RECENT DEVELOPMENTS ON THE ISTANBUL DISASTER INFORMATION SYSTEM PROJECT

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Abstract

Although Geographic Information Systems (GIS) have been used for urban administration and planning, a disaster management system with a data structure and standardization to provide every need of a city has never been perfected for Turkey yet. This study will set an example as the first complete disaster management system for Turkey, and it is supported by the Turkish Prime Ministry State Planning Organization and Istanbul Metropolitan Municipality. A GIS-based information and management support system also with its defined standards for a selected pilot region (Zeytinburnu) in Istanbul is being implemented. The system will be used for planning and applying emergency preparations, disaster management and loss assessment activities in case of a disaster. And at regular times, it will also act as a decision support system in service of central and local authorities.

Along with the implementation of the mentioned system, spatial data standards (TABIS Standards) for emergency management systems for Turkey will also be set. So, harmony and coordination between authorities are aimed to be assisted as well as the foreseen improvements in the TABIS Standards as the project advances. Following the determination of the data source organizations for the collection of data and conclusion of the conceptual and physical designs of the system in the project, data gathered from various sources are inspected in detail and integrated into the project database. The next task to be done is to create analysis tools to serve decision makers according to the emergency plans of the Governorship of Istanbul, in compliance with the organizational regulations set for emergency management in Turkey.

Introduction

The big disasters which affect people all over the world have shown the importance of disaster management. Disasters which people faced can be deadly and they can be resulted in costly lessons. In all aspect of disaster management, information tools such as geospatial have the potential to contibute to the saving of lives, the limitation of damage, and the reduction in the costs to society of dealing with disasters. Disaster managers who know where impacts are greatest, where critical assets are stored, or where infrastructure is likely to be damaged are able manage the disaster in timely and effective manner (NRC, 2007).

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US National Governor's Association developed an all-hazard or comprehensive emergency management model in the early 1970s. With this approach, emergency management activities divided into four functional classes: mitigation, preparedness, response, and recovery.While mitigation and preparedness are pre-emergency activities, response and recovery are considered during and post-emergency activities, respectively. Mitigation deals with emergencies to prevent or reduce losses. Preparedness is planning and enhancing response activities in an emergency. Response begins immediately following an event and examples include mass evacuation, providing medical care, search and rescue, firefighting, containing the hazard, and protecting property and the environment. Recovery continues after the event to restore lifelines (Waugh, 2000).

Geospatial data and tools should be an essential part of all aspects of disaster management life cycle. A GIS, which is one of the geospatial tools, can be used for consequence assessment and developing a disaster response plan by integrating data such as school locations, neighborhoods, key infrastructures, and disaster personnel. GIS can help disaster managers for different scenarios and types of events and create the action plans in deploying the disaster personnel. GIS and its extensions can also help manage data in real-time, allowing disaster managers to make important and proper decisions. GIS also facilitates all of the requirements of disaster planning procedure by allowing decision makers to view appropriate combinations of spatial data (ESRI, 2001).

Disasters, especially earthquakes, affect Turkey and continue affecting it in the near future. The 1999 earthquakes in Turkey were caused of many casualties, injuries, damages and economic losses. The city of Istanbul in Turkey, with the high expectation of likely earthquake, could be affected from it in the near future according to researchers. Therefore, Turkish Ministry of Internal Affairs and Istanbul Technical University initiated a project on May 2001, called Turkey Disaster Information System (TABIS) Standards, to prepare GIS standards based on disaster management and these standards are declared to the central and local governors by the Turkish Ministry of Internal Affairs.

Aim of the study is to apply the proposed GIS-based information and management support system standards model for a selected pilot region in Istanbul in order to set an example for the succeeding applications in the country to be implemented in the future. The system, using modern satellite technologies and information systems, will be used especially for planning and applying emergency preparations, disaster management and loss assessment activities in case of a disaster and will also function as a decision support system for central or local authorities (ministries, governorships, municipalities, etc.) at other times. As a result of the study, an information system model is planned to be built that will support the authorities on their decisions by assisting the harmony and coordination in disaster planning between Istanbul, local municipalities and neighboring cities and by improving the TABIS standards (Unen et al, 2007; Sahin et al, 2006).

So far, data source organizations for the collection of data are determined and preliminary design of the system is done in the project. After the inspection and integration of the data gathered from different sources, the emergency management tools to be used in the system will be determined (DPT, 2007)

With the establishment of the system, the impact to the national economy of Turkey will be minimized because of a disaster and the recovery operations after the disaster that will take place in a metropolitan city like Istanbul.

Background of the Istanbul Disaster Information System Project

This high expectation of Istanbul Earthquake initiated some important agreements about disaster management between Turkey and the United States of America. The first agreement was between Federal Emergency Management Agency (FEMA-USA) and Istanbul Technical University (ITU) in 2000. Next agreement was signed between Istanbul Technical University

and the Ministry of Interior of Turkey in 2001 for four projects about Emergency Management. These 4 projects were;

1. Training on Emergency Management
2. Development of Turkish Fire Brigades
3. Development of Emergency Management System
4. GIS Standards Based on Emergency Management (TABIS)

Istanbul Disaster Information System Project is based on TABIS and it will be an implementation of it. The exact name of the TABIS is "Development of a National Database Using GIS and Remote Sensing System and Standards for a Disaster Management Decision Support System" (Karaman and Sahin, 2004; Karaman et al 2006)

TABIS Object Catalog (TABIS-OK)

The base of the Turkey Disaster Information System is Basic Spatial Database. The reference model of the TABIS system is based on two components. These components are (Karaman and Sahin, 2005);

- Digital Spatial Model (SMM) and
- Digital Disaster Model (SAFM)

Both digital models form the space by separating it to its components based on object oriented basis. This process is called as atomizing of the space in the database modeling. The atomized data of the both digital models prepared as an object catalog. These catalogs are (Karaman and Sahin, 2005);

- TABIS-Basic Topographic-Spatial Object Domains Catalog (TABIS-TOK)
- TABIS-Disaster Management Object Domains Catalog (TABIS-AOK)

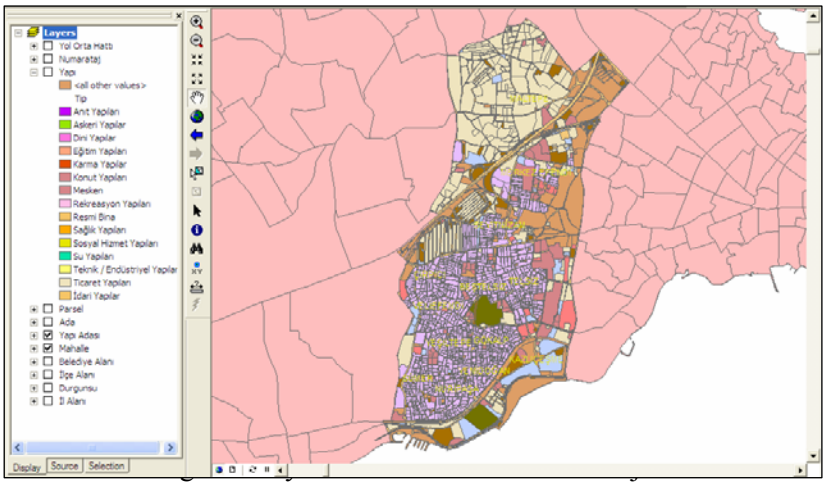
System Architecture of The Project

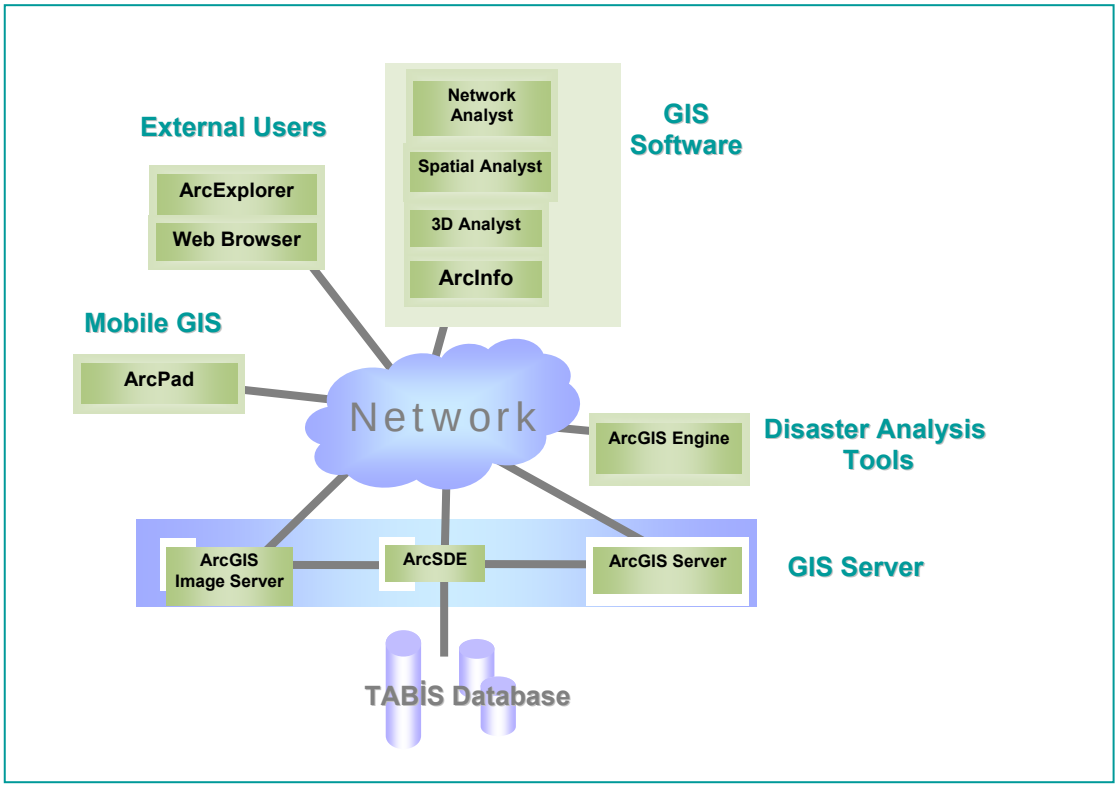
The project is being implemented by using ArcGIS Platform and its extensions. Database design phase for TABIS is finished and updated according to disaster plans available. Database is being served with ArcSDE platform (Fig. 1).

Data Preparation for the Project

First, project data are analysed and then spatial and non-spatial data inventory are investigated in the scope of the project. According to the selected pilot region, data such as district borders, blocks, parcels and building lots and other non-spatial data are obtained and entered into the system (Fig. 2.).

Figure 2. Project Map with selected pilot region





In the following sub-sections brief information about recent developments are given in the context of the project.

Duration of The Project

The Istanbul Disaster Information System Project was started in 2006 and it is planned to be finished in 2009.

Scope of The Project

- Southern banks of Istanbul (stated as one of the most earthquake susceptible regions in Turkey) are determined as the study area of the project.
- Zeytinburnu district is selected as the pilot region for the study because of the availability of high quality, high detail and most up-to-date data.

Value of The Project

- With the establishment of the project spatial disaster information systems to be developed nationwide will be carried on according to standards and can be related to other similar information systems.
- System will enable the decision makers to direct the response teams and logistic supports in the quickest and most accurate way.
- System will also be used for planning the response actions to possible disaster scenarios.
- A decision support system contributing to the minimization of losses due to the disaster by determining how much aid will be provided to what unit in the recovery phase.

In addition to these tasks, decision makers should have the necessary information in order to answer the following questions:

- What kind of help?
- In what amount?

- To where?
- In the shortest possible time.
- How?
- What kinds of personnel are needed? (firefighters, doctors, nurses, military, police etc.)

Finished and ongoing works

Finished and ongoing tasks in the project so far are:

- Determination of aim and scope
- Determination of the study area
- Determination of the data sharing levels. [users, web users, group and user privileges]
- Determination of the infrastructure:
    - Geodetic structure
    - Hardware
    - Software
    - Networking
    - Security
    - Back-up
    - Storage
- Job definition and distribution
- Determination of the staff requirements
- Determination of the strategic partner firm
- Determination of the cooperating organizations and the key contact people from those organizations
- Hardware installation
- Determination of the priorities in case of a disaster
- Determination of the attributes and visualizations needed
- Preparation of the meta data. (it is in progress)
- Protocols with relevant organizations for data exchange
- Defining data transformation models (XML, GML, SVG…) (it is in progress)
- Defining GIS based information to be needed by strategic, tactical or operational decision makers
- Defining the methods and systems for data exchange. (it is in progress)
- Defining methods of data updating and versioning for temporal changes. (it is in progress)
- Data Collection
- Data Input (it is in progress and)
- Data Verification (in progress)
- Defining the queries for the decision support systems. (it is in progress)
- Risk analysis

- Preparation of disaster management plans according to disaster scenarios.

Conclusion

In the Istanbul Disaster Information Systems Project, the completed tasks so far are the infrastructure such as servers and computers, determination of the spatial data, sources, formats, and references, designation of the system proposed, acquisition of the spatial and non-spatial data for pilot region selected, process of database design, analysis and comparision of database models. The next task of the project is to create analysis tools to help decision makers taking into consideration the disaster plans of the Governorship of Istanbul. With the help of the study, a comprehensive information model will be presented and authorities will be supported on their decisions by improving the TABIS standards. Thus, the system will be used as a decision support system by evaluating the different scenarios in efficient manner. In this case, the expected Istanbul earthquake will be better targeted and managed, and additional lives may be saved.

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He is a professor of Surveying in the Faculty of Civil Engineering, Istanbul Technical University. He has been the head of Surveying Technique Division since September 2004. He was born in Pazar, a town of Rize where he finished his primary, secondary and high schools.

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