

## To apply the GIS for Land-use and Housing Management in a district of Hochiminh city

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### Abstract

Hochiminh City (HCMC) is the biggest in Vietnam. It has over 6 million residences, over 1 million immigrants and about 1 million visitors a year. It consists of 23 districts including 17 urban districts and 6 suburban districts. It is keeping up the highest economic growth in Vietnam. Besides suburban zones are urbanized with high speed, a lot of urban areas has been re-planning with many reconstructed houses.

Some of urban districts have been developing systems of geographic information for land-use management and housing planning. In district 5, many procedures were implemented to support officers to do daily works. Digital cadastral maps were used as base maps. The digital base maps and their attributes were installed as a common database for GIS applications.

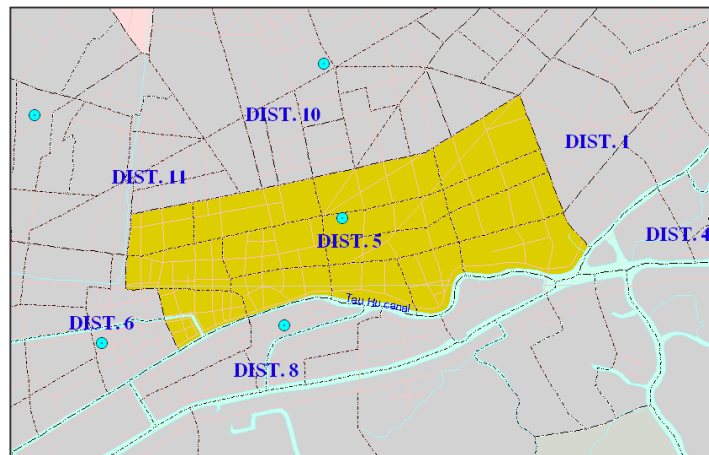
Based on a common database, the system issuing land-use and housing ownership licenses was implemented for the public services in the field of house and land. The systems making plan, managing state owned houses were also installed on the LAN network of the department of urban management to strengthen the capability of the district agency. After being trained, all officers of the department use these systems well for their daily works.

In this paper, the GIS applications are presented as a prototype in the modernization of the public administration of Vietnam authorities at district level. The GIS has improved the activities of district agencies to serve people better and better.

**Keywords:** Land-use management, housing planning.

### 1 Introduction

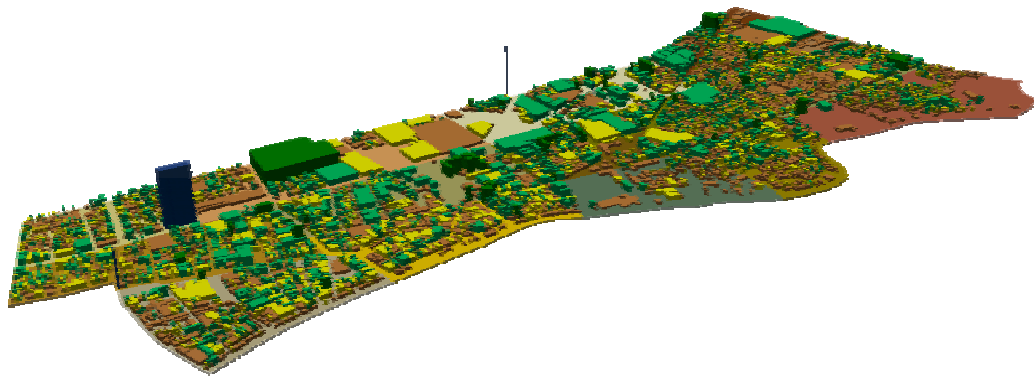
As one of the central districts of HCMC, district 5 has a lot of schools, hospitals, and entertainment places. It is 4.14 kilometers square, 4 kilometers long, and 1 kilometer wide. It is surrounded by district 1 on the east side, district 6 on the west side, district 10 and 11 on the north side, and district 8 on the south side. The Tau Hu canal passing district 5 and separating it with district 8 makes it more beautiful.



**Fig.1:** The location of the District 5 in Hochiminh City, Vietnam

Its population is about 251,999 people and its population density is 60,869 people/km<sup>2</sup>. Besides there are 818 companies involving in various fields in district 5. It also gets over 1 billion US dollars /year for income and contributes about 20 million US dollars /year for taxes.

With 15 wards, the district 5 governmental agencies encounter a lot of difficulty in activities of the urban management. The local government has increasingly seen the benefits of technology in executing many of their responsibilities. Computers have obviously changed the way most agencies do business. The processing, analytical and data storage capabilities of computers have given public agencies that have invested in such systems a great tool for accomplishing their duties. One example of how technology has changed the way governments do business is the development of Geographic Information Systems (GIS).



**Fig.2:** The panorama of the District 5

The ability of GIS to store, manage and manipulate large amounts of spatial data, provides urban managers with a powerful tool. GIS's ability to link tabular, non-spatial data to locational information is likewise a powerful analytic capability. Many different facets of government use GIS technology. GIS also provides ways of viewing and analyzing data that was previously impossible or impractical. With the aid of a GIS, a local planning and community development office can track zoning and site design plans that help form and shape a city.

Up to now, as many local governments in Vietnam, the government of district 5 maintains land-use and housing information either on paper maps or in computerized cad-based databases. This issue causes data unsharing and uncommon problem which limits urban management authority of the local government.

This paper focuses on how GIS has been applied to establish, maintain, and analyze urban and land-use information to support the functions of local government in district 5, Hochiminh City (HCMC),

Vietnam. The GIS model for district 5 will be presented. Then, some automatically functional procedures by using GIS technology will be addressed. Finally the staff of district 5 should be trained to understand what GIS is and to use DIGIS 1.0 skillfully.

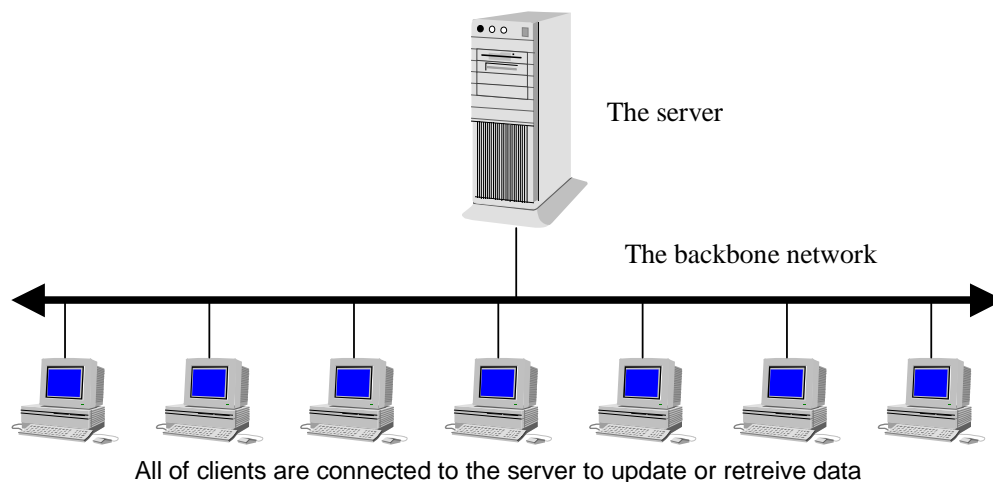
Based on the urgent needs of the local government in managing urban activities especially land-use and housing management, the first GIS project for district 5 was implemented during the time from March, 2002 to June, 2003. Its name is District Geographic Information System or DIGIS. The two primary objectives of the DIGIS are:

- To design and implement the GIS database for land-use and housing within district 5. The objective helps to gather spatial and asspatial data stored on papers and in computerized database.
- To establish some of the most important automatically functional procedures of the Department of Urban Management of district 5. They supports well for the local staff to exploit GIS data.

The user of the system would be staff of district 5.

## 2 THE GIS MODEL OF DISTRICT 5 OF HCMC

In order to be in keeping with an existing official management, the system should be a centralized one. This centralized system needs one server computer that stores all of GIS data in one geo database while other client computers connect to the server to exchange data through a backbone network.



**Fig. 3:** The conceptual model of the GISystem of the District 5

In this model, the server should be located at the People's Committee Office of district 5 while other clients are located at their places in the committee precinct. In general, the GIS of district 5 will be a professional system with 6 components: hardware, software, data, procedure, orgaware, and humanware. However, in order to reuse effectively and early old land-use and housing information stored on paper maps, this project is considered as the first stage of implementing a professional system concentrated on building up a database and automating some necessarily functional procedures.

Consequently, the first version of DIGIS would:

- Hardware: take full advantage of existing hardware including workstation computers, printers, and other devices.
- Software: reuse operating software and be equipped with ArcView GIS 3.2.
- Data: gather all of existing data, put them all together to be ready for updating and retrieving by any GISs. That was an important objective of this project. Data of DIGIS were designed into 2 types: basic data and thematic data. Thematic data could be

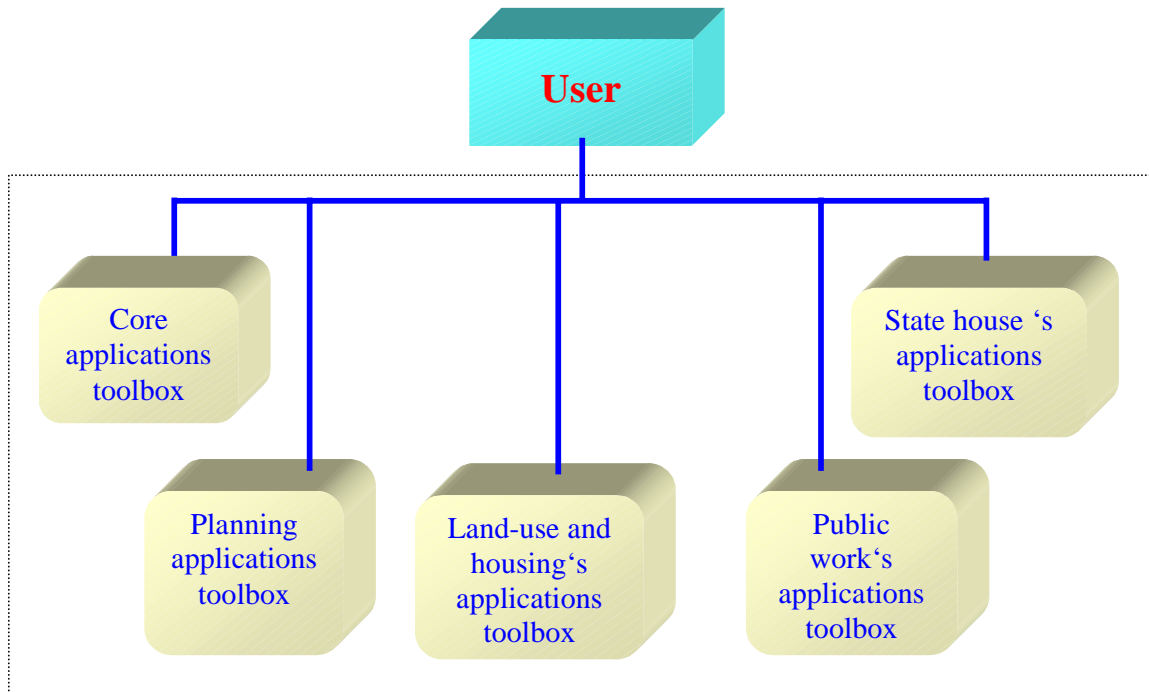
created from paper or digital maps, statistical tables, or other documents. All of paper-based data were vectorized into computer as shapefile data. However, this issue could not be finished at an expected time because some data were being completed, especially the planning data, parallelly with the project. At the end of the project, over 15 spatial data layers and many non-spatial data tables were achieved for DIGIS.

- Procedures: automate some principal business processes as automatic procedures. They have made the system more effectively. Procedures were classified into 5 toolboxes: core applications toolbox, planning applications toolbox, land-use and housing's applications toolbox, public work's applications toolbox, and state house's applications toolbox.
- Organization: not be mentioned in this version of the project. A framework for the system is needed to make it more professional. However, due to the scope of this version of the project, this job will be done in the next project.
- Training: train basic knowledge for the district's staffs. This is one of the important issues to make the system available soon. The project got enthusiasm of the district's staffs. Over 15 people were taught the basic GIS knowledge and how to use DIGIS tools.

In summary, the aims of the project were established at 3 components of GIS: data, procedures, and training. In the future projects, all of 6 components of GIS should be considered to build up a more professional system to help the local government improve their managing tasks and widen their services to the citizen.

**3 THE PROCEDURES TO BE IMPLEMENTED IN DISTRICT 5 OF HCMC**

Although district 5 is one of the old and stable districts in HCMC, its government is responsible for managing thousands of houses, lands, and public works. They have a lot of business processes that need to be automated with the new generation of information technology, the geographic information technology to strengthen their managing capacity and authority. However, at the beginning of the use of GIS, district 5 wanted to be supported with GIS in managing land-use and housing. The tools, hence, were designed for updating ownership data, retrieving land-use and housing data, making reports, drawing planning boundaries, manipulating areas of planning-violated houses, managing public lavatories, and managing state houses. They were classified into 5 toolboxes as the model below:



**Fig.4:** The structure of DIGIS 1.0 software applying in the District 5

In this model, each toolbox is an extension of ArcView GIS. They are different in using level and purpose. Users of DIGIS 1.0 interact with these toolboxes through a simple interface called Expanding Function Interface. After activating needed toolboxes, users start to use functional menu bar, button bar, or tool bar for their various tasks in a familiar environment, an ArcView GIS environment.

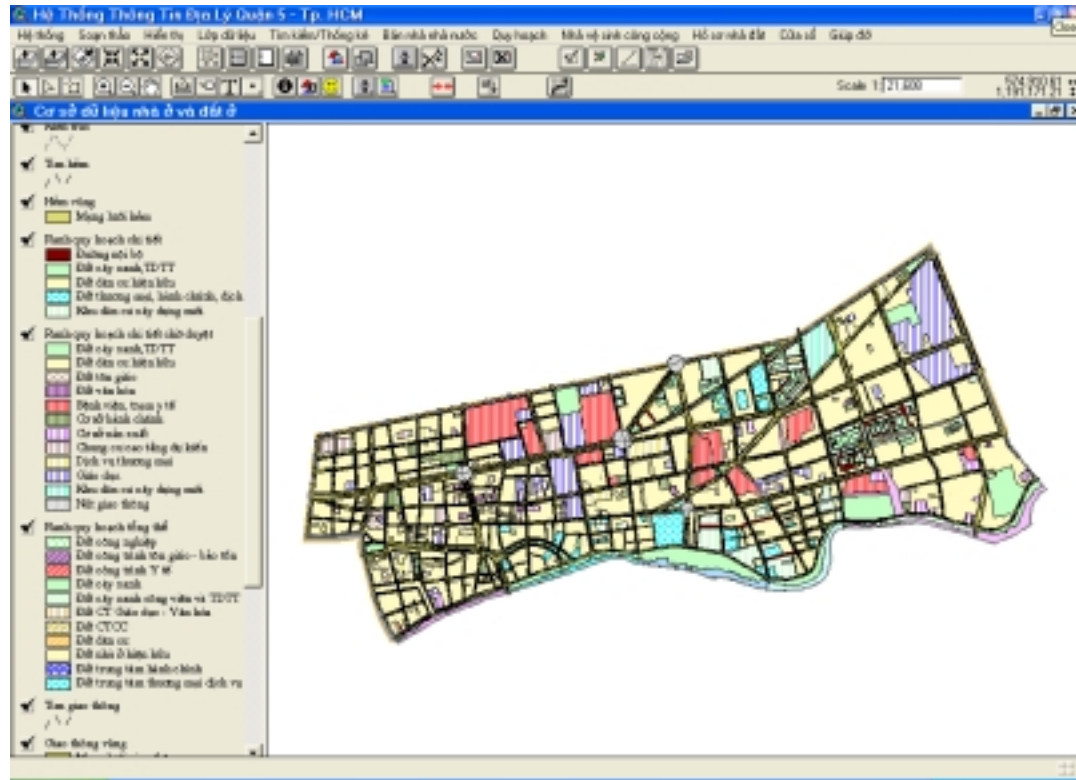


Fig.5: The main Vietnamese interface of the DIGIS 1.0

The Core applications toolbox was expected for public uses. It has these characteristics:

- It can be used by both the district's staffs and the citizens.
- It supports users to identify, query, and count up data.
- Included tools do not change any data in database. Users can retrieve data from database rather than update data.
- Data to be retrieved can be spatial or attribute data.
- Results produced by these tools are reported on maps or on forms.
- The toolbox is a good tool for people to retrieve land-use and housing information in a short time.

The Planning applications toolbox was implemented for private use. Its features are:

- It can be used only by the district's staffs. The Technical Division should use this toolbox to improve their daily issues.
- It helps user to manage and create different type of planning data. The toolbox is provided with many thematic drawing tools for creating exactly planning boundaries.

- It can be used for updating GIS data in database.
- The toolbox is not only good for technical staff to update planning data precisely and quickly but also valuable for manager to control planning areas within the district to meet the needs of people.

The Land-use and housing's applications toolbox was also implemented for private use. Its features are:

- It can be used only by the district's staffs. The Cadastral Division should use this toolbox to improve their daily issues.
- It helps user to manage or update ownership data. The toolbox is provided with tools for creating statement issue, land-use and housing certificate, construction permit; and addressing house number.
- It can be used for updating GIS data in database.
- The toolbox is good for the local government to improve their capability in serving people and increasing people's belief in the government because the toolbox helps a person to reduce the time of getting ownership of his house.

The Public work's applications toolbox was established for private use only. It has some characteristics:

- It can be used only by the district's staffs. The Transportation and Environment Division should use this toolbox to improve their daily issues.
- It helps user to manage or update lavatory data. The toolbox is provided with tools for managing and creating spatial and non-spatial data.
- It can be used for updating GIS data in database.
- The toolbox is good for the technical staff to keep an eye on the development of lavatory constructions.

The last toolbox State house's applications toolbox is actually an automatic state house management procedure. It should be used by the Division of State Houses Management to manage state houses over the district. This automatic procedure helps the local staffs to strengthen their managing capacity. They have to be familiar with working together on a procedure to serve people more effectively.

In conclusion, the project established a lot of tools to meet the needs of the local government. The DIGIS is expected to improve the managing capability of the People's Committee of District 5 to serve people more effectively.

#### **4 TRAINING**

Training was one of critical issues of the project. Training program was divided into 2 courses: Introduction to the GIS and Using the DIGIS 1.0. The first course gave trainees basic knowledge about GIS. The content of this course had 7 chapters: introduction, creating and editing spatial data, creating and editing attribute data, linking data, querying data, presenting data, and creating layout in ArcView GIS. Trainees were supported with textbooks. At the end of the course, they all had to complete a mini-test. The second course was started right after the mini-test. The course focused on giving district's staff skills to use DIGIS 1.0 in their actual activities. At the end of the second course, the final test was performed to help trainees to review all lessons.

The training program was completed successfully with about 16 of 20 trainees passing the examination. All passed trainees got a certificate of achievement.



**Fig.6:** Samples of the certificate of achievement for GIS officers from the District 5

Now, with trained knowledge and detailed help documents, district 5's staffs are using the DIGIS 1.0 in their daily activities.

Training result has distributed to the task of strengthening the managing capacity or managing skill of the local government. With equipped knowledge, district's staffs are able to treat citizen's problems much more quickly and precisely and to support decision making in time. Those problems can be solved conveniently and easily and people feels trustful in the government.

## 5 CONCLUSION

The project of the GIS for urban management in district 5 of HCMC, during 2002-2003, is now accomplished with over 15 spatial data layers and tabular data. The DIGIS 1.0 software has been produced to support well for the governmental staffs in their daily works. With most of land-use and housing information available in digital format and DIGIS software developed on ArcView GIS, the District 5 is on the verge of exponentially expanding its GIS capabilities and departmental applications.

The project is expected to develop a more professional geographic information system with 6 components including hardware, software, data, procedure, orgaware, and humanware for district 5 and other districts of HCMC, Vietnam.

The GIS has proved the effect in managing urban land-use and housing information. The GIS has really improved the activities of district agencies in Hochiminh City to serve people better and better.

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