GIS FOR MAPPING LAND PRICE OF THE TIEN GIANG PROVINCE

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ABSTRACT

In Tien Giang province, land price table must be updated and issued on 1st January every year. Street value for each street is evaluated and defined as the land price of a land parcel with standard shape facing an object-street. Land of commercial area is more valuable than residential land and the value of the land parcel can also vary depending on its location that is classified into land use type (agriculture and non-agriculture land) or land with no planning permission. At present, Department of Natural resource and Environment is a lack of experience and suitable solution for administrative tasks through the application of information technology which can automatically determine the price of for each street or a particular land parcel in a more flexible and efficient way.

This paper aims to introduce the geodatabase model for real estate resource information management in Tien Giang province and discuss about functions of the developed software that provide the tools to the local government to restore, update and analyze information for mapping land price and determine the land price for each planning project.

Keywords: Real estate resource information, Land price table, Geodatabase model

1. INTRODUCTION

The land price dataset and land price table in this study were supported by Department of Natural Resource and Environment (DONRE) that issued the public notice of land prices to the public annually and land price table is one of the most significant land price indices in Tien Giang province. The land prices are appraised on January 1 under the assumption that the land lots are in the best condition. Each street is evaluated and defined as the land price of a land parcel with standard shape facing an object-street and land price table is used to form the basis for land use taxation. Even though detailed attributes of land price table are published, it is quite difficult to compare information about the land price history and appraised prices as well as the related market conditions. In addition, the number of land parcels to be priced is huge and their location is complex in spatial relationships with network of streets that DONRE's staffs can easily search for the present land price and understand the change trends every year from the appraised prices.

In fact, differentiated marginal effect of parcel and location specific characteristics for higher and lower-priced properties are identified (Palmquist, 2003) and land price has a spatial and temporal correlation (neighborhood land lots share local amenities, and short-term land prices are influenced by the prevailing economic conditions), interpolation that considers spatio-temporal correlations should be expected to output more accurate land prices than other methods (Inoue et al., 2010).

Until now, DONRE is a lack of experience and suitable solution for administrative tasks through the application of GIS technology which can automatically determine the price of for each street or a particular land parcel in a more flexible and efficient way.

This paper aims to introduce the geodatabase model for real estate resource information management in Tien Giang province and propose to publish land price information by

functions of the developed software that provide the tools to the local government to restore, update and analyze information for mapping land price and determine the land price for each planning project.

2. STUDY AREA AND METHOD

Our target area in this study is My Tho city's 03 wards, which is in the central area of Tien Giang province. The model of land price information system is designed and considered as a pilot project, and the obtained initial results will be used to expand the system to the whole province that consists of My Tho city and 9 districts (Gò Công, Cái Lậy, Cái Bè, Châu Thành, Tân Phước, Chợ Gạo, Gò Công Đông, Gò Công Tây and Tân Phú Đông) in Tien Giang province of Viet Nam.
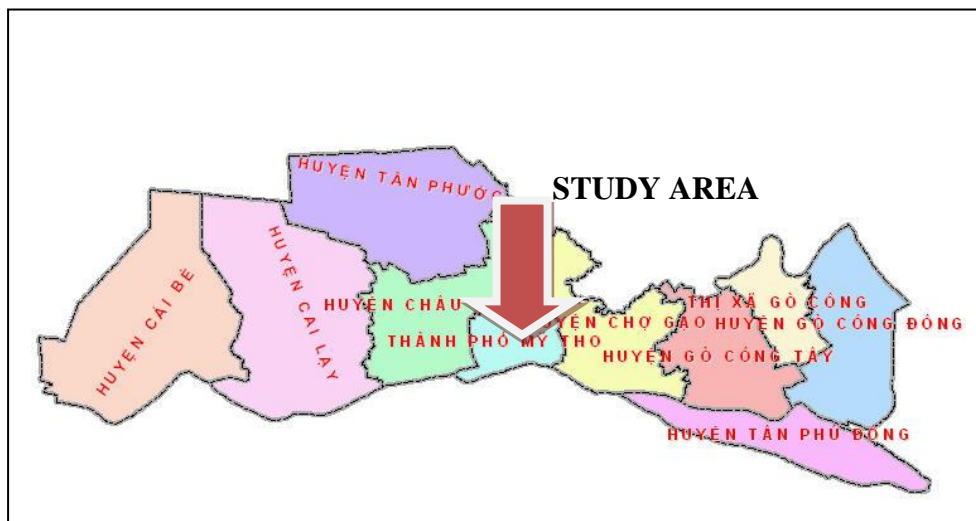

Figure 1. Location map of the My Tho city

In this research, GIS database is established from a variety of sources (topographic and cadastral maps, land use plan map,...) that complied by DONRE. A mix scale approach involving the integration of data is applied, base map and thematic maps are stored and managed based on model of Geo-database Data Management. All data of cadastral maps are conducted in changing the data format (from Microstation sang Geodatabase) and projection (Datum: VN2000). In order to analysis and display to help identify the land price and supporting land management procedures, all datasets gave information about land price table.

The value of the land can also vary depending on positioning levels that the provincial government issued based on decree-law. For example, land price of each land parcel that are located on an alley, are evaluated by modifying the street value of a street which the alley connects directly to a street. Land price is classified into 4 levels of the location of the land in relation to street and the alley's width as well as the distance from land parcel to street.

Table 1. Positioning levels that the provincial government issued based on decree-law

Distance to street	Alley's width ≤ 4m	Alley's width > 4m	Alley not connect to street
≤200m	Level 2	Level 1	
>200m to ≤500m	Level 3	Level 1	Level 3
>500m	Level 3	Level 2	Level 3

In the land evaluation method, price of for each street is determined first based on land

conditions and if alley connects directly to a street is classified into level 1 then land price of each land parcel is lower than price of this street (30%). In reality, the determination of an exact value for a land parcel is almost impossible but based on the analysis of land price table that the provincial government issued on 1st January every year, spatial and attribute data are collected and entered into the database as follows:

- Cadastral map is used to build a layer of land parcels (polygon type) and its attributes include: Parcel ID, Street ID, Street name, Alley ID, positioning level and price of land.

- Topographic map is used for analysis road and other connections, landscape and its attributes include: District ID, Ward ID, name of district/ward,…

- Land use and urban plan map are used to represent agriculture and non-agriculture land, land with no planning permission and other physical characteristics.
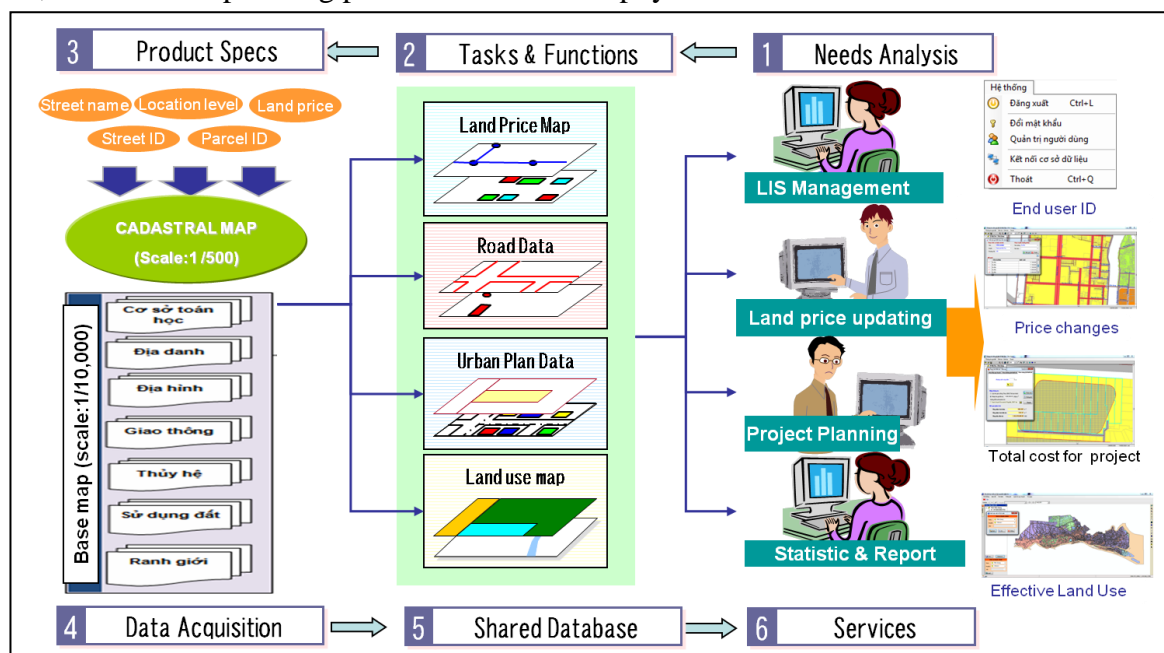

Figure 2. Database management and analyze information for mapping land price

Once real estate resource information has been collected and stored in a GIS where the data can undergo further analysis and display to to help identify the land price and supporting land management procedures. A software is developed based on ArcGIS Engine that aims to provide the tools to the local government to restore, analyze, and represent the basic data of land and real estate resource information, has the following modules:

- **Module for data management:** consists of basic tools for map interaction, viewing all necessary data in thematic layers and utility tools that help to create new thematic maps.

- **Module for supporting information:** includes functions used to determine the land price of each street based on street information and function for querying land price of each land parcel based on attribute and spatial data that allows us to understand the trend of land prices easily.

- **Module for statistics on land price:** includes functions used for statistics relating to land parcels, estimation of total cost for a planning project, and tools that help to create automatic reports and export list of land price of each land parcel for different wards/districts.

- Module for updating data: includes functions and tools used for updating the land price of each street, changing the alley's width and information of positioning level as well as attribute information such as Parcel ID, Street ID, Street name,...

3. RESULTS AND DISCUSSION

GIS technologies have been applied on some fields in Vietnam. However, there is a lack of experience and knowledge on the application of these technologies for real estate resource information management in Tien Giang province. The aim of this study is to develop an Land Information System (LIS) using software that provide the tools to the local government to restore, update and analyze information for mapping land price and determine the land price for each planning project. This is one key issue in a successful implementation of GIS which can automatically determine the land price of each street, analyze complex spatial relationships between the locacation of land parcel with its surrounding network of streets and alleys as well as anyone can easily search the annually appraised price of the land of their interest and the related land price history.

Software is proposed that has several functions to ensure the availability of land price information to the public and local government officers. Figure 3 illustrates user interface of the software that have been developed to provide communication between the user and the GIS software through a set of functions or procedures. The interfaces developed perform integration of multiple databases and flow logic to arrive at the desired result with minimal time and without expert GIS knowledge by the user.
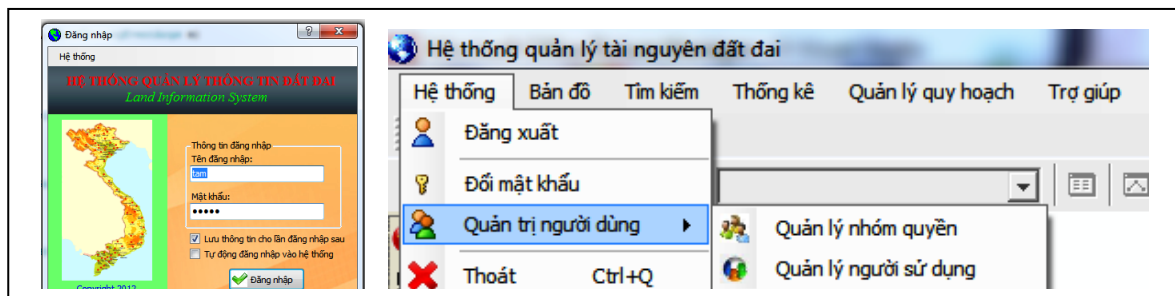

Figure 3. Software for mapping land price of Tien Giang province

The results obtained indicate that the proposed software is a suitable solution for administrative tasks. Local government officers and technicians will be trained with appropriate knowledge to obtain skills in using this software for land management. The production of a complete database of LIS allows users that can save a lot of time in finding detail information and necessary data related to topographic, cadastral and land use map,...
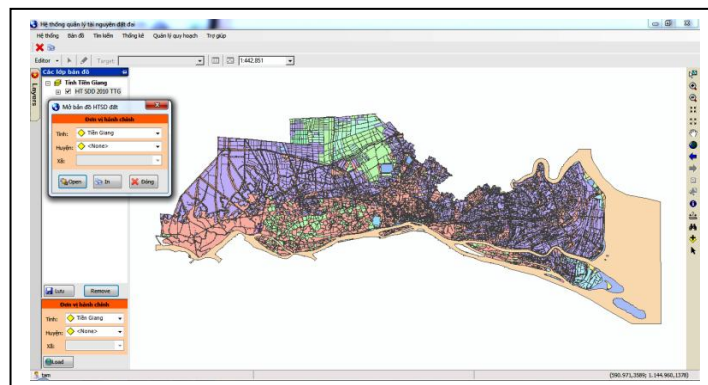

Figure 4. Display necessary information for land management

Every year, DORE must establish and issue land price table, this software can automatically determine and change the land price of each street or positioning level in a more flexible and efficient way.

In adition, the number of land parcels to be priced is huge and their location is complex in spatial relationships with network of streets. This software also provide the tools to the local government create automatic reports about the average land price for a particular ward/district and DONRE's staffs can easily search for the present land price and understand the change trends every year from the appraised prices.
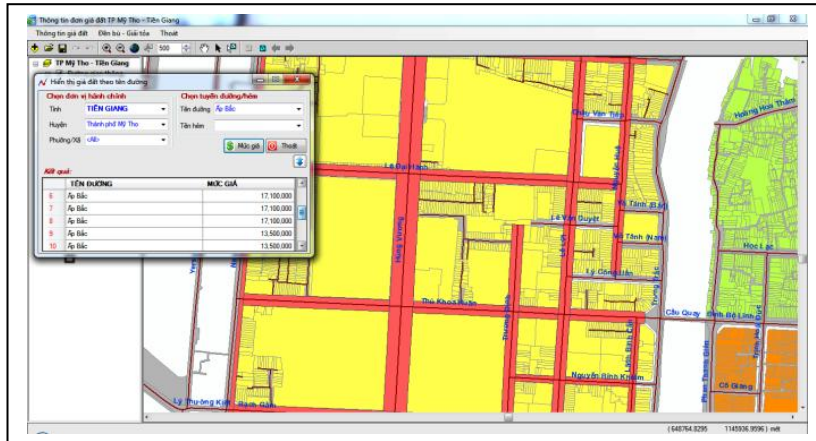

Figure 5. Present a detailed analysis of the land price of My Tho city

Finally, an important task for land price mapping is statistics and analysis of the factors that are related to the estimation of total cost for a planning project. Real estate price analysis may benefit huge amounts of information available in databases that this software can calculate total cost for each project accurately based on its location and spatial relationship with cadastral, topographic map and information of land price. In the example shown the rectangle is gray that is a plan area for construction project. Characteristics of detail plan (building material is stone or wood, public and private services,…) present in a given a plan area may be found in the information system as factors that this software can be used for the estimation of total cost, to create automatic reports and export list of land price of each land parcel. Therefore, the proposed module can provide an understanding of the situation for each planning project that investment companies can easily search for the present land price and create suitable plans for construction project in Tien Giang province.
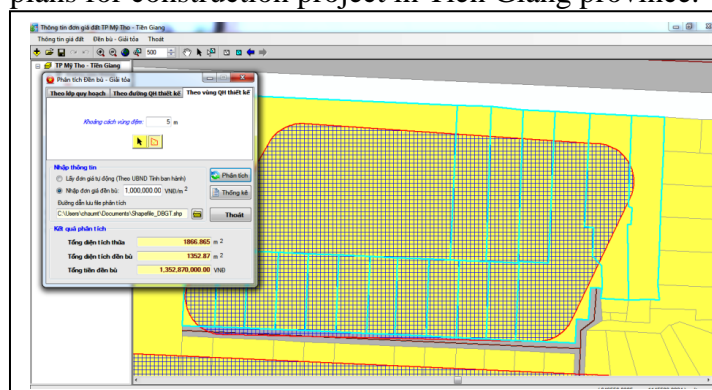

Figure 6. Estimation of total cost for a planning project

4. CONCLUSIONS

Detailed attributes of land price table that issued the public notice are quite difficult to compare information about the land price history and appraised prices as well as the related market conditions. To determine the value of a land, some land valuation criteria are selected and formulated so that land price of each street or positioning level are factors that DONRE's staffs cannot easily search for the present land price and understand the change trends every year. These problems are solved by the joint research project aiming to establish database LIS and to develop technology on utilization of GIS software that is consistent with the needs of the target area for land price management.

This paper showed that proposed solution and developed software help local government view easily the land information and necessary data related to topographic, cadastral and land use map,... and users can save a lot of time in finding detail information related to land price of each street. In addition, by applying GIS technology users can automatically determine the average land price for a particular ward/district and change the land price of each street or positioning level in a more flexible and efficient. Solution of GIS for managing land price can be applied to create suitable measures in project management and assessment that aims to achieve the necessary measures for improvement of land administrative tasks of DONRE.

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