

# THE RIGID PROBLEMS DURING THE ESTABLISHMENT OF INFORMATION SYSTEMS IN TURKEY

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## PURPOSE

While the population of the world increases, the amount of the land on which they live and use remains unchanged. As the social needs and expectations increase due to the prevailing conditions of the time and become more complicated entailing solutions, the advent and improvement of the information systems to be used by the individuals as well as establishments. A Geographic Information (GIS) is a compound of geographic data, computer hardware and software, personnel and associated attributes in order to allow the users to make better decision, to improve productivity, to spare time, money and man power, and in the future nations will be responsible for the collection, management and dissemination of information. These information are very important parts of people's everyday life. The aim of this study is to show up the importance of the Geographic Information Systems. For this purpose several applications are conducted at the photogrammetry laboratory in ITU Civil Engineering Faculty. Some of the applications are; Environmental Information System, Information System in Rural Areas, Information System for ITU Ayazağa Campus, Urban Information System for Public Works of Municipalities, Information System about Air Pollution and Producing Data to an Information System used for GSM Communication by Digitizing the 1:250 000 scaled maps.

## 1. INTRODUCTION

The need of information for mankind can date back to the beginning of civilization. As a result of cultivating the land, and in order to safeguard the proprietary rights, it was necessary to mark the land which were claimed to be owned. The gradually improved sense of ownership brought the surveying techniques together with the compilation of land records.

While the population of the world increases, the amount of the land on which they live and use remains unchanged. Therefore, the available land has to be utilized. The rapid growth of the urban areas, the efforts towards protecting arable land and available land resources, the enhanced concern about the environmental problems, have all caused a growing interest on information. Meeting the basic social requirements such as feeding, defense, energy, health, education, transportation and communication, protection of natural resources call for thorough planning activity. For this purposes, land information is necessary (Şeker, 1993).

On the other hand, records related to the land, which are available are insufficient to meet the needs for a land information systems. The biggest problem encountered in using the land records is not the lack of information but is the abundance of various land data which is neither complete nor interrelated. As there is not a healthy relationship among the institutions, the institutions requiring land information which itself does not possess results to gather new information instead of obtaining it from other institutions. This naturally

increases the cost of data in terms of personnel, money and time (Taştan, 1993).

The hand-drawn map has been the traditional and time-honored means of recording observations and information about the Earth for later visual retrieval or simple measurement. Nevertheless, hand compilation and subsequent manual interpretation of map data has had inherent speed and volume limitations. The rapidly growing use of computers for handling geographic data has been part of a more recent reflection of the overall trend within society toward a rapidly increasing reliance on the computer as a data handling and data analysis tool.

## 2. MAP PRODUCTION IN TURKEY

In Turkey, base mapping vary from 1:1,000 scale to 1:25,000. 1:5,000 scaled standard topographic maps have been produced by photogrammetric method. Also 1:25,000 and smaller scaled maps are under production.

In Turkey, maps are produced by public institutions and private sector. Public institutions which requires map can be classified according to the sectors, like Agriculture, Tourism, Mining, Energy, Transportation and Communications etc.

In Turkey, the map and cadastre services have been considered as services fully attached with each other. The subject of cadastre is to model the land and human relationship. These two systems, together, carry out the fulfillment of numerous basic services. There are over thirty institutions in Turkey which have the authority to produce maps among which are,

- General Directorate of Title-Deeds and Cadastre, (TKGM 1:1000, 1:2500, 1:5000)
- General Commander Office for Mapping, (HGK - 1:10000, 1:25000 ad smaller)
- Municipalities, (1:1000)
- General Directorate of Highways, (KGM - 1: 5000)
- General Management of Provincial Bank, (IB - 1: 5000, 1:10000)
- General Directorate of Turkish Coal Mines, (TKI - 1:10000)
- Technical Searching Institute for Mining, (MTA - 1:10000, 1:25000)
- Turkish Petroleum Partnership Plc, (TPAO - 1: 25000)
- General Directory for Construction of Ports and Airports, (HLIGM - 1:1000)
- Electrical Works Board, (TEK - 1:5000)
- General Directorate for Land and Agricultural Reform, (TTRGM - 1:1000, 1:5000)
- General Directorate of Post, Telephone and Telegram, (PTT - 1:25000)
- General Directorate of Forest, (OGM - 1:10000)

The private sector also produces maps in Turkey, examples of which includes, producing large scale maps for private companies or public institutions like municipalities, applications of projects, etc. Due to a new law in mid 1980s, the private sector also got to opportunity to produce photogrammetric maps. Consequently, large scale photogrammetric maps of the big cities like Istanbul and Ankara now being produced by the private sector.

Development plans in Turkey are done in the period of five years by the National Planning Institution (DPT). In the period of sixth 5-Years Development Plan, it is suggested that an institution responsible for the whole map and cadastre services in the country to be set up, bearing in mind the needs of the individuals and establishments benefiting from the map services, except for the production of maps for military purposes (Şeker, 1993).

Some of the expected benefits can be summarized as follows,

- \* Time and cost effect in using resources.
- \* Possibility of using so much information that could not be possible by classical methods.
- \* Possibility of having comparative data in all kinds of planning operations.
- \* Preventing the outside-the-plan developments by timely warning of the administrative and using units in information exchanges.
- \* Developing the contents of available maps, thus making it possible to use them as sheet in construction planning engineering services and technical services of the differences between mapping systems and GIS.

- \* Planning, application and control of underground lines.
- \* Justice in taxation of avoiding loss of taxes.
- \* Speed in rationalization and consistency in amounts.
- \* Access to easy and accurate information by the citizens.
- \* Obtaining countrywide reliable information about the use of agricultural land.
- \* Directing the use of land according to the needs of the country.
- \* Determining the soil types of the country.
- \* Determining and conserving the public land.
- \* Re-handling the cadastral operations and removing the negative points.
- \* Avoiding duplicate mapping in civil-purpose mapping, easy access to map and cadastre information, achieving standard uniformity in mapping.
- \* Making the data updating possible.
- \* Improving the technical standards.
- \* Fast and accurate offering of all kinds of statistical data about the information in the system to the users and administrator.
- \* A rational use and planning of corporate resources and facilities.

### 3. APPLICATIONS OF PLOT STUDIES

In these studies PC ARC/INFO GIS software has been used. The software is a vector-based GIS and composed of two primary components, ARC and INFO. The former is used to store coordinate data and perform all operations on that type of data, and latter is a relational database management system which is used to store and perform operations on attributes, i.e. descriptive non-coordinate data.

The ARC/INFO GIS is built around a data model which is typical of many historic and current GIS. Here geographic data are organized using a both relational and a topological model. This approach facilitates handling of the two generic classes of spatial data; locational data describing the location and topology of points, line and area features; and attribute data describing the characteristics of these features.

This software is the most popular system available in Turkey hence advice and support on its use is available. It has a wide functionality for data input, storage, manipulation, analysis and display.

Amongst the main aims of the planned pilot projects were;

- ◆ Determine the methods and steps to follow in order to form a GIS in rural areas,
- ◆ Find out the probable problems that can be encountered during formation of such a project;
- ◆ Seek lasting solutions, to stress the importance and necessity of such a system by displaying the capabilities and operations of a GIS,

- ◆ Close inspection of reliability in obtaining a wide range of geographical analysis and products.

People and organizations examining GIS technology are initially attracted to it by the many applications and benefits it offers within their own profession, discipline or area expertise. There are three GIS capabilities which have major significance for people and organizations:

- The ability to share common database of geographic information which often leads to better cooperation and a vast reduction in redundancy and inconsistency.
- The ability to bring together unrelated data, using location as a method for building the relationships which can lead to interdisciplinary discoveries and cooperation at many levels.
- The ability to aggregate data into larger geographic units that are more useful for the large scale applications which can lead to far better understanding, cooperation and management of the operational units within an organization.

The aim of this studies is to show up the importance of the Geographic Information Systems (GIS) clarifying basic ad hoc aspects and to set up pilot projects on the design and implementation of a GIS. The hardware and software used ITU Civil Engineering Faculty for different applications are explained (Şeker and Altan, 1995).

Some of these applications are;

1. Environmental Information System,
2. Information System in Rural Areas,
3. Information System for ITU Ayazağa Campus,
4. Urban Information System for Public Works of Municipalities,

5. Information System about Air Pollution
6. Producing Data to an Information System used for GSM Communication by Digitizing the 1:250 000 scaled maps.

### 3.1. Environmental Information System

The objective of this study is to develop techniques for establishing an environmental information system and to explore its utility as an aid for evacuating water quality management in Porsuk River. Water quality management constitutes an integral part of research project on "River Basin Management for the Sakarya Basin". The project was designed in general, for major task to develop a better understanding of the water resources management and to explore the possibilities of integrated river basin management as the basis for the comprehensive, multi-purpose management of national water resources. Porsuk River water quality management studies is the first application within the context of the project. This study aims to upgrade the water quality of the Porsuk River for beneficial uses planned through the use of an information system abate environmental impact assessment (Arslan, 1993).

### 3.2. Information System In Rural Areas

In this study three different applications in the different parts of Turkey which can be seen in Figure 1. are performed to investigate the implementation of information systems in rural areas by using different kinds of data types in following phases (Seker, 1993, 1995).

- Determine the objectives,
- Creation of the Geographic Database,
- Performing query and analysis,
- Presentation of the results.

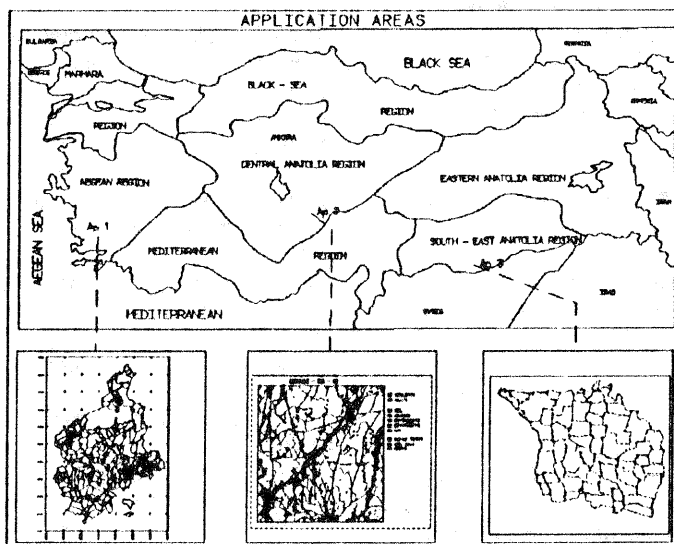


Figure 1. Application Areas.

First application is; collecting data from a conventional map by means of digitizing in a different media, by means of a software which is not a GIS, in the second application, digital data of the Harran Plain (Sanliurfa - Southwestern part of Turkey), which were obtained by private companies by means of photogrammetric techniques were used. These two applications, which were handled by using different types of data collecting techniques, a condition very common in countries of development phase like Turkey which should by overcome if a GIS project should be implemented, above the difficulty of handling this kind of data and given necessary hints for an establishment of a GIS-project. In the last application, a plot GIS project performed. The design and implementation of GIS basically named SAKBIS, has been realized in three phases. Data used to create database are manually digitized from the 9 maps scaled 1/2500 and 1/1000 belongs to Söke - Ağacli Village. The coverage are; Parcel, Build, Water, Way, Border, Hedge and Point. Later on different queries and analysis are performed and results were presented. One of the query example related to the building coverage can be seen in the Figure 1.

### 3.3. Information System for ITU Ayazaga Campus

Aim of this study is to show up the importance of the Geographic Information Systems (GIS) clarifying basic ad hoc aspects and to set up a pilot project on the design and implementation of a GIS, named as AKBIS (abbreviation of Turkish words "Ayazağa Kampüsü Bilgi Sistemi" which means "Information System of Ayazaga Campus of Istanbul Technical University), via the software package PC ARC/INFO.

This study is dedicated to the design and implementation of the GIS plot project AKBIS, containing the creation of the AKBIS Geographic Database and basic Spatial analyses and queries to produce reports and maps required. Having been added to this study, some AKBIS products obtain are demonstrated in the forms of hardcopies and soft copies.

As quoted before, the design and implementation of a GIS named AKBIS has been realized in two phases (Taştan, 1993).

### 3.4. Urban Information System for Public Works of Municipalities

Municipalities have great responsibilities in planning and in implementation of infrastructures that have gotten out of control due to high growth rate of cities, limited budgets and priority of political decisions over service considerations. All functions that contribute to the goals of the municipality must be reviewed to determine how a geographic information system can be used to assist to their improvement.

In this study, building activities, which are one of the urban information system, are modeled at sub municipality level in accordance with present building

and planning regulations and requirement of the city. The project is implemented to a chosen pilot area in Istanbul - Etiler using PC ARC/INFO . Public works in the city, and how they managed, and the problems associated with the implementation are determined. For this purpose, interviews with the organizations effective in the activities were conducted, further more reports, correspondence files, map sheets, form used, existing public regulations and rules, plans and related footnotes, municipality council and committee decisions were examined (Alkiş, 1993).

### 3.5. Information System about Air Pollution

Environmental problems take the interest only at the places where the problems increase in Turkey. Generally the interest helps only to determine the degree of the problem that is to say the pollution of a local area is tried to determine, sometimes master plans and projects are made about the prevention. However, the removal or the reduction of the pollution can to be obtained. The aim of this project for the removal and prevention of the pollution has to be to determine the approach has is to the subject. By this way the principles, concepts and working systematic for the solution of the problem are considered (Iydiker, 1995).

### 3.6. Producing Data to an Information System used for GSM Communication by Digitizing the 1:250000 Scaled Maps

This study has been performed to plan the GSM on the highways between Istanbul to Ankara by digitizing the 1:250 000 scaled maps. A five km wide strip has been digitized along the highway with 100 m contour lines and other map information. ARC Digitizing system of the PC ARC/INFO has been used and ARCEDIT and ARCPLLOT modules support this digitizing process. The information are stored in 16 different layers (Atan, et al, 1995).

## 4. RIGID PROBLEMS OF GIS APPLICATIONS IN TURKEY

A GIS which manages all geographic information using a database approach could have benefits for development in Turkey. Using the experiences gained from the plot projects the problems of introducing a GIS are;

### 4.1. Institutional problems

These are founded on the lack of the relationship between institutions. The bureaucracy experienced in the data exchange between institutions should be avoided and the joint use of data, personnel, software and hardware should be encouraged.

### 4.2. Current state of mapping

These are problems relating to areas to mapping. Some of the reasons are;

- Produced map information are disorganized,
- There is no archive for all produced maps,
- Duplication of mapping can not be prevented,
- Main geodetic networks can not be used for large scale mapping,
- There is no consistency between the maps,
- There are different regulations and rules to produce maps,
- There is no long term plan for the production of maps,

#### 4.3. Educational problems

These are encountered basically in the terminology of the technology and in showing the basic benefits of the map and land information. There is going to be an increasing gap between the need for qualified staff in agencies which have acquired a GIS and the ability of the educational system to provide them. Again this stems partly from the lack of central planning in the educational system and the level of autonomy enjoyed by most educational institutions.

#### 4.4. Technological problems

GIS is a highly attractive technology and suffers from the problems of all such technologies. It has repeatedly been wrongly sold as a solution in response to needs which were poorly defined or not defined at all, and to clients who did not really understand its capabilities or limitations. Many failures have resulted from the acquisition of the wrong type of system because of poor advice or lack of advice. The success of technology is in many ways dependent on the availability of good advice, through either public or private sectors (Şeker and Altan, 1995).

### 5. ENCOUNTERED PROBLEMS DURING THE PILOT PROJECTS

- One of the main problems encountered was having to work with poor quality, out dated sheet copies because of bureaucratic hindrances. Although the available sheets not being at same scale seemed to pose a problem in the beginning, this in effect was not a problem.
- The obtained data was not updated. Some of the parcel owners were registered to dead people because of inheritance problems.
- There is no data standards, for example used maps were in the different scales. Although the available sheets not being at same scale seemed to pose a problem in the beginning, this in effect is not a problem.
- One of the limitations of PC Arc/Info, is you can add only one attribute to the related items, whereas most of the real estate has been owned by more than one person.
- There are no elevations (contour lines) on the map, so it is not possible to obtain a three dimensional view. (Also the polygon points that can be used for

coordinate transformations from the geodetic nets do not have elevation values).

- The purposes of the institution and expectation from the land management are should clearly explained.
- The purposes of the institution, and expectation from the land management, should clearly be explained,
- The data model has not been criticized by the different group of the people, who produce maps.
- People who lives in the related real estate do not want to give true information so not to pay more tax.

### 6. CONCLUSIONS AND DISCUSSIONS

By means of this useful tool a number of benefits can be utilized. For example; reduces duplication of effort in order to reduce cost, increases efficiency in daily operations, increases management control, provides information for decision support and policy making and saves time, man power and time.

Accurate/available land information is the key to managing and processing developments in the rural areas of Turkey.

Due to lack of standardization, unnecessary data in the system, therefore unnecessary work will increase. The standards to be established, will not guarantee the efficient exchange of spatial data. Therefore, it is necessary to establish a central unit which will introduce the regulations for the purpose of allowing data exchange and assume tasks such as providing the system security.

It can be seen that the basic solution to prevent confusion in the map field is; the implementation of both "an information system with definite and determinate purposes" and "an institution responsible for all of the map and cadastre services in the country".

Goals have to be predicted according to the sources. Many failures can be occurred because of the inadequate resources and exaggerated goals

A primary benefit of a GIS lies in the new capabilities which it introduces, rather than in the ways in which it allows old tasks to be done more efficiently or more cheaply. A GIS requires strong and consistent motivation on the part of all users.

A successful program in GIS at the national scale would seem to need the coordination of some efforts among are; a set of valid application, set of active vendors, research and development and a substantial source of expertise which is independent of vendors and acquiring agencies.

The educational sector, which will provide the trained personnel to run systems, conduct basic research, staff the vendors and train future generations.

- ♦ As far as possible, data entries should be carried out in GIS media. Geographical data application results obtained from the other media have been found

rather .It has been that in the application of geographical data obtained from other media have been found rather dissatisfying. However, if the digital maps of the area to be studied are available, it should be preferred to use these maps instead of redigitizing to obtain data, in order to save time, money and personnel.

- ◆ To spend out the GIS to countrywide is highly necessary and inevitable. This should be achieved with the contribution of all concerned individuals and institution.
- ◆ The difference between mapping systems and GIS should be clearly established. Institutions and bodies forming GIS ,have to be very careful to select the software which is most functional and independent from the hardware employed.
- ◆ Continuing efforts should be made to faster cooperating between government, industry and universities. The red tape(bureaucracy) experienced in the data exchange among the sectors must be avoided as much as possible .
- ◆ More support needs to be provided for research at the universities. Sources of funds must be created for technology transfer.

The last decade has seen a growing awareness and concern regarding the effect of the local and global environment on human health and nature. In the face of this concern ,there is an increasing need for accurate and reliable information to underpin epidemiological research. GIS offer powerful instruments for the construction of environment model , but to be widely useful they must make maximum use of the limited and disparate data available on both environmental conditions and health come. In Turkey, these data are not available in every region therefore, we have to establish stations which collects these data in certain time intervals .

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