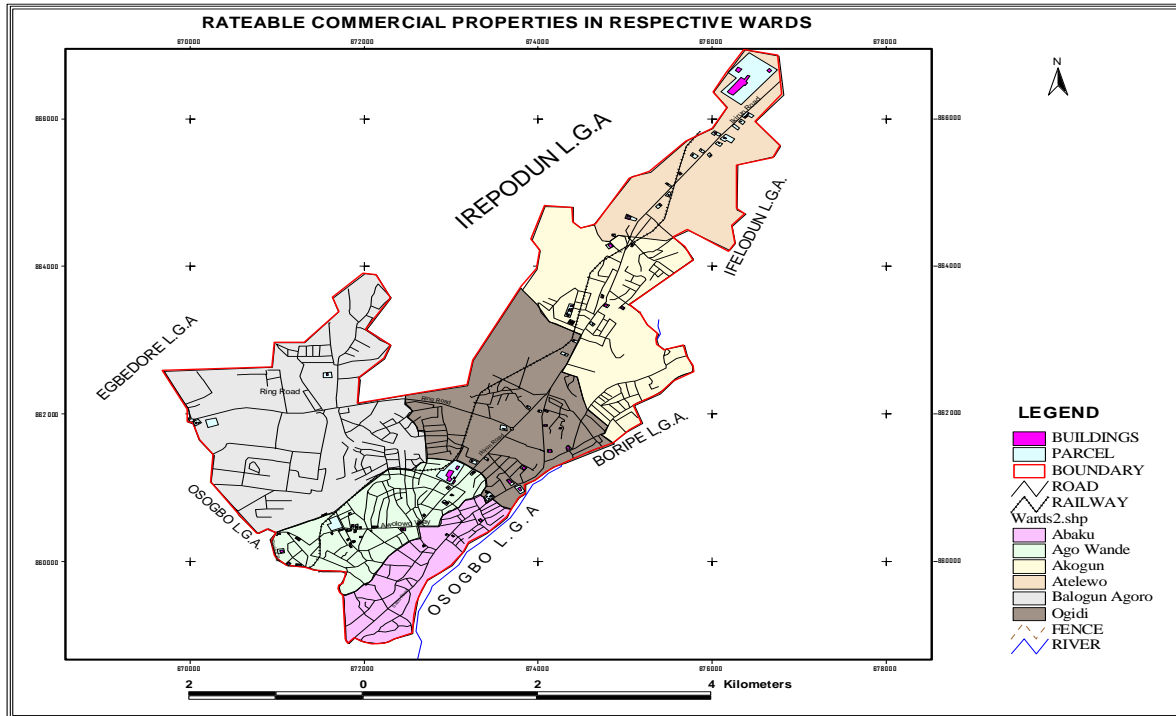


Figure 1: Map of the Study Area Showing Rateable Commercial Properties in their Respective Wards.

RESEARCH METHODOLOGY

This research employed a combination of primary and secondary data sources. The primary data was obtained through interview and the administration of structured questionnaires.

For officials of the taxing authorities, the data collected relates to their opinions on how the various property taxes are being assessed, levied and collected. Furthermore, data relating to how much revenue is being generated from tenement rating, problems encountered in the process and the level of effectiveness of the exercise and ways of improvement were collected. GPS was used to determine the locations of 85 parcels of land, containing 116 buildings, spatially distributed in 8 selected wards in the study area.

Secondary data sources include the official publication of the Internal Revenue Department of the Council and topographical maps of the study area obtained from the Office of the Surveyor-General of Osun State. In addition, satellite imageries were downloaded using Google Earth software. These data sets enabled the actual shape and size of the properties to be derived.

Descriptive data, property characteristics, ownership records and valuation/rental information were obtained from the Local Government Office in Igbona.

Database Design

In the design of database for this study, the vector data model was adopted to depict conceptual view of reality (buildings, streets, rivers and other relevant geographic entities). Figure 2 depicts four major fields used in the design of the database. The fields are River, Road, Building, and Parcel. Building is situated within a parcel of land. A parcel of land may contain more than one building and these buildings vary in size, shape, ownership, address as shown in Figure 2.

The design also shows that both building and parcel of land are point features and are adjacent to either road or river. Road has beginning and end nodes. River has attributes such as name, flow direction, length and identification number.

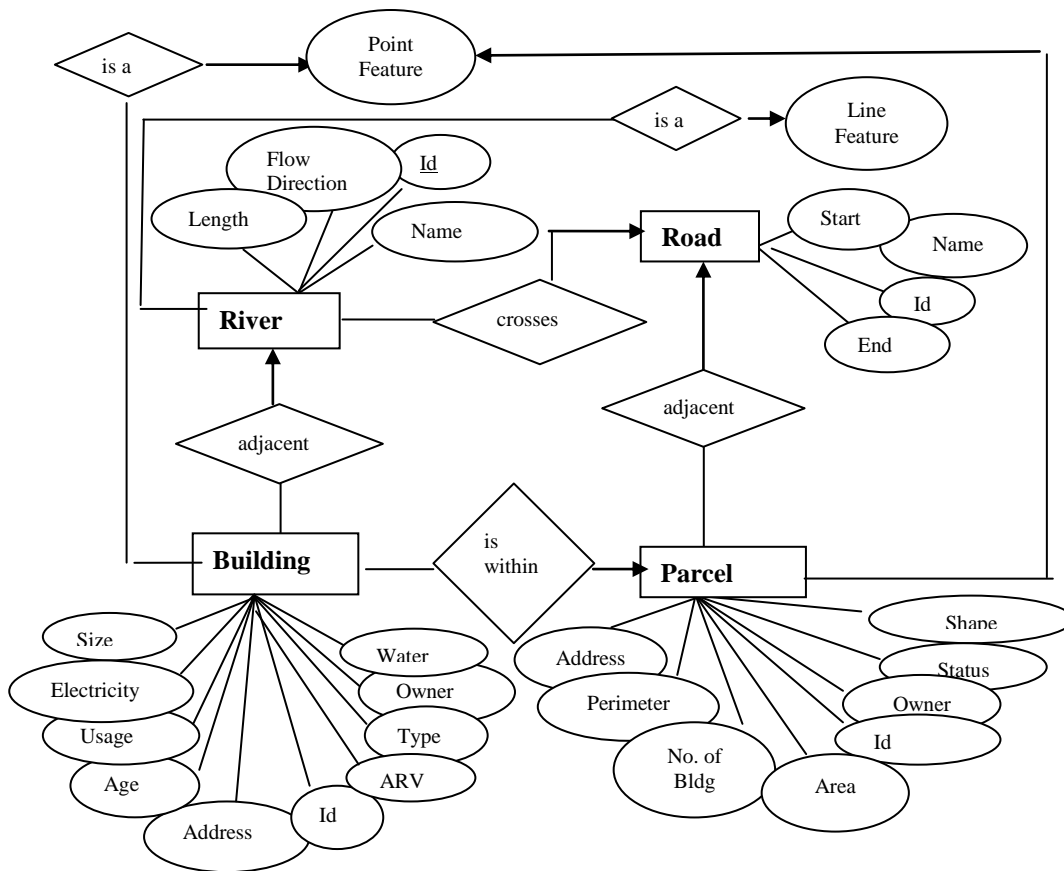


Figure 2: Logical Model Entity Relationship Diagram for Tenement Rate
(Source: Prepared by the Authors, 2010)

Creation of Database

The software adopted in the creation of Database was ArcView GIS[®] version 3.2a. This enables union of digital maps and attributes tabular data that facilitates display, query, summary and organization of data in a geographical context. The methodological approach adopted in the creation of the database is in the following systematic order:

- a) Acquisition of spatial and non-spatial data using the appropriate data acquisition methods;
- b) Satellite imagery of the study area was acquired in bits through Google Earth, stitched together using Corel Draw 11 and saved in raster format;
- c) The image in raster format was exported to ILWIS 3.0 environment for geo-referencing and digitizing. Out of the three available digitizing methods, on-screen digitizing was employed;
- d) After the digitizing of all the layers, the layers were checked for self-overlap and dead-ends. The layers created include the major roads, rateable properties, buildings, wards, among others; and
- e) The edited layers were exported to ArcView[®] 3.2a software environment; tables for the attribute data were prepared using Microsoft Access Software and finally linked with the graphics to form the expected database.

Techniques of Data Analysis

In an attempt to validate and communicate the results, data analyses were carried out using the geo-processing and spatial analysis tools of ArcView GIS® such as querying, histogram and overlay were used for visual display of the results.

A GIS stores spatial and attribute data in two separate files. Corresponding records in the two files (for example, a map of property parcel boundaries and the corresponding data such as the name of the owner, structure built on the property parcel, and the value of the structure) are linked by an identification number (for instance, the parcel number). This allows a GIS to search and display attribute data based on spatial criteria, and vice versa. For example, a GIS user can point to a particular property and ask the GIS to retrieve and display the attribute data of that parcel, but can also ask the GIS to locate the corresponding property parcel on the map by supplying a record in the attribute database.

A GIS is also able to handle much more complex queries. GIS users can define search parameters involving arithmetic and logical expressions by building a "query statement." Operators such as +, -, =, not =, <, <=, >, >=, between and others specify the value to be found. Several query statements can be combined to perform a single query.

Logical operators could be employed to narrow the search or even to specify which attributes to retrieve. The resulting query set could be used to generate reports, graphic displays, and new map

files. This was partly employed in achieving the second objective of this study.

Some of the query analyses performed aimed at determining the categories of defaulters among the ratepayers, those that are up-to-date in paying their rates, the location and condition of prospective properties, total amount due for payment, etc. Visual representation of the results was presented on maps.

DISCUSSION OF RESULTS AND FINDINGS

Variations According to Location

Table1 shows the distribution of properties as they vary from one ward to another. While properties are densely located in wards like Agowande and Ogidi, it is the opposite in Balogun Agoro and Abaku wards. In Atelewo ward all the commercial properties are situated along the major road with the exception of Motel De Daniel Hotel located in the interior. Osun Guest House in Akogun ward is located along the express way. Also Terminus Hotel is located in Agowande ward which is a high density zone.

Five parcels (5.88%) of the properties are found in each of Abaku and Agoro wards. Also, Atelewo and Ogidi equally have 16 properties each representing 18.82%, while 9.41% of the entire parcels of the study area are found in Akogun ward (Figure 3). Agowande has the highest concentration of commercial properties being the location of the Local Government headquarters. It contains 35 parcels representing 41.18% of the commercial properties in the study area.

Table 1: Variations According to Location.

Wards	Parcel Frequency	Percent	Building Frequency	Percent
Agowande	35	41.2	42	36.2
Ogidi	16	18.8	20	17.2
Balogunagoro	5	5.9	7	6.0
Abaku	5	5.9	8	6.9
Atelewo	16	18.8	17	14.7
Akogun	8	9.4	22	19.0
Total	85	100.0	116	100.0

Source: Authors' Field Survey, 2010

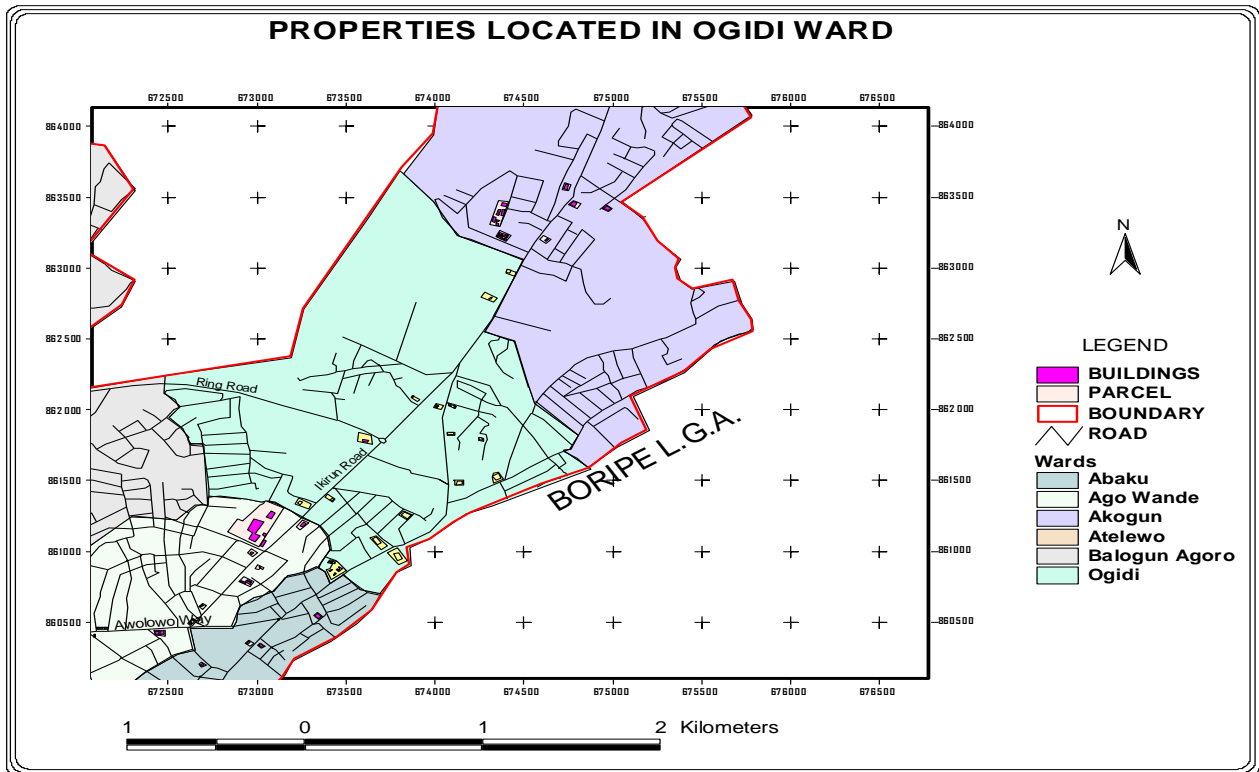


Figure 3: Map Showing Properties Located in Ogidi Ward Highlighted Yellow.

Analysis of Behavioral Response to Payment

Multiple criteria queries were carried out to analyze the behavioral pattern of the rate payers whether they have the ability to pay but do not want to pay or they do not pay because of financial distress.

Only one property was found out of 17 properties, which satisfies all the conditions stated as follows: property owners owing at least N10, 000 in Atelewo ward, whose parcels contain 2 buildings; fenced and property rated high as being good. This same set of queries was launched for Agowande ward and only one property was found out of 42 properties.

Overview of Financial Status of Ratepayers

Query was also launched to filter out the categories of ratepayers who defaulted in paying, those who pay partially and those who have fully

paid their rates. The result is presented in Figure 4

Out of the eight (8) selected properties in Agowande, which fall in age range of 5 and 10 years, it could be seen that United Bank for Africa (UBA) paid (N150,000), being the highest of all the rates imposed for a period of 3 years. This was closely followed by other four banks who are supposed to pay (N120, 000) for the same period of time. Out of these four banks, only Spring Bank did not pay in full. It still owed N20, 000 as revealed in Figure 4.

Boorepo Chemist is the least-paying property owner. It ought to pay N40,000 for the period under consideration. However, it paid half of the amount, leaving a balance of N20,000 to balance. Four of the eight bars are missing in the chart because four of these property owners do not owe. It could also be observed that those who do not owe are the banks.

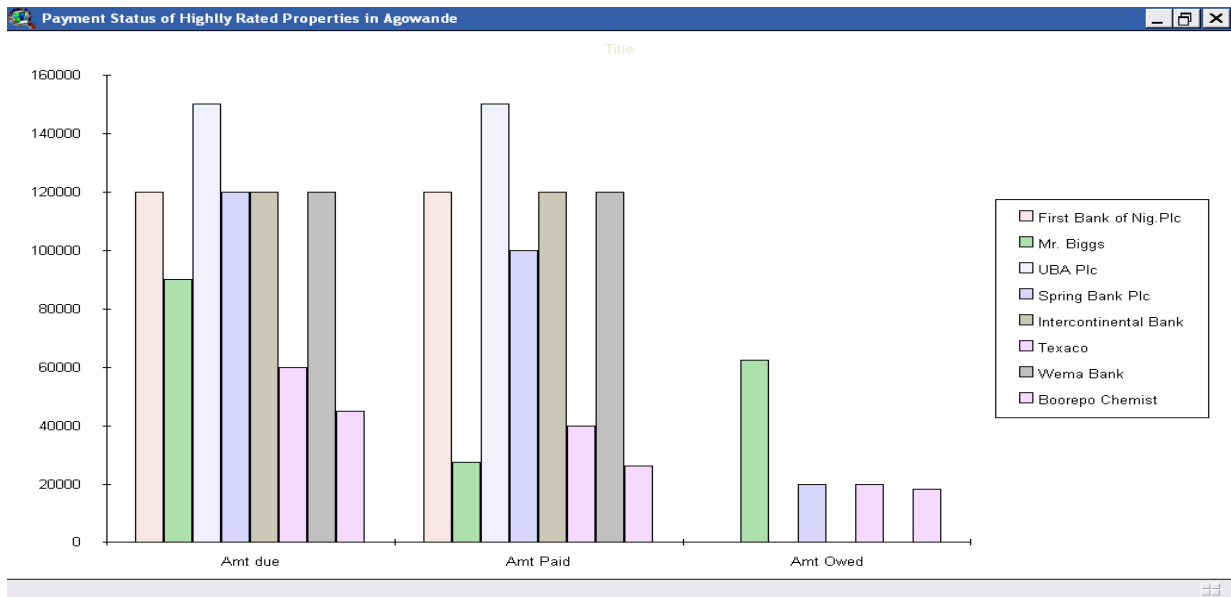


Figure 4: Payment Status of Property Owners in Agowande Ward.

Shape	ID	Zone	Owner	Amt due	Amt Paid	Amt Owed	Address	No of Bldg	Fenced
Polygon	1	Awo	Wema Bank	150000.00	150000.00	0.00	Station Road	1	Yes
Polygon	2	Awo	First Bank of Nig.Plc	120000.00	120000.00	0.00	Station Road	1	Yes
Polygon	3	Awo	Olorunda LGA Secretariat	0.00	0.00	0.00	Awolowo Way	7	Yes
Polygon	4	Awo	Obelawo Plastic Industry	105000.00	0.00	105000.00	Ikirun Road	4	Yes
Polygon	5	Awo	Presidential Hotel	105000.00	53500.00	51500.00	Kola Balogun Are	5	Yes
Polygon	6	Aderin	Total Filling Station	60000.00	29000.00	31000.00	New Garage	1	Yes
Polygon	7	Aderin	Texaco Filling Station	60000.00	30000.00	30000.00	New Garage	1	Yes
Polygon	8	Awo	Olatundun Plaza	30000.00	30000.00	0.00	Awolowo Way	1	Yes
Polygon	9	Awo	Union Bank	120000.00	120000.00	0.00	Awolowo Way	1	Yes
Polygon	10	Awo	Mr. Biggs	90000.00	27500.00	62500.00	Awolowo Way	1	Yes
Polygon	11	Awo	Mobil Filling Station	60000.00	29000.00	31000.00	Apetoro Area	1	Yes
Polygon	12	Okefa	Dennyst Petrol	60000.00	35000.00	25000.00	Ring Road	2	Yes
Polygon	13	Okefa	NNPC Mega Station	0.00	0.00	0.00	Ring Road	3	Yes
Polygon	14	Awo	UBA Plc	150000.00	150000.00	0.00	Olerisoto Area	1	Yes
Polygon	15	Awo	Concol	60000.00	28000.00	32000.00	Old Garage	1	Yes
Polygon	16	Awo	Total Filling Station	60000.00	45000.00	15000.00	Old Garage	1	Yes
Polygon	17	Awo	Terminus Hotel	45000.00	45000.00	0.00	Ajegurle Area	1	Yes
Polygon	18	Awo		0.00	0.00	0.00	Ajegurle Area	1	Yes
Polygon	19	Awo		0.00	0.00	0.00	Awolowo Way	1	Yes
Polygon	20	Awo		0.00	0.00	0.00	Bishop Road	1	Yes
Polygon	21	Awo		3000.00	3000.00	0.00	Bishop Road	2	Yes
Polygon	22	Awo		4500.00	4500.00	0.00	Awolowo Way	2	Yes
Polygon	23	Awo		5000.00	5000.00	0.00	Apetoro Junction	2	Yes
Polygon	24	Awo		6000.00	6000.00	0.00	Ikirun Road	3	Yes
Polygon	25	Awo		8000.00	8000.00	0.00	Pepsi Cola Area	1	Yes
Polygon	26	Awo		8000.00	8000.00	0.00	Ota Efun Area	1	Yes
Polygon	27	Awo		9000.00	9000.00	0.00	Ikirun Road	1	Yes
Polygon	28	Awo		10000.00	10000.00	0.00	Stadium Area	1	Yes
Polygon	29	Aderin		45000.00	45000.00	0.00	Aderin Area	2	Yes
Polygon	30	Aderin		60000.00	60000.00	0.00	Aderin Area	1	Yes
Polygon	31	Aderin		80000.00	80000.00	0.00	Aderin Area	1	Yes
Polygon	32	Aderin		90000.00	90000.00	0.00	Testing Ground	1	Yes
Polygon	33	Awo		40000.00	40000.00	0.00	Testing Ground	1	Yes
Polygon	34	Awo		10000.00	10000.00	0.00	Kola Balogun Are	1	Yes
Polygon	35	Awo	Triumph Medical Centre	30000.00	20000.00	10000.00	Sabo Area	1	Yes

Figure 5: Property Owners who are up-to-date in Payment,

Figure 5 shows that out of 85 property owners in the study area, only 16 of them are up-to-date in the payment of their rates and this represent 18.8%. Further query launched revealed that only 3 property owners have never paid at all while, 66 owners representing 77.6% have made part payment. This reveals the attitude of rate payers to tenement rating, that is, majority who made part

payment did so possibly because they had no opportunity to evade it. This attitude is not good enough for revenue generation in the Local Government Area. If more efforts could be made to encourage the rate payers, there is likelihood for improvement in the revenue generation through rating.

SUMMARY OF FINDINGS

Olorunda Local Government Area is comprised of 11 wards, eight of which are located in the urban area, while the remaining three are in the rural areas. However, six of the wards in the urban area fall within the study area. The total number of ratable commercial buildings found was 116 and these buildings are spatially distributed on 85 parcels of land. This is so because some parcels have more than one building on it.

It was also noted that most of the commercial activities are located along the major roads with the exception of medical premises which are located in the interior. In most cases, roads leading to these medical premises are untarred and this may probably affect the frequency of rate collectors to these locations. Only banks were found to be paying in full, possibly to protect their image in the public.

It was also gathered in the course of the study that ownership of some of the properties have changed, while some are even out of service but these changes were not updated in the valuation register.

CONCLUSION AND RECOMMENDATIONS

It could be concluded that the system of rate administration in the study area needs overhauling based on the current manual system of keeping property tax record. With the method of data acquisition employed in this work, coupled with that of storage, analyses and presentation, GIS is seen to be amenable to meeting up with the challenges faced in the collection of tenement rate. Tenement rating could be a reliable and consistent means of revenue generation for the government if the right approach is adopted using the GIS technology.

Germane to the findings of this study, every rate authority office should maintain a GIS database for effective collection of tenement rate. Regular update of valuation list should be done every 2 years instead of the conventional 5 years because of the affordable and easy update opportunities presented by GIS technology. In addition, the Local Government Authority should acquire appropriate satellite images of their territory for the identification of the owners of newly built properties and inclusion of the property in the

database by Government officials when they go on site visit.

Land Officers and Geoinformaticians should collaborate at producing digital maps that could be used for billing schedule and rate collection. Digital maps produced will also help the management to allocate field workers proportionately. It is glaring from the study that Agowande ward will need more field workers than Balogun Agoro ward because it has higher concentration of commercial properties.

REFERENCES

1. Ajala, D.O. 2000. "Application of Geographic Information System (GIS) in Urban and Regional Planning" *Journal of the Nigerian Institute of Town Planners*. Vol.XIII.
2. Ayeni, O.O. and O.S. Adewale. 2006. "Promoting Land Administration and Good Governance", 5th FIG Regional Conference Accra, Ghana, March 8-11, 2006.
3. Ayeni, J.B. 2003. "GIS, Cartography and Mapping for National Development" In: P.C. Nwilo, N.O. Uhiocha and D.N. Saka (eds). *Proceedings for the Conference of Geoinformation Society of Nigeria*. 153-172.
4. Dillinger, W. 1992. "Urban Property Tax Reform Guidelines and Recommendations". The World Bank: Washington, D.C.
5. Egunjobi, L. 1996. "Framework for Property Rating". Workshop on Urban Management System. Oyo State Government: Ibadan, Nigeria.
6. Federal Republic of Nigeria. 1999. *The Constitution of the Federal Republic of Nigeria*. Federal Government Press: Abuja, Nigeria.
7. Gboyega, A. 1990. "Property Rate". In: Bello-Isman I.B. (Ed). *Local Government Finance in Nigeria*. Nigerian Institute of Social and Economic Research Monograph: Ibadan, Nigeria.
8. Kufoniyi, O. 1995. "An Introduction to Object Oriented Data Structures". *ITC Journal*. 1995-1.
9. Kufoniyi, O. 1998. "Basic Concepts in GIS". In: C. U. Ezeigbo (ed.). *Principles and Applications of Geographic Information Systems*. Department of Surveying, University of Lagos: Lagos, Nigeria.
10. Malme, J.H. 1990. "Property Tax Administration in North America." *Property Tax Journal*.

- International Association of Assessing Officers (December 1990).
11. Malme, J.H. 1991. *Policies and Practices That Promote Assessment Equity: Case Studies of Alternative Models*. Lincoln Institute of Land Policy: Phoenix, AZ.
 12. Ndukwe, N.K. 2001. *Digital Technology in Surveying and Mapping*. Rhyce Kerex: Enugu, Nigeria.
 13. NPC. 2006. *Federal Government Official Gazette: No.24, Vol. 94 of May on Legal Notice and Publication of Details of the Breakdown of the National and State Provisional Total 2006 Census*. Federal Government Press: Lagos, Nigeria. B194.
 14. Ntamere, C.C. 1982. "Metropolitan Finance in Nigeria: Sources and Variations". In: J.O. Abiodun (ed.). *Urban and Regional Planning Problems in Nigeria*. University of Ife Press Ltd.: Ile-Ife, Nigeria.
 15. Olaleye, J.B., A.I. Hamid-Mosaku, and S.O Idowu. 2005. "Geographic Information Systems (GIS) for Tenement Rate Administration: A case study of Eti-Osa Local Government in Lagos State". First National Seminar on the Application of Geographic Information System (GIS) on Local Government Administration for Efficiency and Good Governance. Abuja, Nigeria.
 16. Olorunda Local Government. 2005. *Pocket Map of Olorunda Local Government Area*. Igbona, Nieria.
 17. Olowu, D. 1989. "Prospect of Property Rates as an Additional Revenue Source for Nigerian Local Government." *Research for Development. The Journal of Nigerian Institute for Social and Economic Research (NISER)*. Ibadan. 4(1&2). July.
 18. Olu-Ajayi, R. 1991. "Impediments to Local Government Revenue Generation". *Local Government News*. January. 15,18.
 19. Oluwadare, C.O. 2010. "Spatial Analysis of Rateable Properties in Olorunda Local Government Area, Osun State". Unpublished M.Sc. Dissertation, Department of Geography, Obafemi Awolowo University: Ile-Ife, Nigeria.
 20. Rabi, S.A. 1998. "The Current Property Based Taxes in Nigeria, Administrative, Logistics and Procedural Problems in Implementation". International Seminar on Property Based Taxation. Nigerian Institution of Estate Surveyors and Valuers. International Conference Centre: Abuja, Nigeria.
 21. Tesfay, A. 2008. "Infrastructure Development Enhances National Development". Shaebia. http://www.shaebia.org/artman/publish/article_5480.shtml, Wikipedia. 2008. Olorunda. <http://en.wikipedia.org/wiki/Olorunda>

ABOUT THE AUTHORS

Caleb Oluwadare, is a Lecturer in the Department of Estate Management, Obafemi Awolowo University, Ile Ife, Nigeria. He is a registered Surveyor and a member of Nigerian Institution of Surveyors. He holds a Master of Science in Remote Sensing and Geographic Information System (GIS) from Obafemi Awolowo University. He is a Ph.D. student in the Department of Geography. His research interests are in 3D Cadastre and Land registration.

Dr. Olatoye Ojo, is an Associate Professor in the Department of Estate Management, Obafemi Awolowo University, Ile Ife, Nigeria. He holds Ph.D. degree in Estate Management. He is a registered Estate Surveyor and Valuer and a Fellow of the Nigerian Institution of Estate Surveyors and Valuers. His research interests are in the areas of property management and housing finance

SUGGESTED CITATION

Oluwadare, C.O. and O. Ojo. 2014. "Database Creation for Tenement Rate Collection: The Role of GIS". *Pacific Journal of Science and Technology*. 15(1):190-199.

 [Pacific Journal of Science and Technology](http://www.akamaiuniversity.us/PJST.htm)