

DEVELOPMENT OF A GIS WITHIN A WATER COMPANY

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Introduction

Geographic information systems (GIS) confirm every day, and with increasing popularity, that they are some essential tools for storing, managing, processing and mapping a large amount of georeferenced data, which related to a database shape a given geographical space. The increasingly widespread use of personal computers, along with a greater choice by software manufacturers allow an item, previously limited to powerful computers, can be treated by a large number of users.

Geographic information systems make possible, among other things, the ability to extract different layers of thematic information relating to a particular spatial area, as well as all kinds of analysis and diagnosis in areas as diverse as territorial planning, or the environment or management resources.

This report aims to examine the development of a geographic information system within an organisation. More specifically it is a water company, as might be the case of Thames Water. This report will go into the operation of a large water company. The nature of the information included into geographic information system is varied. For example, data from network infrastructure projects are used as well as a geographical aspect, such as hydrologic basin boundaries, water bodies and other ... In this company there is also administrative information such as databases related to public use of water resources in a basin. Another type of information made available is the satellite image.

For the development of the geographic information system it has been necessary to carefully define its own infrastructure of all the components involved in the process.

These components are:

Hardware, storage, software, information structure in a server (done in a way that can be cost effective), tools for accessing and updating. Thus, it allows system users to access all information related to use them in tasks of water management. The idea of the implementation of a geographic information system in the company aims to provide technological and methodological solutions to the tasks of water management. The geographic information system is established to respond to questions that are not predefined in advance.

Background

An initial analysis of the company gives an idea of its size, and in base to this, the kind of infrastructure is chosen. Also, an study of the resources available is needed in order to meet the requirements of GIS that the company has. Services are put in place regarding maintenance of the geo-referenced information: infrastructure maintenance ...

Within a water company, like Thames Water, several activities related to water management are summarised next in order to give examples of need for a GIS.

- First, there is a need to manage water resources, the public usage of water, water supply infrastructure and reservoirs
- GIS can help in the creation and implementation of water policies.
- Carry out the administration of public water usage and manage the use of water.
- Manage the implementation of works and water infrastructure; coordinate the exploitation and management of works and projects.
- Manage the recruitment, management and control of the earnings in the company
- A mobile system that reinforce the department's ability to manage field resources and service orders (Jacobs, D. et al., 2007)

GIS sources

As mentioned earlier, the company deals with information from different sources, each with its particular characteristics:

Information from infrastructure projects and other projects and other directly related to the natural environment, information from information systems information from satellite imagery and derived products. Information from infrastructure projects and other projects and other directly related to the natural environment The projects that the company deals with generate a lot of geographic information: major infrastructure projects (for example, water supply), environmental monitoring and planning (like flood zones and evacuation routes map (Mioc, 2008) and reference maps on issues relating directly to the environment (for example maps of rivers or watersheds).

Once the company receives the information, the administrator of GIS adds value to information. One example is the case of water supply infrastructure: establishing topology, and enabling queries of what happens at certain point. Information from other systems

The GIS of the company uses data from other information systems. The GIS software of the company is linked to external databases. Through database connectivity the company have access to information on Oracle format and Access format that contain administrative information with the records of the actions of the public with water resources (for example consume, discharges, building permits, etc.)

It is also linked to other information systems with information directly related to the physical environment (network information system of surface water control)

The company databases are based on a relational data model where data is stored in two dimensions tables. In this way theses tables are related and contain records for one entity. The company databases are also based in a georelational model where the tables are linked and contain data like topology, attributes etc.

Using SQL language the company can query the data from the database and in this way can generate maps and tables with the information required by the users. The integration between databases and GIS software allows the

end user to represent the elements of the database on a map, in that way many layers of different maps can be opened and overlaid and geographical relations between the elements mapped can be checked.

The company uses Automated Mapping/Facilities Management AM/FM. With this application the non geographic and the geographic information can be integrated in one. The information of the company database is geocoded with the postcode address of their home. The process to geocode can be tedious, so another company does it. Once the information is geocoded analysis can be undertaken combined with other maps overlaid like a city map for instance. Like this the company can undertake different tasks. Information from satellite images and derived products Another type of information that makes use of GIS is the remote sensing information. Through contracts with other companies water company regularly receives processed images from satellites such as Landsat or SPOT. The images are geometrically and radiometrically corrected, the metadata is completed and is integrated into the GIS.

The images are produced as a product of great visual interest. Compositions are created with true colour and false colour, easily accessible guide maps are made for quick access to view the images. This information is also used to track water requirements of crops, monitoring of snow cover and monitoring of water quality along the coast. On products derived from monitoring the area are creating databases, initially simple, storing the information, and are creating management tools to generate reports, graphs and maps to access quickly.

On products derived from monitoring the area databases are created, that store the information, and management tools are created to generate reports, graphs and maps to access quickly. Maps can be created using this information of humidity index, cadastral parcels with water content, evapotranspiration, etc.. One of the problems that the company is facing is the lack of knowledge of the resources of remote sensing data.

The GIS and Remote Sensing software used have been chosen according to the needs of the company: the key points when deciding which software to use in the company are: which benefits the software offer, the profile of users who will use it is also important, number of licenses needed and the price is also important.

The technology is used by the company is ESRI because offers a high performance level in GIS: for example, has the necessary tools for analysis and interfaces hydraulic and hydrologic modelling (very important for a water company) and also offers the possibility of programming highly customized interfaces that are often very friendly welcome by users, but the disadvantage is its high cost that can limit the number of licenses.

Hardware

For hardware, the company has chosen to use a high-powered server as the company is a large size company and the amount of map information generated is very large. It is very important to choose a high performance hardware because as a large company, the amount of data to be processed is very high. When choosing the hardware is taken into account the time factor as the large amount of data that is received daily makes essential a technology that can provide mid-term capacity. Besides, the hardware has to respond to the addition of new series of maps and the continuing contribution of remote sensing imagery.

It is essential to manage the huge volumes of geographical data in a efficient and effective way if the GIS is to be cost justified. Apart from hardware and software the structure of the data is also very important.

The access to the information has to be easy to the users and also the maintenance and update. Information must be stored in a way that is structured in a objective way, scalable and easy to add new information.

The structure of the data have been created according to the major thematic areas within the company. Here are the big four groups where the data has been divided into:

Mapping management:

maps and databases that include elements of the territory directly involved in the management, control, planning and land always in relation to the water business. These maps are generated within the company. (watershed, sewage systems, etc.).

Thematic Mapping:

Mapping not linked to the water business, but that is related to environmental issues that the company is related to like natural reserves,

Mapping of reference:

Map collections supplied by the Ordnance Survey (all sort of maps, from topographic to aerial photo rectified...

Other mapping:

Maps and databases of a part of the territory administered by the company, this mapping may also come from other entities as a result of specific studies

Those who do easier tasks they don't need a full training on GIS and Remote Sensing because probably they are not going to use it, but what it is important is that these users have a personalised training on the task that are going to perform normally.

For this reason within the company some personalized training is undertaken. Also step by step manuals describing the processes and above all the GIS office of the company are conducting ongoing advice on issues of GIS and Remote Sensing to the entire company.

Conclusions

Currently the GIS is an essential tool in the in the day to day in the company. Work of different sorts relating the water is undertaken with GIS. The GIS model of the company has allowed, despite some problems, enhance in each of the workspaces GIS as a tool for management, planning and analysis.

References

1. Jacobs, D., Souza F., Ramey R. "GIS to the Rescue" Water & Wastes Digest February 2007 Volume: 47 Number: 2
2. Darka Mioc, François Anton and Gengsheng Liang On-line Street Network Analysis for Flood
3. Evacuation Planning Remote Sensing and Gis Technologies for Monitoring and Prediction of Disasters. Berlin: Springer, 2008. Pages219-242