

# **Integrated application of Land Surveying and Mapping**

## **Data on Web-GIS**

### **Abstract**

The data system of the land surveying and drawing is the core of the land information system. It includes the following contents: Control Surveying Results, Cadastral Map Data, Topographic maps, Aerial photography, telemeter the image of the satellite, and so forth. Nowadays, it is also the essential data of the national land planning, national land nursing, and calamity relieving, etc. However, the data are very complicated and varies frequently, so that it could not be easily unified and used.

Consequently, The National Land Surveying and Mapping Center wants to integrate the data of the land surveying and drawing. It makes use of the technologies of the data warehouse together with GIS to standardize the data of the land surveying and drawing, and establishes the land surveying and drawing system. Besides, it possesses a unitary website to exchange and provide each kind of information.

### **I. Preface**

There are an enormous number of data, such as Control Surveying Results, Digitization of Cadastral Maps, Management of Cadastral Maps, Land Section Data, digital Topographic Maps, Coastal Topography Maps, underwater Topography Maps, DEM, Aerial photography, telemeter the image of the satellite, of the territorial Surveying and Mapping. They are not only the most common and the most core data of the territorial information system but also are eagerly used to the land mapping and land protecting presently. Owing to the complexity and variety of their very different types, they are very difficult to be integrated with the GIS data.

To react quickly and serve the crowd for the need of the above mentioned data, The National Land Surveying and Mapping Center have established a unitary service website, using the following technologies such as Data Warehouse, Spatial Database, Geographic Information Systems (GIS), and web service, etc., on the internet to provide information and circulation.

We have made use of the information science and technology to establish a platform of the Surveying and Mapping data. As a result, the platform can thus perfectly integrate the development of the circulation system to share the data. Now a day, the system of Surveying and Mapping data which have already integrated with the circulation system has been established completely. Finally, the system will

follow the rules of the administrative order to provide the users a diverse and safe circulation window, and popularize the trading mechanism to serve each one.

## **II. The problem about integrating the Surveying and Mapping data**

There are three main questions which must be solved now when we are talking about the integration of the Surveying and Mapping data of the land. They are

(1) Lacks the overall planning mechanism

Maintaining the data by a sole organization, which unifies the form and each standard of the data, is the most important topic now. From this sole responsibility organization, we can easily obtain the data which have already been standardized. And then, each administrative unit can communicate the data as convenient as possible. Consequently, the government will thus save a lot of money.

(2) Establishment of the distributed data warehouse

The distributed management is the current most used and powerful mode of administration. However, most of the data are still stored up in the files of the graphic form. For the sake of the consistence, completeness, and safety of the data, to build the distributed data warehouse is inevitable. If the Surveying and Mapping data has converted into the database, the management problem and the program development work will be greatly simplified, because the data could be easily searched and handled by dividing the data to smaller part which is really needed by the user. As a result, the network transmission time has been reduced and the efficiency could be improved. Finally the cost could be lowered.

(3) Construction of the metadata

Metadata is "data about other data". An item of metadata may describe an individual datum, or content item, or a collection of data including multiple content items and hierarchical levels. Consequently, metadata is very suitable in the inquiry and the retrieval of the geography data. In order to unify the standard of the circulation format of the data on the network, the government should instruct the producer of the various geography data to follow the rules to build the metadata of these data. Then, everyone could search the data correctly, suitably, and quickly on the internet.

## **III. Build the territorial Surveying and Mapping data warehouse**

The building of the data warehouse of the territorial surveying and mapping data could roughly divide into four parts:

- (1) By overlapping the photos of the land and the Cadastral maps, the accuracy of the data is quit high.



Figure 1.

- (2) To convert the data from the CAD numerical format to the type of GIS format.

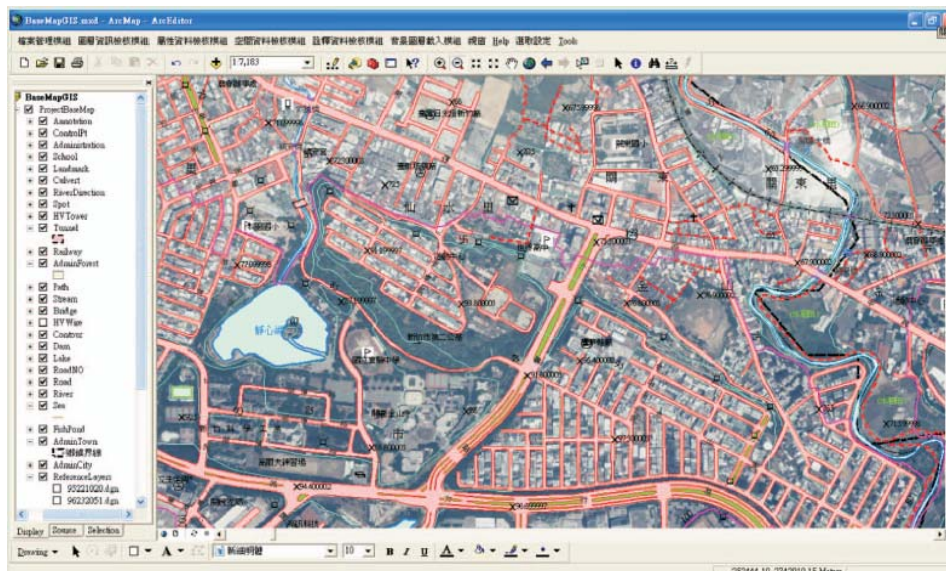


Figure 2. Digitization of Cadastral Map

- (3) To build the topographic charts of the tidal zone, and to research the data formats of the basic charts. According to the requirement of the users, to provide the possibility of the transformation of the nautical chart.
- (4) The spatial data of the territorial Surveying and Mapping are imported into

the database by using RSRI ArcSDE or Oracle Spatial. However, the image data are stored by ESRI Image Server. And the rules of metadata are based on the TWSMP version 1.0.

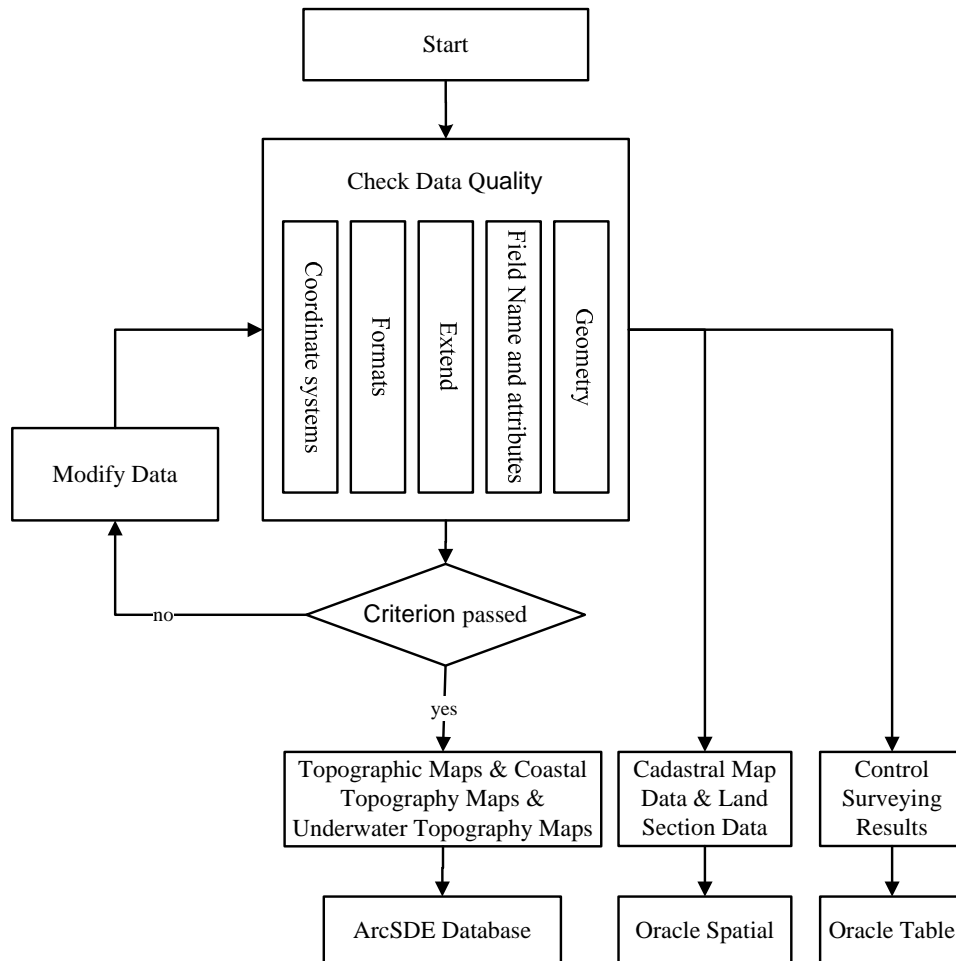


Figure 3. The Standardized Flowchart of the Vector Data Processing

#### IV. Build the Integration and Circulation system of the territorial Surveying and Mapping data

For convenience from the users' viewpoint, the system would serve as a one-stop portal site and could also carry on the system development which is established on the Windows 2003 Server platform that includes IIS and ASP.NET together with the soft wares, such as ArcIMS 9.2 and ArcGIS Server 9.2 WEB GIS, as development tools. Besides, the database of the system is Oracle10g, and the spatial database is accessed by using ArcSDE9.2.

In order to enable the user to be possible to access the complete data and to eliminate the differences between various data, the image layers must be grouped first. For example, the hydro-topographic map contains 72 layers which are the current

property, the plane waters, the coastal line, the ocean, the ocean current, the saline land, etc. The similar layers are the topographic maps, the base chart of marine area, the general digital map, and so on.

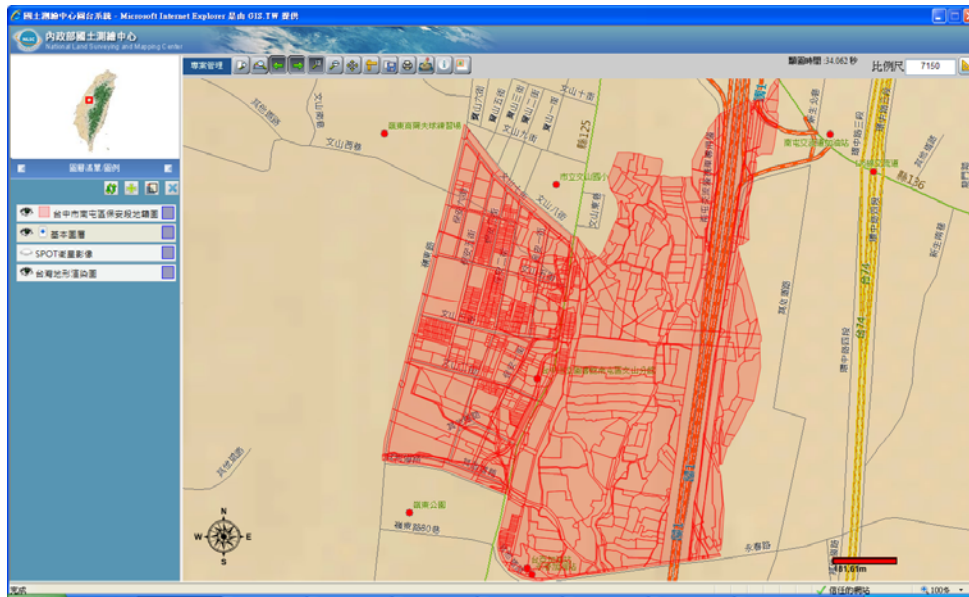


Figure 4.Overlapping the Oracle Spatial cadastral map

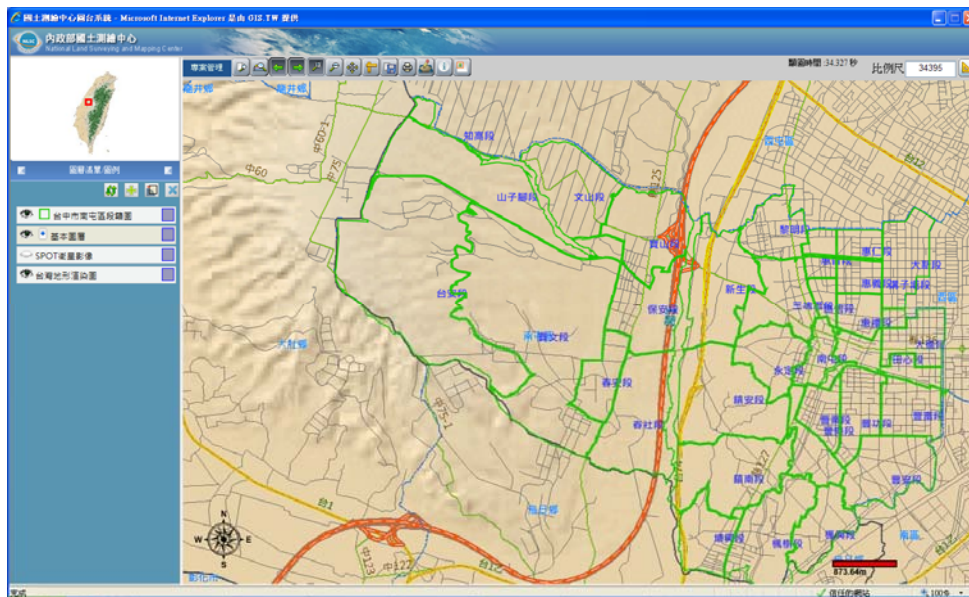


Figure 5.Overlapping the Oracle Spatial cadastral map

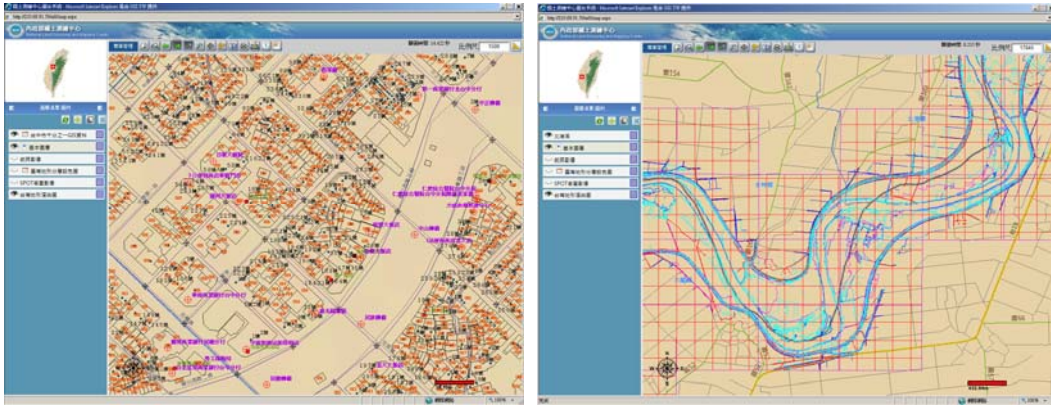


Figure 6. Digitization of Cadastral Map

## V. Conclusion

The National Land Surveying and Mapping Center has already begun to handle the various data of the territorial Surveying and Mapping, and try to work out a developing system for many years. The system could analyse the current situation of the surveying and mapping data, establish a territorial surveying and mapping database, develop a circulation system which is composed of the various territorial data. Once the system establishment completes, it will provide the workers of the center of the land Surveying and Mapping many benefits, it will also improve the flow of the data of chart form. We could expect the beneficial results of this plan as the following:

- (1) Promote the consistence of the Surveying and Mapping data via Centralized management, dispersion maintenance.
- (2) Enhance the security of the data, and increase the management efficiency.
- (3) Provide the functions of retrieving, circulating, and furnishing the data by the established territorial Surveying and Mapping integrated system.
- (4) Establish SOP, and simplify the procedures of the data maintenance as well as the management programs.
- (5) Cooperate with the Warehousing and circulation center of the Ministry of Interior information center to fulfill the following goal:

The data is ultimately unique; however the applications are maximally diversified.