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Creation Of Digital Cadastre For Redemption Estate Obinze/Avu Off Port-Harcourt Road Owerri Imo State, Nigeria

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Abstract: ***A digital cadastre is a computer based land administration system which will force standardization in collation and processing of land data, decrease the cost and space required for storing records, prevent unnecessary duplication, facilitate access to land related data and provide built in mechanism for quality control. Redemption Estate Owerri has a myriad of problems which results in poor land administration. These problems include: storage of data in traditional cadastral system, low precision of geometric data, divergence between map and the register, lack of supervisory tools amongst others. This project is therefore aimed at creation of digital cadastre of Redemption Estate Obinze/Avu off Port-Harcourt Road Owerri, Imo State. This was achieved through the following objectives: to acquire primary and secondary datasets within the study area to create a cadastral database for the study area, and to perform spatial and attribute queries. The methodology adopted included; acquisition of primary and secondary datasets, creation of cadastral database, use of ArcGIS 10.3 and AutoCAD 2014 software amongst others. Analysis was eventually carried out. The results of the study showed various spatial and attribute query results, composite map of the study area amongst other results. Research findings showed that some streets in the area are tarred and some are not tarred, no plots were allocated for recreational activities as well as other findings. It is therefore recommended that this study should serve as a decision support system for land administration in Redemption Estate amongst other recommendations.***

Keywords: Database, Digital Cadastre, Geographic Information System, Query.

I. INTRODUCTION

Traditionally the cadastre was created for fiscal purposes. This was already the case in antiquity such as Assyria, Egypt, and Rome. In the course of time the cadastre started to be used also for other purposes. It came to be the basis for establishing land registers and at the same time was used for the protection of property (Cichocinski, 1999). A system of records or inventory of ownership and interest in land parcels is called a cadastre or cadastral system. A land parcel refers to an area of land which may be identified as a unit for information recording such as residential plot of land. A cadastre is supposed to provide statistics of all issues relating to ownership, use and status of landed property in a given geographical area. According to Dale and Mclaughlin (1990), a cadastre is a general systemic and up-to-date register of information about land parcels including details of their area, value and ownership. All these definitions point to the fact that land ownership information is an important mandate of a cadastre. Computerization of land administration activities, involving the creation of a digital cadastre as part of Spatial Data Infrastructure (SDI), is considered necessary to improve data access, usability, and coordination of land related activities (Carter and Bounhorn, 2007). Spatial Data Infrastructure is the technology, policies, standards, human resources, and related activities necessary to acquire, process, distribute, use, maintain, and preserve spatial data (OMB, 2002). Thus, digital cadastre is a tool for achieving land administration. Land administration is the process whereby land and information about its ownership is effectively managed and in the control of a central authority that regulates the structure and patterns of land ownerships, land use and environmental and economic perspectives (Usman, 2010). An ideal land administration must be able to include the provision

of information on land in an effective and efficient way to correctly identify those people who have interest in real estate and providing information about these interests (such as duration of lease). It must also allow easy access to land for development where it is needed, increase efficiency in land use management through good planning and promote greater social equity. It should also allow for revenue generation to the government (taxation), maintenance of environmental quality and provide security of tenure.

The significant problems existing in the estate (Redemption Estate) that necessitated this study are traced to data stored in traditional cadastral systems fail to meet requirements connected with supervision, management, decision-making, forecasting and development planning. The most significant problems posed by analogue cadastre include low precision of geometric data; quality and speed of data access; divergence between the map and the register; and lack of supervisory tools. The traditional method of data management has proved to be inefficient and cumbersome. It is faced with problems such as redundancy (the unnecessary repetition or duplication of data), high maintenance costs, difficulties in moving from one system to another, difficulties in data sharing, lack of security and standard, lack of coherent corporate views of data management among others. The layout plan and records of Redemption estate are in analogue format. Updating the records of the estate in this analogue format is relatively expensive and time consuming. There is little or no flexibility in handling the information of the estate in this analogue format. The best way to minimize these enormous problems is the comprehensive application of Geographic Information System (GIS) in plan production and record keeping in other to facilitate its future updating with modern technique, hence this study involves designing and creation of a digital cadastre for Redemption estate along Port-Harcourt road Avu/Obinze Owerri West Local Government Area of Imo State comprising of over 300 plots. It is limited to GIS integration of land ownership records and maps, land use pattern, status, processing, queries/analysis and retrieval of information from the cadastral map generated.

II. STUDY AREA

The study area is Redemption estate Avu/Obinze in Owerri west L.G.A, which is part of Owerri capital territory Imo State South East, Nigeria. The estate covers an area of 22.869168 hectares, it lies approximately bounded with latitude $05^0$25'N to 06^0 58' North of the Equator and longitude $6^0$50'E to 7^0 25' East of the Greenwich Meridian on a relatively flat plain within the Eastern Nigeria.

III. METHODOLOGY

The methodology adopted in this study is subdivided into various steps such as: planning, reconnaissance, field work, database design and creation.

IV. PLANNING

This is the arrangement carried out to achieve the desired goal. Planning involves the determination of what to produce or what to market in that quantity and of what quantity.

In the process, the software to be used was considered; approach and analysis to be performed were also considered to save time for easy access to data.

A. RECONNAISSANCE

The economic and successful implementations of any survey job will largely as well and extensive reconnaissance otherwise known as reccé. A good reconnaissance will definitely save a great deal of time. The reccé was divided into two. They are namely; office reconnaissance and field reconnaissance.

a. OFFICE RECONNAISSANCE

This involved gathering of all available information about the project area, and the examination of the existing survey plans/maps of the area

b. FIELD RECONNAISSANCE

This aspect involves going to the site to have an overall view of the area and to plan how to arrange and do the work.

B. FIELD WORK

The data i.e. the co-ordinates of all the points were obtained through ground method using total station instrument by the government survey unit.

GPS positions of various plots were acquired using a hand held GPS device to verify the accuracy of the Job.

C. DATABASE

It is an organized, integrated collection of non-redundant data stored so as to be capable of use by relevant application with the data being accessed by different logical paths. It is theoretically application independent but rarely so in practice Kufoniyi, (1998).

It is heart of GIS and it is the process by which the real word entities and their inter-relationships are analyzed and modeled in such a way that maximum benefits are derived while utilizing a minimum amount of data.

Why the Need for Database?

- ✓ It gives speedy retrieval updating and compactness of data
- ✓ It enables data sharing
- ✓ Drudgery is removed

To obtain a GIS database it involves two stages viz: Database design and database creation

a. DATABASE DESIGN

A database design is essentially a computerised Book Keeping System (i.e. an electronic filing cabinet). It is also

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termed data modelling. In designing a database the following issues were considered.

- ✓ Availability of the hardware and software.
- ✓ Availability of basic input data (X,Y coordinates and attributes)
- ✓ The use of information (cadastral purpose)

b. DATABASE CREATION

This is to assemble what was highlighted in the design phases in the system. Both the spatial and attribute data will be stored in the database in the format the data was structured in the implementation software so as to achieve the objective of a database creation.

A generic data structure was designed and all the necessary hardware and software made available the overall system model were desired to facilitate the ease of data exchange.

D. MULTIPURPOSE CADASTRAL DATABASE DESIGN

Multi purpose cadastre database design was carried out during this study taking into consideration all the objects and their interrelationship within any spatial unit being considered. The design is usually carried out in such a way that maximum benefit could be derived from the results database.

The database design was done through four stages (Kuffoniyi 1998).

- ✓ Reality (Articulation of view of reality)
- ✓ Conceptual design (conceptual data modeling)
- ✓ Logical design (Data structures): and
- ✓ Physical design

V. RESULTS

All the results of database queries were presented in form of digital maps or graphic displays, report and tables. Data storage, editing, updating and analysis, manipulation, retrievals were done in a logical and well-defined manner. The various maps and tables can be presented in hardcopy, softcopy and onscreen

Spatial query and analysis are common analysis in GIS. It is a way of processing or manipulating data in order to generate useful scenarios for decision-making. GIS software (ArcGIS 10.3) was used for database management. This will help the relational database management software to carry out information in the database.

This presented a user interface which will enable us to make a choice depending on the intended operation, which includes options such as opening of database files, inputting data into the files, retrieving data from the files in time and updating of files.

Search operation is useful when looking for a certain attribute within the neighbourhood, which must be logically defined. Query IS a means of data extraction to generate information with a well ordered and well-constructed relational database, the only limit to queries is the imagination. The queries for this project were both attributed and locational form. Attribute queries means where is what and locational means what is at a particular location.

A. QUERY COMMAND TO SHOW COMPOSITE MAP OF REDEMPTION ESTATE

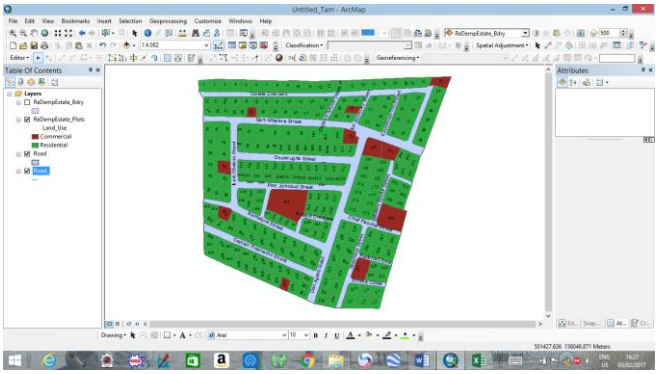

Figure 4: composite map of the study area

Figure 4.0 shows layout map of the study area with street names and roads within are shown clearly. Different colours are used to distinguish between plots. The highlighted layers are also shown. A total of 283 plots are shown.

B. QUERY COMMAND TO DETERMINE PLOTS WITH AREA GREATER OR EQUAL TO 1000M^2

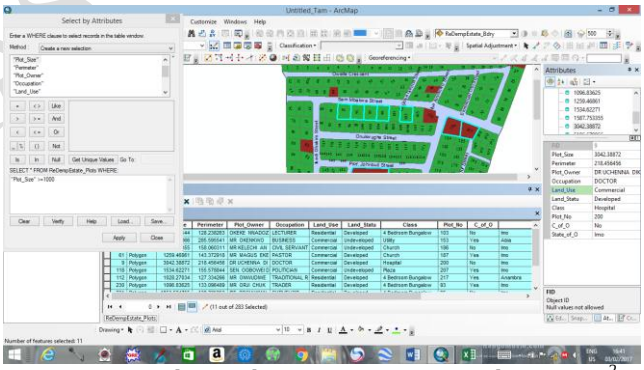

Figure 4.1: Plots with area greater or equal to 1000m^2

The fig. 4.1 shows a query command ("Plot_Size" >=1000) which precisely determines the property area greater than or equal to 1000m^2. The result of the query shows all (11) out of 283 as being selected. The plots are seen highlighted in digital layout map.

C. QUERY COMMAND TO DETERMINE PLOTS THAT ARE ALLOCATED FOR RESIDENTIAL PURPOSES, UNDEVELOPED AND HAVE C OF O

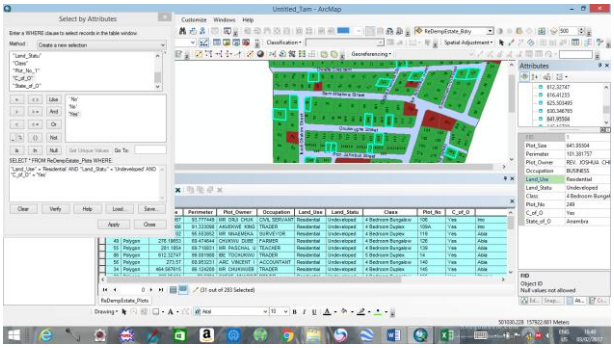

Figure 4.2: Plots that are allocated for residential purposes, undeveloped and have C of O

The figure 4.2 shows a query command ("Land_Use" = 'Residential' AND "Land_Status" = 'Undeveloped' AND "C_of_O" = 'Yes') which precisely shows three condition query. The result of the query shows all (31) out of 283 plots as being selected. The plots can be seen highlighted in digital layout map.

D. QUERY COMMAND TO SHOW THE STATE OF ORIGIN OF PLOT OWNERS IN REDEMPTION ESTATE

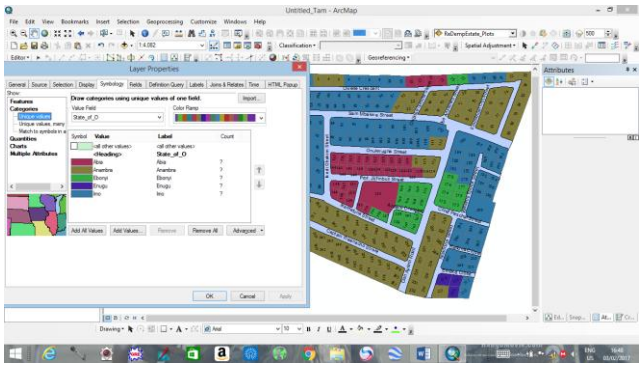

Figure 4.3: State of origin of plot owners in Redemption estate

The figure 4.3 shows plot owners and their states of origin which are mostly Abia,Anambra, Ebonyi, Enugu and Imo. Display of map based on sysmbology (colours) helps in easy access of plot owners based on their respective states.

E. QUERY COMMAND TO DETERMINE PLOTS ALLOCATED FOR RESIDENTIAL PURPOSES, DEVELOPED WITH NO C OF O

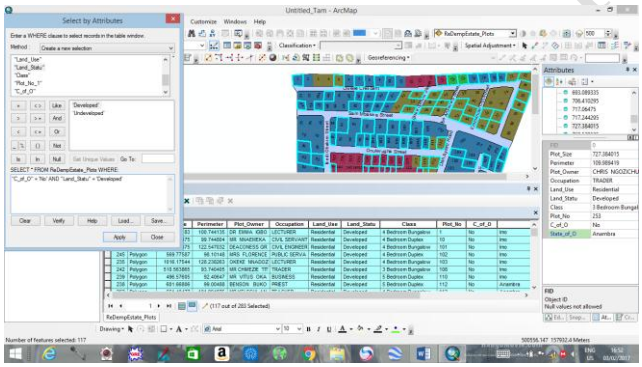

Figure 4.4: Plots allocated for residential purposes, developed with no C of O

The figure 4.4 shows a query command ("C_of_O" = 'No' AND "Land_Statu" = 'Developed') which precisely shows two condition query. The result of the query shows developed plots with no certificate of occupancy. It is easy to show status of each plot based on land use, owner's state, perimeter of plot, size, C of O and occupation of owners.

VI. CONCLUSION

This study has demonstrated the effectiveness of digital cadastre system in land management. The aim was to create a digital cadastre for Redemption estate along Port-Harcourt road Avu/Obinze Owerri West Local Government Area of Imo State comprising of over 300 plots for proper management. This was achieved by acquiring primary and secondary datasets within the study area to create a cadastral database for the study area, and performing spatial and attribute queries. In the course of this study the following research findings were made.

These research findings are very important as it reveals appraisals and shortcomings in the estate.

- ✓ There are some parcels which were fraudulently acquired by some top government officials.
- ✓ Some streets in the estate are tarred while some are not tarred.
- ✓ The activities of land speculators sky rocketed the price of developed and a few undeveloped plots in the estate and environs.
- ✓ There is poor power as well as water supply in the estate.

No plot was allocated for school and other recreational activities.

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