Geo-Property Tax Information System- A Case Study of the Tarkwa Nsuaem Municipality, Ghana

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Key words: Tarkwa Nsuaem Municipal Assembly, Geo-Property Tax, Spatial, GIS

SUMMARY

Property Tax is one of the most important sources of income for the Tarkwa Nsuaem Municipal Assembly (TNMA) and the country as a whole. An efficient Property Tax System has the potential to generate enough revenues to sustain government's social programmes such as the School Feeding Programme, Capitation Grant and the Livelihood Empowerment Against Poverty (LEAP).

However, Property Tax revenue mobilization at the local and district assemblies is ineffective due to lack of Geo-Property Tax Information System. Property Tax details in the TNMA are therefore maintained without spatial data and involve lot of human effort.

The objective of this research therefore was to create an interactive and user-friendly Geo-Property Tax Information System (GPTIS) that enables spatial query, visualization, efficient updating and processing of Property Tax records. The System will incorporate all the spatial and non-spatial details regarding built-up structures for effective maintenance, collection and update of Property Tax information. The System will keep track of both defaulters and non-defaulters.

The procedure used in this research involve; the collection of spatial and non-spatial data of properties in the municipality, designing the database as well as scripting and debugging in a Visual Basic (VB) environment embedded with MapObject.

The result of this application is a user-friendly GPTIS capable of displaying both spatial and non-spatial tax information. The application allows tax officers to perform spatial queries, update newly added properties as well as update and process tax records.

Finally this research recommends that this application be extended for utilities like, sewage tax and telephone services.

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1. INTRODUCTION

Local governments in Ghana have depended on the funds allocated them by the central government for most of their expenditures, which is not enough to provide and maintain local infrastructures. As part of the central government's fiscal adjustment, many local government funds have been reduced, and the local governments are now dependent on locally generated funds. Of the many locally raised revenue sources, Property Tax is one of the most important and effective revenues. Unfortunately, this is one area that the tax reform process never touched. In fact, there had been no general revaluations between 1960 and the late 1980s, when the Property Tax was based on construction costs and its administration taken over by the central government. Although a well established rating system had operated in the main urban centres of the country for some time, by the mid 1980s the tax base in Accra, for example, was well out of date. The last revaluation was done in 1960. Inflation has since been high and almost half of the Properties were not revaluated (Keith, 1993). As a result, supplementary valuations of new properties have failed to keep pace with growth, causing the share of Property Tax revenue in total revenue to become increasingly insignificant. The reason for the neglect of Property Tax in Ghana and for that matter, all the district assemblies, is that it is politically sensitive. The sensitivity stems from the fact that the tax is very visible, effective and difficult to avoid. Besides, annual action is required to keep the tax rise. The visibility of the tax and the effect of gearing, i.e., that a small increase in a local government budget can cause an increase in the Property tax.

Since Property Tax will for some time remain an important source of local government revenue, action is needed in this area. More recently, an arrangement between the UK Valuation Office and the Ghana Valuation Division led to revaluation of all properties in Accra. The exercise led to an increase in the number of properties under valuation from 46,000 to 250,000, thereby increasing the tax base 800-fold (Keith, 1993). This exercise needs

to be extended to all the urban areas including the Tarkwa Nsuaem Municipality to ensure a full exploitation of revenues from Property taxation.

TNMA is expanding rapidly with new structures springing up. It is therefore necessary to assess all these new and existing built-up structures and maintain an effective database for easy collection of Property taxes.

2. ABOUT THE STUDY AREA

The study area is Tarkwa Nsuaem Municipality in the Western Region of Ghana. The Municipality lies on latitude 5^0 N and longitude 2^0 W, about 89 km north of Takoradi, the Capital of the Western Region. Tarkwa and its surroundings are between two long ranges of hills considered the two limbs of a gold mountain with an average elevation of 300 meters above sea level (Akabzaa and Darimani, 2001). According to the 1994 census, population of Wassa West District (Now Tarkwa Nsueam Municipal) was 260,000 with an estimated growth rate of 3.0% (Akabzaa and Darimani, 2001). About 70% of the population resided in the Tarkwa Township, where population growth is above the national average of 3.1. This is due to migration of people in search of mining sector jobs (Akabzaa and Darimani, 2001). Tarkwa is therefore characterized by high population growth rates. It is therefore important to create an organized spatial database system to support revenue collection mechanism in the Municipality.

3. IMPACT OF GPTIS ON PROPERTY TAXATION IN THE MUNICIPALITY

Currently, Property Tax details are without geo-spatial information in the TNMA. The officials are unable to collect the Property Tax efficiently and hence fall short of the budget estimate year after year. If the tax details are maintained electronically and geo-spatially, the efficiency of tax collection can be improved. Also to achieve total transparency, spatial dimensions of all the structures can effectively be maintained in a GIS environment.

The GPTIS will incorporate all the spatial and non-spatial details regarding the built up structures for effective maintenance, collection and update of Property Tax information.

With the advent of geo-information systems and availability of computers the Property Tax Department is not an exception where tax records are maintained electronically (in the form

of database tables with a front-end application) but there is no geographical reference made in such application. The above limitation can be overcomed by integrating the applications with a Geographical Information System.

4. THE PROPERTY MARKET IN GHANA

Activities in the Property market are most of the time informal. That is, the Property market is not regulated or transparent. As a result there is considerable differences in transactions and the value and methods of payment used to buy and sell Properties.

This is partly due to cumbersome procedures prospective Property owners have to go through before registering their properties. This in turn makes collating Property database for efficient tax collection very tedious. Unlike the postcolonial period, Government involvement in the Property market is now minimal. The uncertainty that surrounds the use, development and title to land, resulted in about 80,000 reported legal cases involving disputes on the title to land in urban Ghana (Mahama, 2004). Consequently, there is a high risk factor being built into prices for Properties, with buyers prepared to pay a premium where security of tenure will not be challenged (Migot-Adholla et al, 1994; Mahama, 2004). However, it would be prudent to minimize valuation complexity by improving data accessibility and dissemination (Wyatt, 1995). Valuations are often based on the open market value and this requires adequate records of transactions (Wyatt, 1997) but appraisers are often unable to gather adequate information on comparable Properties due to commercial secrecy and lack of data.

5. STREET AND PROPERTY ADDRESSING IN THE MUNICIPALITY

The Local Government Act 1993, Act 462, Section 49 (LGA) requires that all Property developments have written permits from the Assemblies with the Statutory Planning Committees as the arm of the Metropolitan, Municipal and District Assemblies (MMDAs). However, local Assemblies have lagged behind in the preparation of Layouts and even where they are prepared, enforcement has been very effective. In particular, development of properties have outstripped the pace at which Assemblies are able to put in place approved Layouts to be used as a basis for enforcement. Until recently, issuing building permits was

unnecessarily delayed which have resulted in Property developments proceeding without approval from the MMDAs.

Consequently, a considerable number of developed properties have no permits as well as addresses as most of the developments hardly go through the approval process of the MMDAs. Moreover, most of the properties developed do not have well laid-out access ways and the system of addressing in use by the Town and Country Planning Department (now Department of Physical Development as per LI 1961) of MMDAs in urban development is facing difficulty in providing the relevant addressing system comparable to modern trends.

To address these challenges, the Ministry of Local Government and Rural Development (MLGRD) has been charged to issue a framework to guide MMDAs to put in place a nationally coherent addressing framework that will not only facilitate implementation of the addressing system but will ultimately contribute to national development efforts since it will facilitate better service delivery to the population and also improve Property Tax collection in the Municipality.

6. DATA AND SOFTWARE REQUIRED

For the GPTIS described above to be able to exist and deliver it purpose, the following are required:

6.1 Spatial data

These are geographic data of the area (Tarkwa Nsuaem Municipality) showing landed properties. The geographic data was obtained by digitizing a map of the study area and geo-referencing it in a GIS software.

6.2 Non Spatial data

These are details not represented on the spatial data. They include specially designed database with information of every Property on the spatial data such as type of building (i.e. residential, commercial, industrial etc.), owner's name, date registered, photo ID of owner, home and work address etc. The dynamic nature of the application allows it to be linked to any database.

6.3 Visual Studio (Programming Environment)

This is the tool for developing applications that targets the .Net Framework. The .Net Framework provides developers with wide range of tools such as compilers, debuggers, programming languages and execution engines. It feature's many programming languages such as Visual Basic (VB), C++, J#, C# etc. making VISUAL STUDIO an all in one programming package for developers. The language of choice in this study was VB. It is compatible with COM and ActiveX controls and provides unlimited extensions for applications developed with VB.

6.4 MapObject

MapObjects is the mapping component software created by Environmental Systems Research Institute, Inc. (ESRI), to allow mapping functions to be included in applications developed in a variety of programming environments. MapObject software is a set of mapping software components that lets developers add dynamic mapping and geographic information system (GIS) capabilities to existing Windows applications or to build custom mapping and GIS solutions.

6.5 Computer system with operating system

This serves as the platform for hosting all the other requirements. The application can be split into client-side and server-side which may require more than one of computer systems and operating systems.

7. METHODOLOGY

7.1 Developing the Application

The application (GPTIS) was developed using Visual Basic, Mapobject and Google Earth API. The back-end of the application is shapefile or SDE files, Database file (DBF, Access, SQL, etc) and image files. The front-end (User Interface) was developed using Visual Basic,

MapObject, Ozeking sms gateway and Google Earth API. The application design and achitecture is shown in Fig. 1.

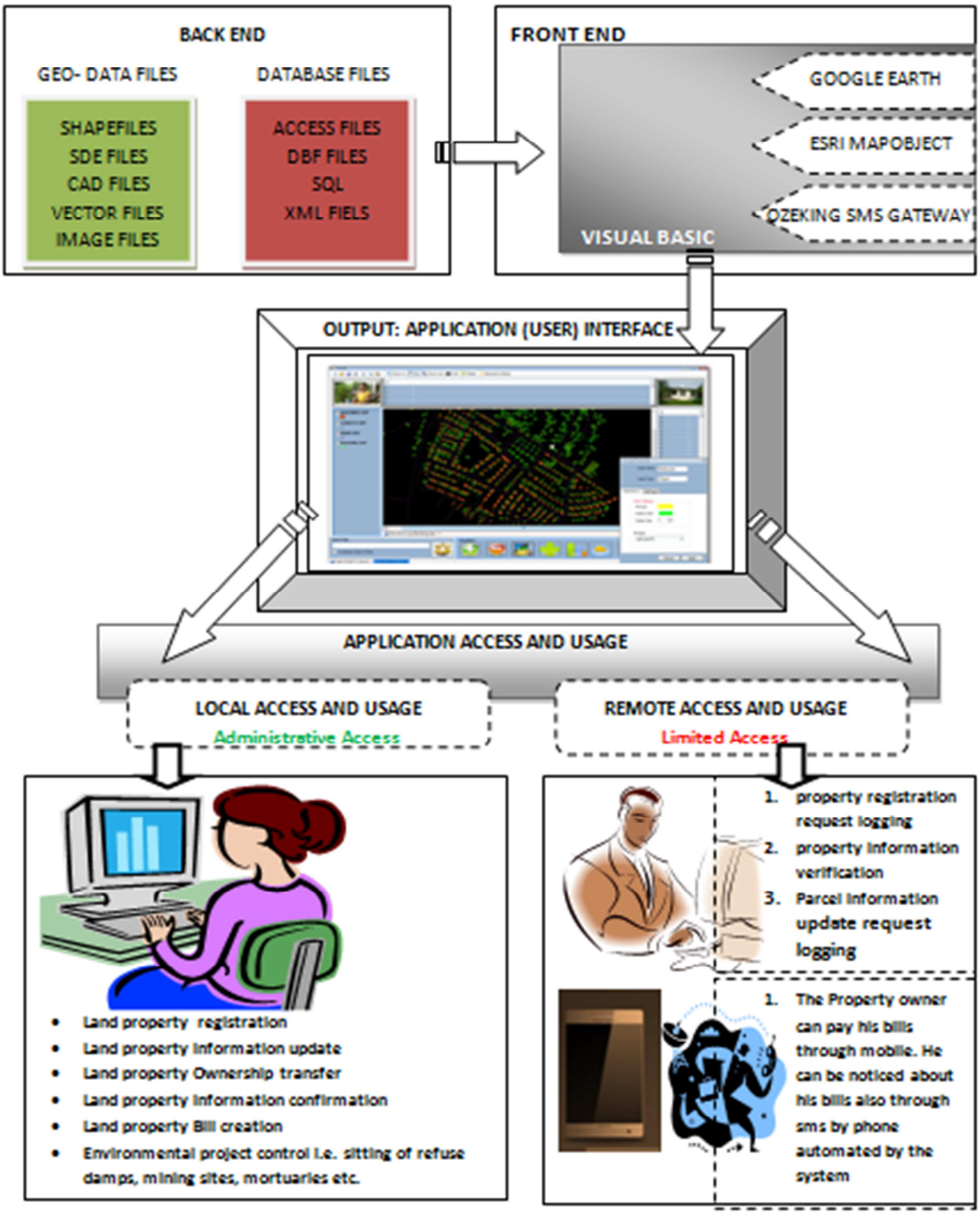

Fig. 1: Application Design/Architecture

7.2 General Procedure

7.2.1 Database Design

In designing the database, editing procedures and integrity rules were defined. The editing workflows was also designed in order to meet the integrity rules set for the data. Map display properties were then set for the maps after the digital maps were assigned the Ghana War Office projection and re-projected to the WGS84 Universal Transverse Mercator (UTM) zone 30 North. This was to enable accurate overlaying of data obtained from different sources. Responsibilities for building and maintaining each data layer was then assigned. A geodatabase of the design was built using a file geodatabase. A larger dataset was loaded so as to checkout, performance, scalability and data management workflows. Geodatabase was then ready for validation and population.

7.2.2 Database Validation and Population

Database validation was performed to ensure that all the privileges associated with data editing are adhered to. The developed spatial database was therefore tested to ascertain its validity. Firstly all properties were selected, set to edit mode and validation performed using the edit tool in a GIS Software. This showed that all the features were valid to participate in the system. Also a number of properties were added (populated) and their attributes checked.
The database population involved two stages; entering data into the geodatabase: The fields in the geodatabase (Poly_id, House_no, Type_of_Property, Property_Usage, etc) are populated. External Database entry: The fields of the external database are filled with respective attribute data.

7.2.3 Accessing GIS Data through MapObject and ODBC Driver

Using Open Database Connectivity (ODBC) Driver, the GIS data was accessed in conjunction with an external database. The programming environment provides the necessary drivers for accessing various database files, which includes (ODBC) and ActiveX Data Object (ADO).

7.2.4 Accessing external tabular data through ‘relate’

“AddRelate” was used to join data file to an attribute table for the duration of a session. This

means that the application can be provided with any external database file of a supported format to be linked to the attributes of the GIS data, hence making the attribute table of the GIS data (Geodatabase) dynamic and unlimited.

8. RESULTS AND DISCUSSIONS

The application has been developed successfully by adding the geo-spatial dimension to Property records. There are two Login modes of the application, they are;

(i) Administrator mode (Full privilege mode) and

(ii) User mode (Restricted mode)

With this application authorized users can:

- Perform spatial and non-spatial queries
- Update newly registered Properties
- Add new registered Properties by coordinates and by on-screen digitizing
- Update and process Property records

The GPTIS provides a user-friendly standalone application involving spatial details without depending on proprietary desktop GIS. The application's user interface is shown in Fig. 2.

The menu bar as shown in Fig. 3 contains the application's standard controls as follows:

Fig. 3: The Menu Bar

Zoom in: This activates the zooming function of the map. The user can click and drag to define a zoom extend. The user can also click on the mapdisplay to zoom and centre on the mouse click location.

Zoom out: This activates the zoom out function of the map. The user can double click to zoom out to full extend or simply click on the mapdisplay to zoom out.

Pan: This activates the pan function of the map display. It allows the map to be paned or moved to bring the area of interest into focus. Its effect is only visible when the map display

has been zoomed in.

Find: The find tool allows the user to click on a Property on the map display. It is used for a quick search.

Delete Property: This button allows the administrator to delete a Property or records from the map. When the administrator activates the "**DELETE BUTTON"** and clicks on any Property on the map display, the selected Property highlights, blinks and prompts the user to verify whether he/she wants to continue the deleting process. If the yes button is clicked by the user, the Property is deleted from the map layer.

Interactive Mode This button activates the "Hot-Track Mode" of the mouse cursor causing it to interactively display the Owner's photo ID, Property image and the attribute of a Property on which the mouse moves.

Fig. 4: Main Control Block

Fig. 4 contains the main tool for manipulating and viewing data on the Map. The "**Add Map Button**" allows the user to add new map and the "**Remove Map Button**" allows the user to remove the currently selected map layer.

The "**Display Styles**" allows the user to change the display of the map by changing its fill colour, line thickness and shading. It also allows a spatial rendering of data on the map.

The "**Add Property Button"** allows the user to register new Property onto the map. When clicked it prompts for the number of Coordinates bounding the property and it uses the input coordinates to draw the Property at the exact location on the map. It then presents the user with a window to fill to populate its attribute table (see Fig. 5).

The "**Profile button"** presents the window containing all the information about the current selected property (see Figs. 6 and 7).

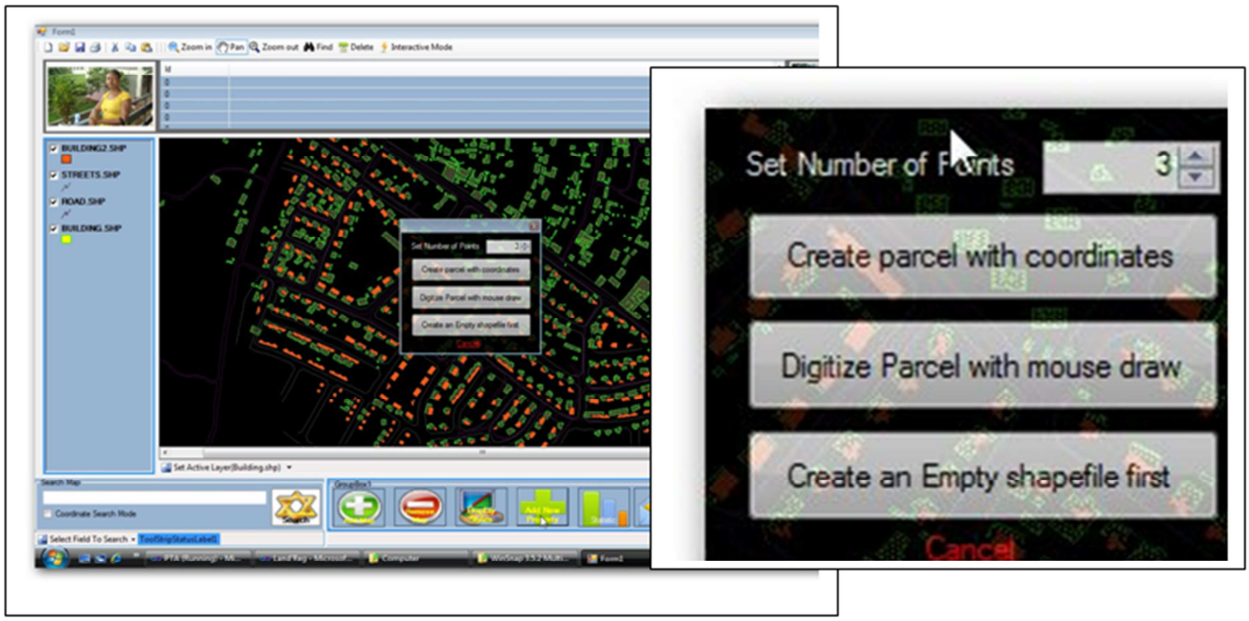

Fig. 5: Add New Property dialog Window

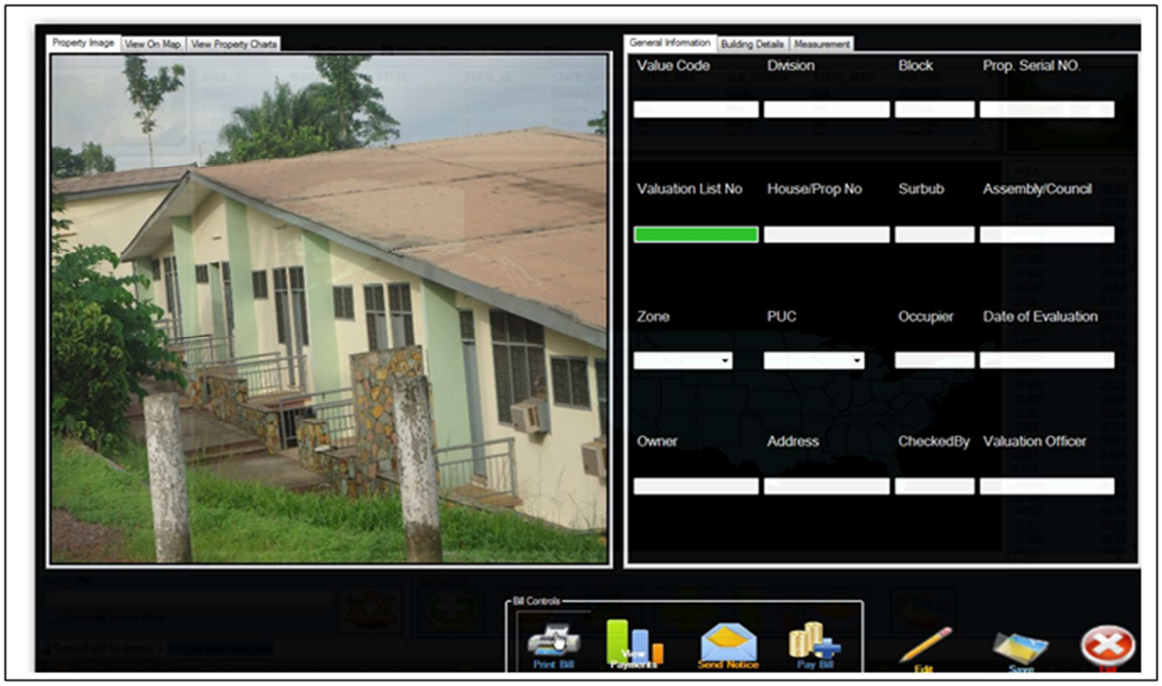

Fig. 6: Window containing general information about the current selected property

Fig. 7: Window containing building details about the current selected property

9. CONCLUSIONS AND RECOMMENDATION

This study seeks to bring to the attention of stakeholders of Property Taxation, the need to have a Geo-Property Tax Information System for efficient revenue mobilization.

The GPTIS provides basic information about a Property, including its location, size and details of Owner(s). The System can become more useful when the Street Naming and Property Numbering exercise is completed and used as the Map layer. It can also be expanded to incorporate land registration, the supply and billing of utilities and the creation of a full multi-purpose Geo-Information System.

The GPTIS will improve revenue collection and promote operations of businesses in general.

It is recommended that only authorized staff have access to the administrator password and be allowed to add and edit Property Tax Information in the System.

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