Covenant Journal of Research in the Built Environment (CJRBE) Vol. 5, No. 2, Dec. 2017

An Open Access Journal Available Online

Unfolding the Potentials of Geographic Information System on Property Taxation in Lagos State

Peter Shakede & Markson Opeyemi Komolafe

Department Ogedengbe of Estate Management
University of Benin
Benin-City.
peter.ogedengbe@uniben.edu

Abstract: Technological advancement has turned the entire world into a global village with its attendant benefits to virtually all professions including estate surveying and valuation. It is against this background that the paper examined how the administration of property taxes can be enhanced using Geographic information system (GIS) with focus on GRA Ikeja, Lagos State. The map of GRA was obtained, digitised and exported into the GIS environment. The arc view 3.2a software was used, from which queries were carried out. GIS software was used to demonstrate how information concerning properties can be accessed from a database that contained all property types in GRA Ikeja. The database includes the facilities in each building, location, its rental value, and the property owner. Attribute data of the properties such as street name (parcel address), land use, ownership, building type, owner's occupation, owner's sex, title on the property, age and state of origin etc were collected. In addition, interview was conducted with some residents of GRA Ikeja, Lagos state. The study covered a total of the 1705 buildings in the GRA that were captured through the use of the aerial map which was further digitised. The digitised map when inputed into the GIS software automatically numbered all the buildings and roads in the area. Database query was used to retrieve information stored in the data base using structured query language [SQL] Queries were generated basically through data base extraction in arc view 3.2a. Various queries were run to satisfy the user's expectation(s). The results showed the vital roles of using GIS in the management of a simple data within a system, which was used in the creation, storage, and retrieval, manipulation of spatial and non-spatial data. The results further showed that administration of property taxes can be carried out within the comfort of one's home with the

aid of GIS. The paper concluded that GIS as a vital part of technological advancement is very important to the administration of property taxes.

Keywords: Geographic information system (GIS), Land Use Charge, Query, Property Taxes.

1. Introduction and Statement of Problem

The world we live in is made up of a lot of geographical features, natural resources and man- made features. Information about the location, nature, type, quality and quantity of these features play an important role in our everyday life. The compilation, updating, organizing, storage and usage of these details from time to time are of benefit to us. They provide us with required choices for planning, management and development of resources, thereby helping to make certain decisions for both the present and the future (Ayeni and Ifechukwu 2003).

In the past, corporate organizations and government at various levels have made different attempts aimed at collecting and presenting geographic information in an acceptable form. One of the earliest forms is the map, which is a collection of various geographic data of a particular location on the surface of the earth. This location is defined by a set of coordinates with reference to a coordinate system at a given scale e.g. Geographical coordinate system – longititude and latitude (Longley and Goodchild 2001, Bruce 1996).

Nearly all government information has a geographic dimension - a street address, a transportation corridor, a river, and a city lane. All kinds of descriptive information can be linked to a particular place to present a rich and detailed picture of a neighbourhood, a park, a coastline, or an industrial site.

Geographic Information System (GIS) offers unique opportunities to analyse and compare these disparate types of information, opening up new opportunities to deliver both information and services.

Landed properties form part of man-made geographical features in which information on location, nature, type, quality and quantity are sought by people in all walks of life from Estate Surveyors and valuers and agents for the purposes of transactions including tax administration, among others. Since landed properties have geographical dimension, which could be street addresses, transportation, corridors, rivers or city lanes, these descriptive information could be linked together to enhance property tax administration.

GIS is an information system that is used to input, store, retrieve, manipulate, analyse and output geographically referenced data or geo-spatial data (landed properties inclusive) in order to support decision making for planning and management of land use, natural resources environment, transportation, urban facilities, and other administrative records. Integration of Geographic Information System (GIS) and remote sensing provides a means to update time oriented information and mapping of dynamic features of the earth surface (land and properties inclusive) for management and planning.

An increasing common application of remotely sensed data is for change detection.

Change detection is the process of identifying differences in the state of an object or phenomenon by observing it at different times (Singh 1989). This paper focuses on the ways by which

Geographic Information Systems (GIS) can make property tax administration easier thereby leading to better service delivery.

Concept of Geographic Information System (GIS)

Many definitions of GIS have been suggested over the years, and none of them is entirely satisfactory, though many suggest much more than a technology. Today, the label, GIS is attached to many things: amongst them a software product that one can buy from a vendor to carry out certain well-defined functions (GIS software), digital representations of various aspects of the geographic world, in the form of datasets (GIS data), a community of people who use and perhaps advocate the use of these tools for various purposes (the GIS community); and the activity of using a GIS to solve problems or advance science.

GIS is a computer system capable of capturing, storing, analysing, and displaying geographically referenced information; that is, data identified according to location. Practitioners also define a GIS as including the procedures, operating personnel, and spatial data that go into the system.

GIS: - is a container of maps in digital form: a computerized tool for solving geographic problems; a mechanized inventory of geographically distributed features and facilities a is tool for revealing what is otherwise invisible in geographic information a tool for performing operations on geographic data that are too tedious or expensive or inaccurate if performed by hand (Longley and Goodchild 2001).

GIS can be defined as a computerized system that facilitates the phases of data entry, data analysis and data presentation especially in cases when we are dealing with geo-referenced data.

This means that a GIS user will expect support from the system to enter (geo-referenced) data, to analyse it in various ways, and to produce presentations (maps and other) from the data. Many kinds of functionality should come with this: support for various kinds of coordinate systems and transformations between them, many different ways of 'computing' with the geo-referenced data, and obviously a large degree of freedom of choice in parameters such as colour scheme, symbol set, medium et cetera (Rolf and Maguire 2001).

GIS has been defined as the art, science or technology dealing with the acquisition, storage, processing, presentation and dissemination of geo-information. A GIS can also be defined as a configuration of hardware, software, communication networks and analytical procedures for the extraction of information from data to support decision-making so as to achieve planning or managerial objectives (Ayeni and Ifechukwu 2003).

Burrough and Macdonnell (1998) defined GIS "as a powerful set of tools for storing and retrieving at will, transforming and displaying spatial data from the real world for a particular set of purposes". This is often called the "toolbox definition" of GIS, because it stresses a set of tools each designed to solve specific problems (Clarke 1999).

If GIS is a tool box, a logical question is: what type of tools does the box contain? Several authors have tried to define GIS in terms of what it does, offering a functional definition of GIS. Most authors agree that the functions fall into categories and that the categories are sub-tasks that are

arranged sequentially as data move from information source to a map and then to the GIS user and decision maker.

Another view, for example states that GIS are "automated systems for the capture, storage, retrieval, analysis, and display of spatial data."(Clarke 1999). This can be referred to as a process definition.

GIS is an information system that is designed to work with data referenced by spatial or geographic coordinates. In other words, a GIS is both a database system with specific capabilities for spatially-referenced data, as well as set of operations for working with the data (Star and Estes 1990).

This definition stresses that the GIS is a system for delivering answers to questions or queries, so that this is an information system-sort of definition.

Dueker (1979) defined GIS as "a special case of information systems where the data base consists of observations on spatially distributed features, activities or events, which are definable in space as points, lines, or areas. A geographic information system manipulates data about these points, lines and areas to retrieve data for ad hoc queries and analyses".

The term GIS according to Steven (1994) has various meaning. It could be termed an 'industry', 'a product', 'a technology', and 'a science' depending on the user. To a software developer ,it is an industry, the system marketer and data provider will see it as a product, while the application specialist, or academic researcher will see it as technology or science.

Goodchild and Steyeart (1993) views geographic information systems as "the generic issues that surround the use of GIS technology, impede its successful implementation, or emerge from an understanding of its potential capabilities".

Typically, data associated with properties is held in a computer assisted mass appraisal (CAMA) system that is responsible for sale analysis, evaluation, data management, and administration, and for generating notices to owners. CAMA systems are usually implemented on top of database management system (DBMS) and can be linked to the parcel database using a common key.

The task involves a geographic database query to locate all the property sales of a similar type within a specified distance of an owner's property. First the owner's property must be found in the property data using a query. Then a geographic query can locate all comparable properties valued similarly within 1 mile of the owner's property.

Hence Geographic Information Systems are integrated, spatial, data management programmes with which we bring together, store and retrieve spatial data from the real world. From the foregoing - GIS can be conclusively described as a set of tools comprising appropriately chosen hardware component, and a software component made up of technically designed databases with a set of fail-proof data handling programs that are all technically integrated for the collection, storage, retrieval, manipulation and dissemination of processed spatial data of a given area.

Anatomy of A GIS

GIS is characterised by the immense storage requirements Antenucci and Philip (1991), Frank (1998), Ayeni and Ifechukwu (2003), Longley and Goodchild (2001), Read and Lam

(2002) and the hybrid nature of the system. It is made of the following:

The Network

The most fundamental of the well-defined component parts of a GIS is the network, without which no rapid communication or sharing of digital information could occur, except between a small group of people crowded around a computer monitor. GIS today relies heavily on the Internet, and on its limited-access cousins, the intranets of the corporations, agencies and the military. The internet was originally designed as a network for connecting computers, but today it's is rapidly becoming society's mechanism of information exchange, handling everything from personal messages to massive shipments of data, and increasing numbers of business transactions.

The recent histories of GIS and the Internet have been heavily intertwined. The Internet has proven very popular as a vehicle for delivering GIS applications for several reasons. It is an established, widely used platform and accepted standard for interacting with information of many types. It also offers a relatively cost-effective way of linking together distributed users (for example, telecommuters and office workers, customers and suppliers, students and teachers. The interactive and exploratory nature of navigating linked information has also been a great hit with users. The availability of multi –content site gateways (portals) with powerful search engines has been a further reason for success.

Hardware

The second piece of the GIS anatomy is the user's hardware, the device that the user interacts with directly in carrying out GIS operations by typing, pointing, clicking, or speaking and which returns information by displaying it on the devices screen or generating meaningful sounds.

Traditionally this device sat on an office desktop, but today's user has much more freedom, because GIS functions can be delivered through laptops, personal digital assistants (PDAs), in-vehicle devices, and even cellular phones.

Software

This third piece of the GIS anatomy runs locally in the user's machine. This can be as simple as a standard Web browser (e.g. Microsoft Explorer or Netscape) if all work is done remotely using assorted digital services offered on large servers. More likely it is a package bought from one of the GIS vendors. Each vendor offers a range of products, designed for different levels of sophistication, different volumes of data, and different application niches

Database

This consists of a digital representation of selected aspects of some specific area of the Earth's surface or near surface, built to serve some problem-solving or scientific purpose. A data base may be built for one major project, such as the location of a new high-voltage power transmission corridor, or it might be continuously maintained, fed by the daily transactions that occur in a major utility company (installation of new underground pipes, creation of new customer accounts, daily service crew activities).

It might be as small as a few megabytes (a few million bytes, easily stored on a few diskettes) or as a large terabyte (a trillion bytes, occupying a storage unit somewhat larger than a shoe box). GIS databases can range in size from a megabyte to several petabytes.

Management

In addition to these four components- network, hardware, software and data base- a GIS also requires a management. An organisation must establish procedures, lines of reporting, control points and other mechanism for ensuring that its GIS activities stay within budgets, maintain high quality, and generally meet the needs of the organization.

Finally, a GIS is useless without the people that design, program and maintain it, supply it with data and interpret its result. The people of GIS will have various skills, depending on the roles they perform. Almost all will have the basic knowledge needed to work with geographic data.

Functions of GIS

GIS is a computerized, integrated system used to compile, store, manipulate, and output mapped data.

i. Compilation

Data compilations involve assembling all of the spatial and attribute data that are to be stored in a computerized format within the GIS. A base map is a set of standard requirements for data. It provides accurate standards for geographic control, and also defines a model or template that is used to shape all data into a compatible form. This conversion process, referred to as "conversion" or "digitizing," converts paper maps into numerical digits that can be stored in the computer can be performed using various techniques – scanning, line digitizing which uses a tablet and a tracing stylus.

ii. Storage

Once the data have been digitally compiled, digital map files in the GIS are stored on magnetic or other (e.g., optical) digital media. Again, different GIS software packages will employ different storage formats. In most cases, however, data storage will be based on a generic data model that is used to convert map data into a digital form. The two most common types of data models are raster and vector. Both types are used to simplify the data shown on a map into a more basic form that can be easily and efficiently stored in the computer.

iii. Manipulation

Once data are stored in a GIS, many retrieval, analysis, and output options are available to users. These functions are often available in the form of "toolkits." A toolkit is a set of generic functions that a GIS user can employ to manipulate and analyze geographic data. Toolkits provide processing functions such as data retrieval, measuring area and perimeter, overlaying maps, performing map algebra, and reclassifying map data. A GIS usually includes a basic set of computer programs or "tools."

iv. Output

The final functional task of a GIS is to generate output; usually a map. GIS-generated maps are compiled from the many data sets contained in the digital GIS and match exact user specifications. Map output may employ several colors and symbology schemes, and will be sized and scaled to meet user needs.

Scientific Foundations and Generic Questions.

Critical to the success of property taxation is a high-quality, up-to-date geographic database that can be linked to a CAMA system. Considerable effort must be expended to design, implement, and maintain the geographic database. Even for a small community of 50,000 properties it can take several months to collect the geographic descriptions of

property parcels and their associated attributes. Linking GIS and CAMA system can be quite straight forward providing that both systems are based on DBMS technology and use a common identifier to effect the linkage between a map feature and a property reward. For example in the USA a unique parcel number is used while in the UK a unique Property reference number is used.

Clearly, the system is dependent on a clear and unambiguous definition of parcels, and common standards about how different characteristics (such as size, age and value of improvements) are represented. The GIS can help enforce coding standards and can be used to derive some characteristics automatically in an objective fashion. For example using GIS it is very easy to calculate the area of properties from the boundary information.

Fundamentally, this application, like many others in GIS is about maintaining an unambiguous and accurate inventory of geographic features. To be effective it must employ methods of description and representation that are clear, understood by every user of the system, and work the same way every time they are used. These are all core objectives of scientific method, and although the application is clearly not driven by scientific curiosity, it nevertheless follows procedures that are much like those used in a scientific laboratory.

A compilation of information concerning properties is very important in property taxation which can be enhanced using a classical operational GIS system. It requires an up-to-date inventory of properties and information such as locational address, owner's name, assessed value, property type, characteristics, etc.

It is also possible to use GIS for more strategic modelling activities. The many tools in GIS for charting, reporting, mapping and exploring data help sourcing officers to understand the variability of property value within their jurisdiction.

Once a property data base has been created, it becomes a valuable asset to government for taxation purposes.

Property tax laws in Lagos State

Population increase has brought the need for more social amenities and services by the people which invariably puts financial burden on the government. As a way out of this, the Lagos state Government enacted the Land Use Charge Law in 2001.

The most popular property tax laws in operation are tenement rate edict, neighbourhood improvement charge law, and development charge law. Other property tax who are operation in the state were inherited from the constitution and other act entrenched in the constitution, they include capital gain tax, consent fees, stamp duty, registration fees and ground rent charge (land use act), withholding tax and lastly land use charge law. Some of these laws, fees and charges will be discussed in brief in the following paragraph.

- Capital Gains Tax (CGT): It is the first tax paid when a property was purchased before the deed of assignment can be stamped to validate the transaction. Capital Gain Tax supposed to be a proportion of the gain or profit paid to the government as tax. It is a universal tax paid all over the world in line with income tax laws. However, in Lagos State 10% of the value or

purchased price of the property will be paid to the state government.

- Stamp Duty: It is also a universal tax recognized all over the world just like the Capital Gain Tax (CGT). Stamp Duty is a payment for the stamping of the deeds of assignment or conveyance. In Lagos State, one is expected to part with 5% of the cost of the property to the state government. Comparing this percentage charged by Lagos State government with that of other states or even with rate charged all over the world, that of Lagos is outrageous. For instance, in United Kingdom the rate is just 1% of the cost of the property.
- Registration Fees: It is a fee payable everywhere in the world for entering the detail of deed of assignment or conveyance in a register of title. In most countries the fee is a very small amount and it is fixed. It has nothing to do with property in question. The logic is that the effort required in writing the detail of any property is the same and it does not reflect the value or the cost of the property.
- Consent Fees: Unlike registration fees, stamp duty and capital gain tax which derived their origin from the world tax, consent fees is applicable in Nigeria only. It derived its existence from the Land Use Decree (now land use Act) of 1978. According to section 21- 27 subsection 4 of land use act which provided that for any transaction on land on which a certificate of occupancy (COFO) had been granted to be valid, the consent of the Governor must first be obtained. For properties whose titles are over ten years the fees is 15% of the cost of the property while for properties whose titles are below 10years the fees is 20% of the cost of the property.
- Development Charge: It is a rate payable on all state lands which is meant to fund the provision of infrastructure within the estate. The rate varies from scheme to scheme. It is payable on government land especially in high brow areas like Lekki which payment started during the tenure of Rtd Brigadier Raji Rasaki when he was the military Governor of Lagos State. Initially it was just #179.00 per square meter but due to increase in the cost of provision of infrastructure it was increased to #12,500.00 per square meter. This rate also varies depending on the location and the infrastructure provided within the neighbourhood.
- Neighbourhood Improvement Charge (NIC): According to Neighbourhood Improvement Charge Law Improvement means "the provisions, in an area declared as improvement area, of one or more of anything of any quality permanently attached to the estate of developed or undeveloped property or the land resulting from the expenditure of capital or labour by the state government, to enhance the value of the said estate or developed or undeveloped property or land, or its utility or amenity thereof and it includes buildings, fencing, road, reclamation works, drainage and other infrastructural facilities similar to those provided by the state government in any of the state government estate or developed properties or land owned by any of its agent. This is a levy on owner of private estates for which State Government has provided infrastructure. It is backed by the Neighbourhood Improvement Charge

Edict 1986 but its implementation started in 1989. It is calculated as the land area multiplied by #2:00 and then by number of years beginning from 1989 or otherwise.

- Ground Rent Charge: it emanated from land rates law of 1984 which covers ground rent, premium and other incidental charges payable by the property owners to the government. This is a levy the state government on every land owned by the government. The rate varies according to areas and size of land. It is measured in square meters and rent is revisable at every five years. As with government owned land, ground rent is also collectible on any private land involving application for certificate of occupancy from the government. It is always charged once in this case. It is an annual due.
- Tenement Rate: It is also referred to as property rating. It is a universal tax paid all over the world in line with income tax laws. It started with British Poor Relieve Act of 1601 which was introduced to Nigeria in 1915 as assessment ordinance. It was amended in 1958 to become assessment Act Cap 15 laws of Nigeria and Lagos. The reform of 1976 brought in significant changes by not only introducing tenement rating all over the country but also set clearly the structure of administration of the local government authorities. With the reform Lagos State government enacted the Tenement Rate Edict in 1985. Therefore, tenement rate is a levy imposed on the occupier of all rateable hereditament within the jurisdiction of the rating authority. The amount payable is 10% of the rateable value.
- Land Use Charge: It was introduced in 2001 in order to harmonize the fragmented land related charges (ground rent, neighbourhood improvement charge and tenement rate) being collected by the state and local governments. After due consultation with all the chairmen of the local governments in the state in 2001, Lagos State Administration decided to utilize the collection machinery of the state to harness the land use charge revenue in order to enhance uniformity, efficiency in collection and convenience for its citizens. The amount collected is shared between the state and the local governments, sometimes between the local governments alone.

Assessment of Land Use Charge

To determine the annual amount of land use charge payable, the formulae to be used as designed by the Commissioner for Finance is:

LUC—MX (LA*LV) + (BA*BV*PCR)

Where:

LUC is annual amount of land use charge in Naira;

M is annual charge rate expressed as a percentage of the assessed value of the property

LA is the area of parcel of land in square meters

LV is the area value of a land parcel in the neighbourhood per square meters in naira

BA is the total developed floor area of building in the plot of land in square meters.

BV is the average value of medium quality buildings in the neighbourhood per square meters in naira.

PCR is the property code rate for the building and which accounts for the building being of higher or lower value than the average building in the neighbourhood and which also accounts

for the degree of completion of construction.

Thus, the assessed value of the property is calculated using (LA*LV) + (BA*BV*PCR). However, the Commissioner for Finance in accordance with the provisions of section 5(2) of Land Use Charge Law sets the value of the annual Land Use Charge rates in the state for year 2004 applicable to eligible property as follows: Owner occupied residential property – 0.0375% per annum; Residential property- 0.125% per annum; Commercial property – 0.375% per annum and Industrial premises of manufacturing concerns – 0.125%

Shortcomings of The Land Use Charge

Just as the case of compensation under Land Use Act, the method of assessment of property under Land Use charge is another statutory valuation as the Commissioner for Finance is the one who sets the value of annual charge rate and property code rate thus making the tax payer not having or see in advance how much he is to pay. This is against the principle or certainty in taxation. The law consolidated taxes with different bases and principles, which result in higher taxes to the taxpayer. By the principle of taxation, you cannot base an annual tax on capital values rather it should be based on annual values. The uproar was as a result of high incidence of the tax on the premises concerned. A typical example is a property at 96, Awolowo Road, Ikoyi with an annual rental value of #800,000.00 while the land use tax demanded was #590,322.48. Before the introduction of Land Use Charge, annual sum payable to both the state and local government as ground rent and tenement rate was #97,029.00.

The Land use charge incorporates ground rent. Before its enactment, only allotees of state lands pay ground rent. Under the law everybody will now have to pay even on properties inherited. It brings together everybody into the tax bracket irrespective of the individual tax liability under the provision of tax law. Land Use Tax abolished the collection of tenement rates which is the constitutional duty of the local government.

The enumeration and assessment of the tax were carried out by unprofessional people against the provision of cap 111 laws of the Federation of Nigeria empowering Estate Surveyors and Valuers to carry out valuation of interests in lands in Nigeria. Geo-coding which serves as the basis of collection and administration left much to desire as it is fraught with many errors, omissions and addition. It neither shows the description of each property nor the capital value. With the use of GIS, all these shortcomings can be minimized.

2. Research Methodology

The map of GRA was obtained, digitised and exported into the GIS environment. The arc view 3.2a software was used, from which queries were carried out.

GIS software was used to demonstrate how property taxes can be administered from a database that contained all property types in GRA Ikeja. The database includes the facilities in each building, location, its rental value, and the property owner. Attribute data of the properties such as street name (parcel address), land use, ownership, building type, owner's occupation, gender, tenure, age and state of origin.

In addition to this, interview was conducted with some residents of GRA Ikeja, Lagos state.

The study covers a total of the 1705 building types in the GRA that were captured through the use of the aerial map which was further digitised. The digitised map when inputed into the GIS software automatically numbered all the buildings and roads in the area. Various queries were generated and run basically through data base extraction in arc view 3.2a.

Digital Database of Buildings and Plots in GRA Ikeja.

GIS as a computer system is capable of capturing, storing, analysing, and displaying geographically referenced information; that is data identified according to location and the systematic process of data collection, classification, sorting, retrieving & dissemination.

Hence, a digital database was created for GRA, Ikeja for the different attributes based on the data normally required by clients that require properties. Imaginary attributes were entered as discussed earlier due to the sensitivity of the real data.

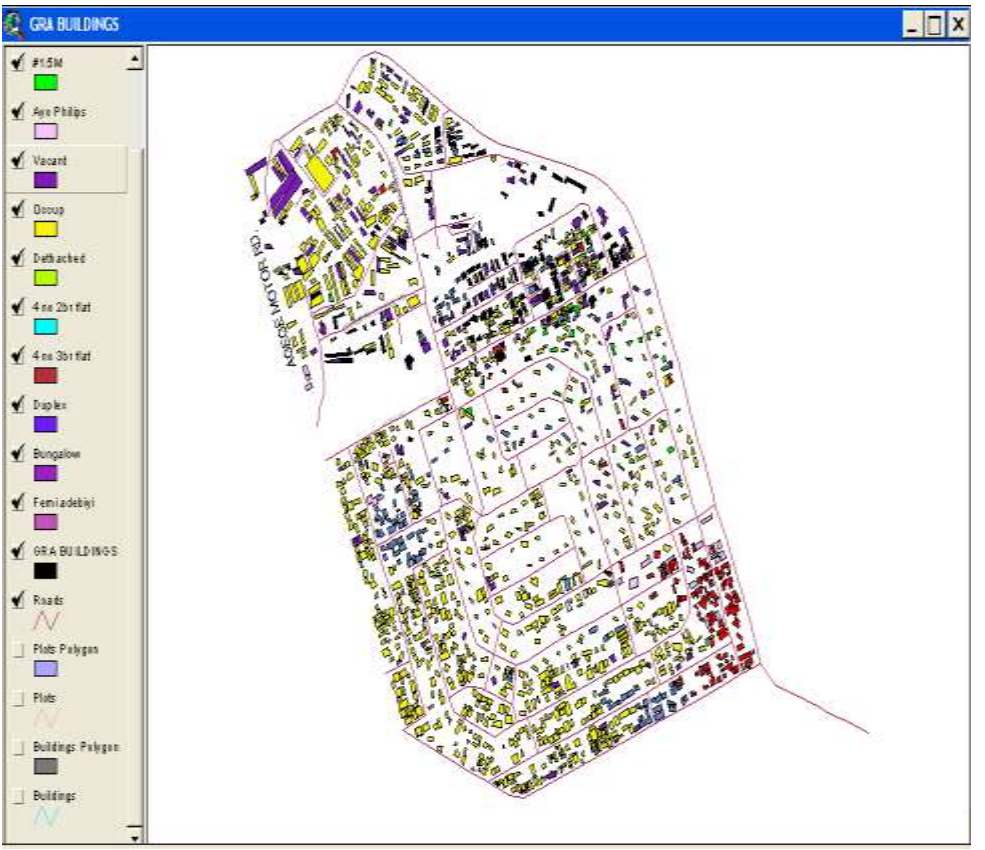
Spatial Search and Query

Various search for queries were conducted to satisfy the user's expectation(s). For example, show properties that are equal to #1.5 million. For each query performed the properties affected by the query operation are highlighted in different colours other than that of the imported polygon. Different queries have different colours and each query has same colours of polygon all through. Twelve queries were carried out and the map of GRA highlighting the attribute data is also included.

The queries are as follows:

- Select and show all buildings that have a rental value of #1.5m
- Select and show the layout of Ikeja GRA
- Select and show all properties that are vacant
- Select and show all 4 no 3BR flat
- Select and show all Ayo Philips Assets
- Select and show all buildings that have 3 toilets and 3 bathrooms
- Select and show all bungalows
- Select and show all duplexes
- Select and show all occupied properties
- Select and show all detached buildings
- Select and show all terrace buildings

The following graphical results (Map 1-13) show all the query results listed below.



Map of GRA highlighting the following features :

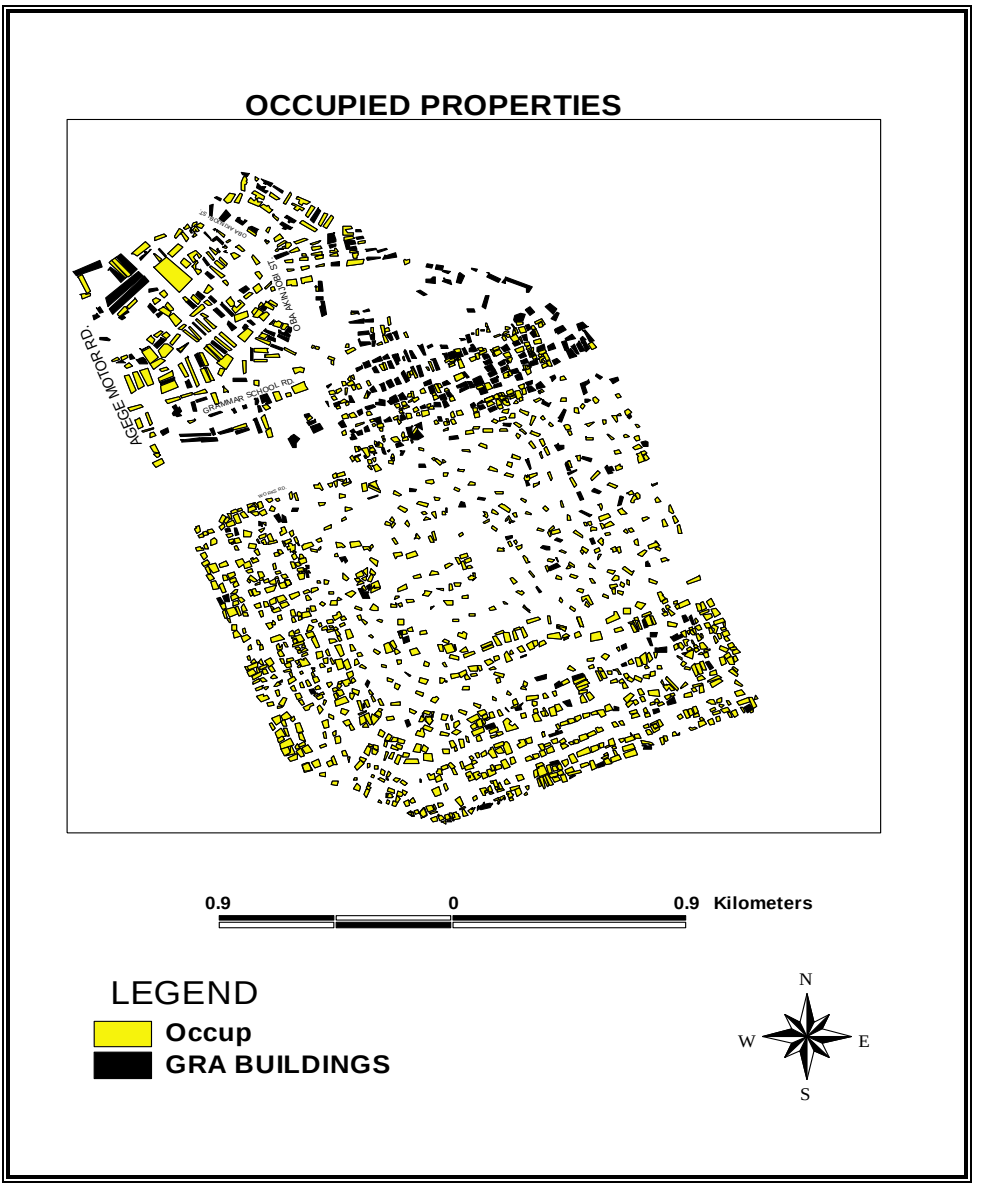
- Buildings with #1.5m rental value
- Ayo Philips assets
- All vacant properties
- All occupied properties
- Detached buildings
- The road network
- GRA buildings
- Femi Adebiyi's assets
- All bungalows
- All 4no 3br flat
- All 4no 2br flat

The pages overleaf show all these views.

MAP 2
Query 1: Select and show all buildings in GRA.
The map above shows at a glance all the various buildings in the GRA, the map also includes the roads in the GRA. There are 1,705 buildings in all.

MAP 3

Query: Select and show all properties of Ayo Philips. The GIS software enables the property the property manager to view at a glance all the assets of his client.

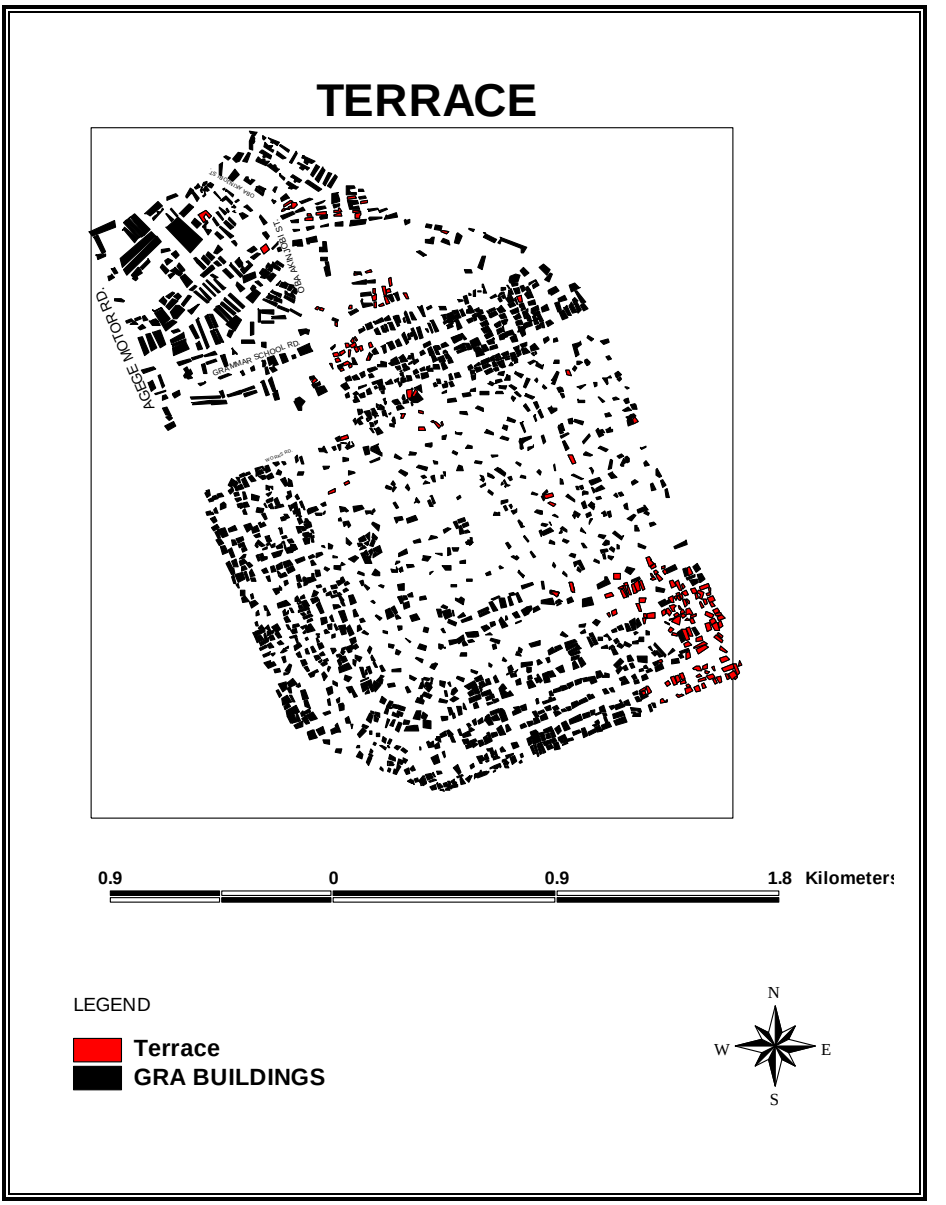


MAP 3

Query: select all buildings that are occupied.

In the estate manager's search for properties, he would not bother to check out the above properties in that they are already occupied. Hence the dark patches represent the vacant properties.

MAP 4
Query: select all buildings with a rental value of #1.5m
A client may come up with a request for any property that does not exceed #1.5m; this map displays all properties within that range.

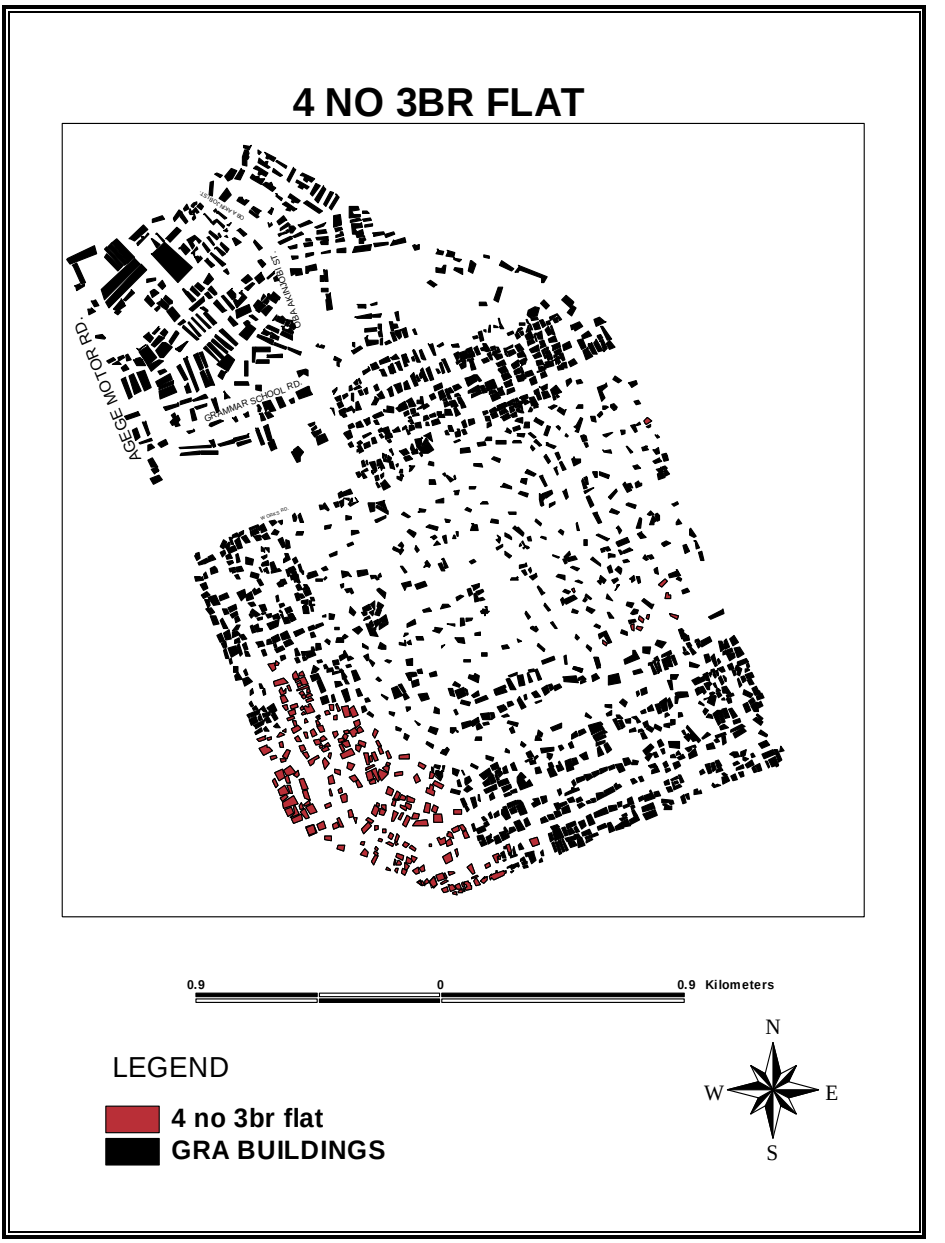


MAP 6

Query: select all buildings that are terrace

Often clients come with specific requests of the particular type of properties that they require i.e. terrace, the map above will direct the estate manager as to the point from which he may begin his search.

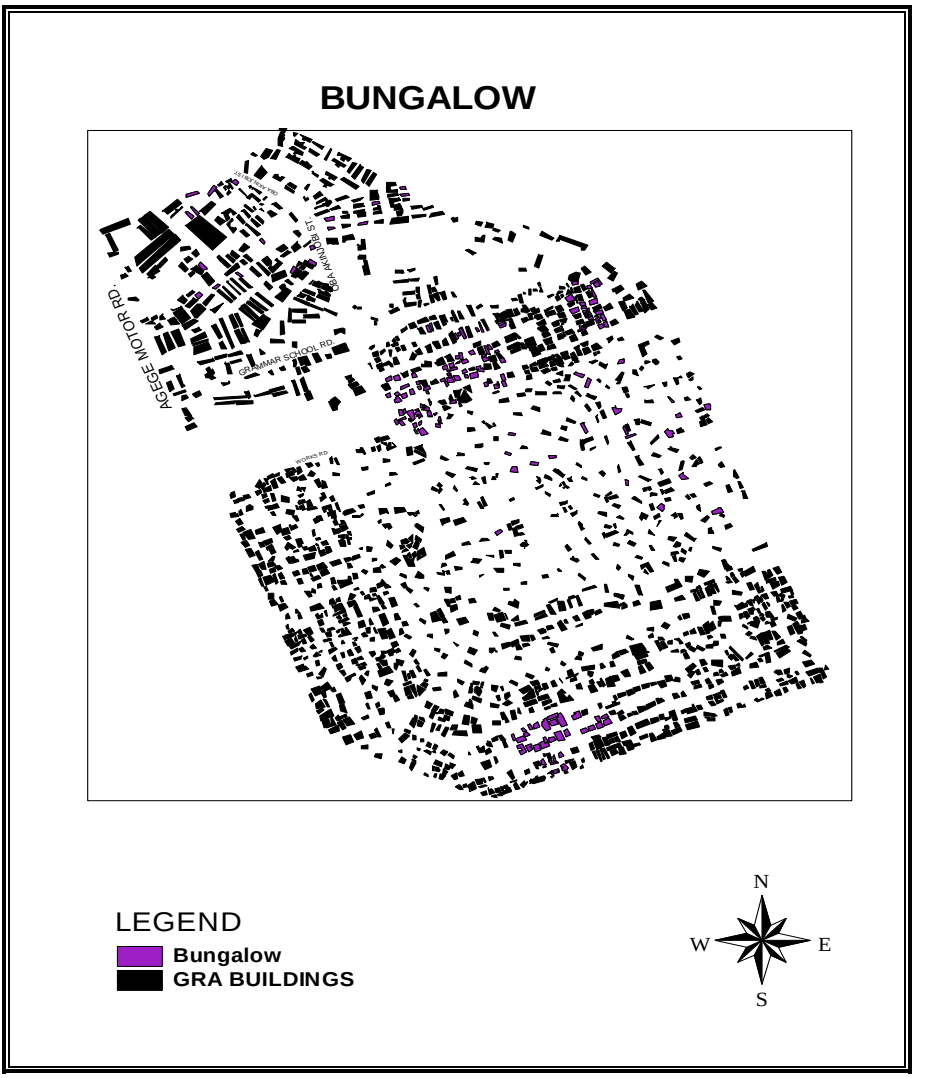
MAP 7
Query: select all detached buildings.
This is similar to map 6. Here the estate manager directs his search towards the buildings highlighted in green alone, then he goes ahead to check if any suits his client's requirement.



MAP 8
Query: select all 4 no 3br flat
A request for 4 no 3br flat will warrant this query and the above will be displayed. It can be observed that all the flats are located on the same part of the map.

MAP 9
Query: select and show all 4 no 2br flat
Unlike the other type of buildings the 2br flats are not located in the same area.

MAP 10
Query: select and show all duplexes



MAP11
Query: select all bungalows

3. Results and Discussion

The paper has shown the vital roles of using GIS in providing a computerized Geographic Information System in the management of a simple data within a system, which shall be used in the creation, storage, and retrieval, manipulation of spatial and non-spatial data.

The above was achieved by converting analogue format into digital format and the system of manual storage and retrieval was modernized through the:
(1) The identification of the present condition of the spatial and non-spatial conventional storage and retrieval system of all the entities and their factors (attributes).

(2) Establishment of spatial relationship between these entities by designing creating and developing database management system for the GIS so as to maintain information and make the information accessible when required using powerful relational database management system software.

4. Conclusion and Recommendation

Geographic Information system as a decision making tool is therefore inevitable in planning and management of the Environment and its natural resources for improving social and economic well-being of the people and the estate management profession.

In view of the above, therefore, there is the urgent need for the replacement of the present analogue system on the method of record keeping and search of properties with the modern method of Geographic Information System (GIS) which is a fast, accurate and secured way of land and property record keeping, retrieval and management towards a sustainable social and economic development.

A comprehensive Geographic Information system (GIS) for the Government Reservation Area, GRA-Ikeja Lagos State should be established so as to enable effective practice of agency and to enable better service delivery in estate management profession.

The internet has proven very popular as a vehicle for delivering GIS applications for several reasons. It is an established, widely used platform and accepted standard for interacting with information of many types. It also offers a relatively cost-effective way of linking together distributed users (for example, telecommunications and office workers, customers and suppliers, students and teachers. The interactive and exploratory nature of navigating linked information has been a great hit with users. The availability of multi content site gateways (portals) with powerful search engines has been a further reason for success.

The above states clearly that the internet is a very essential part of the GIS and it is recommended that government ministries and parastatals involve in tax administration should be connected to the internet to be able to navigate linked information.

The implementation of the GIS software in the management of Geographic Information system (GIS) has been demonstrated. The results of various analyses have also shown that the application of modern technology would go a long way in reducing the tedious and cumbersome manner of conventional system of cadastral records keeping by enhancing the speed, accuracy, reliability and developments in terms of search for properties for taxation purposes.

References

AyeniO.O and Ifechukwu I.J. (2003) Application of Geographic Information Systems in local government administrations: A Case Study of Onitsha north local government Administration, Anambra state, Nigeria.

Antenucci, F.R, Philip, E. T (1991) Geographic Information System: A guide To the Technology Preston College press, United Kingdom.

Borough & Mcdonnell (1998) Principles of Geographic Information System. New York: Oxford University Press Inc.

Bruce E. Davis (1996): Geographic Information Systems: A Visual Approach. Published by Onword Press, New York, USA. Pg 63.

Clarke, K.C. (1999) Getting started with Geographic Information System London; Upper Saddle River, N.J. Prentice- Hall International.

Dueker K. (1979) Geographic Information Systems London; Upper Saddle River, N.J. Prentice-Hall International.

Goodchild, M.F., Parks, B.O. and Steyeart G.T.(1993) Environmental Modeling with Geographic Information Systems.Oxford University Press, Oxford.

Longley E.T, Goodchild, Rhind (2001) Geographic Information Systems and Science

John Wiley & sons Ltd.

Maguire, D.J., Goodchild,M.F and Rhind, D.W(1991) Geographic Information

Systems: Principles and Applications Harlow,Essex, UK: Longman Scientific & Technical; New York;Wiley.

Read J.M. and Lam S.N. (2002): 'Spatial Methods for characterizing Land cover and detecting land cover changes for the tropics' International Journal of Remote Sensing, 2002, Vol.23, No. 12 2457-2474

Rolf, Adeby ,Maguire.L (2001) Principles of Geographic Information Systems International institute for Aero space survey and EarthSciences (ITC), the Netherlands

Singh, R.K (1989) Urban Displacement Reconnaissance Memo paper Prepared by the US Department Of Housing and Urban Development, Washington D.C.

Star, J. and Estes J.E.(1990) Geographic Information Systems: An Introduction. Upper Saddle,NJ: Prentice Hall

Steven,Reader (1994) The Present State of GIS and Future Trends Proceeding s of an international workshop held in Sri-Lanka, organized by (IDRC) International.