

## CURRENT STATUS OF ISTANBUL DISASTER INFORMATION SYSTEM PROJECT

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**Keywords:** GIS, Disaster Management, TABIS, Standards

### Abstract

*After the two devastating earthquakes in the Marmara Region of Turkey in August and September of 1999, several disaster management agencies were established and several activities have begun to implement. For example, in Istanbul, many studies have been initiated on disaster management. Important agreements between Turkey and United States of America were signed after these catastrophies. The first agreement, “A Cooperative Hazard Impact-reduction Effort via Education- ACHIEVE” was signed with Federal Emergency Management Agency (FEMA-USA) and Istanbul Technical University (ITU) in 2000. The second agreement was signed between ITU and Ministry of Interior of Turkey in 2001. Turkey Disaster Information System (TABIS) is one of the projects signed between ITU and Ministry of Interior of Turkey. The exact name of this project is “Development of a National Database Using GIS and Remote Sensing System and Standards for a Disaster Management Decision Support System”. The aim of the project was to prepare standards with experts in different disciplines utilising related international standards and Turkish experiences. Istanbul Disaster Information System is based on TABIS standards and its aim is to apply the proposed GIS-based information and management support system standards model for a selected part of Istanbul (Zeytinburnu District) in order to set an example for the succeeding applications in the country to be implemented in the future.*

*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 comparison 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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## **Introduction**

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; Sahin et al, 2008).

## **System Features of Istanbul Disaster Information System Project**

System will provide planning and preparedness for disasters and will help to orientate the response and logistic support faster and more accurate than before. After a disaster, system will act as a decision support unit for the mitigation efforts. The system will inform the decision makers about:

- What kind of and how much help is needed from where,
- From where can this help be provided in the shortest time,
- Which specifications are needed for the staff to be charged.

Optimization and planning of the response will reduce the disaster loss and response and recovery costs. Thus, the system will minimize the economic catastrophe likely to follow the disaster for Istanbul. Also, announcement of the emergency plans to public will minimize the panic state during and after the disaster. This will also enable the participation with public. The system will provide current, correct, standardized and consistent data for its users and prevent the complexity of transmitting of unnecessary information.

Steps proposed at starting phases related to the study were: Configuration of the spatial and non-spatial data related to emergency management, formation of the principles of the institutional structure to keep the system up-to-date, formation of the system and determination of the hardware and software to be used, acquisition of different types of data according to the prescribed scales, determination of the integration of the data coming from different sources, determination of the presentation formats, formation of access and distribution of the data. As can be seen, the study requires a multi-dimensional expertise, generating solutions for the tasks in multiple phases (Şahin et.al, 2006; Karaman et al, 2006).

In order to achieve all of these planning tasks, emergency services are determined and they are planned to support as a decision support services in the project. These services are:

### -Temporal Housing Services

- Potential tent areas
- Inventory
- layout plans, water services, sewer systems, phone and power lines.

- determination of the school, sports hall, dormitory and public facilities as temporal housing.

Some query and analysis are determined according to all of these information:

- Querying the temporal housing areas
- Querying the temporal housing areas by capacity
- Querying the temporal tent areas.

#### Logistics Coordination Services

- Logistics storing centers
- Logistics distribution centers

Some query and analysis are determined according to all of these information:

- Querying the logistics storing centers
- Querying the loading areas
- Querying the heliports

#### Health Services

- Inventory of the Health Facilities
- Inventory of the ambulances
- Mobile hospital areas
- First aid areas
- Planning tasks for health personnel

Some query and analysis are determined according to all of these information:

- Querying the mobile surgical hospitals
- Querying the ambulance deployment areas
- Querying health and first aid coordination centers
- Querying the pharmacies
- Querying health organizations
- Querying properties of health organizations.

#### Food supply services

- Meet the food requirements in daily basis
- Potable water inventory
- Querying the water distributing areas

#### Search and Rescue Services

- Inventory of search and rescue personnel
- Inventory of equipment used during search and rescue operations
- Distribution maps for search, rescue and supporting teams

Some query and analysis are determined according to all of these information:

- Querying buildings by their attributes
- Querying buildings by their properties

#### Fire Response Services

- Inventory of fire response personnel
- Inventory of equipment used during fire response

Some query and analysis are determined according to all of these information:

- Querying gas stations
- Analyzing the impact area of gas stations
- Querying factories

#### Debris Removal Services

- Inventory of public and private heavy construction vehicles
- Debris dumping area

Damage Assessment Services

- Inventory of assigned personnel for damage assessment
- Carrying out risk analysis of major industrial facilities

Transportation Services

- Preparing disaster transportation plans

Some query and analysis are determined according to all of these information:

- Querying roads by their attributes
- Querying roads by their functional types
- Querying roads by their properties
- Querying ports
- Querying airports
- Querying closed roads due to weather conditions
- Querying closed roads due to icing probability
- Querying alternative routes due to weather conditions

Infrastructure Services

- Inventory of electricity, water, drain and natural gas facilities
- Inventory of portable facilities
- Inventory of assigned personnel during disaster
- maps for distribution areas of assigned personnel during disaster

Some query and analysis are determined according to all of these information:

- Querying transformer centers
- Querying power transmission lines
- Querying streams

Communication and security Services

- Disaster Management Centers

In this project, some applications are developed by taken into consideration with above service requirements. Application software has also some capabilities below:

- Applications software is working on TABIS-VT (Turkey Disaster Information System Database) which has been prepared and used in project.
- Applications software is working on desktop GIS software (ArcGIS Desktop).
- Applications software is developed by using ArcObjects' application development library considering to GIS software used in Disaster Management Center of Governorship.
- Software can run on GIS servers (ArcGIS Server) including TABIS VT.
- Software is able to provide direct access to TABIS VT in GIS servers and it is able to read and write data in TABIS VT without any conversion operation.
- Web components of application software can be monitored and used by clients having web browsers like Internet explorer, Mozilla Firefox or Safari without installing any additional software to their computers.
- Disaster mapping application is developed and this estimation and mapping processes can be carried out on websites which are published by both desktop GIS softwares (ArcGIS Desktop) and GIS servers (ArcGIS Server).
- Users are able to login the system by typing user name and password. These user names and passwords should be confidently stored. User rights related to system are administrated by a management and authorization application. In the system use-cases are described for the TABIS Project. 'Login the system' and 'creating the user' use cases can be seen in Table1 and Table2.
- Disaster risk and accessibility analysis can be performed in application. These analysis processes can be carried out on websites which are published by both desktop GIS softwares (ArcGIS Desktop) and GIS servers (ArcGIS Server).

- Disaster impact maps can be produced by this application in order to determine damage during disaster. These operations can be carried out on websites which are published by both desktop GIS softwares (ArcGIS Desktop) and GIS servers (ArcGIS Server).

Table1. Definition of Use Case

Definition of Use Case TABIS Project	
Use Case	(U1) Login the System
Group	Authorization
Summary	System administrators and group users must login system by typing user name and password.
Actors	System administrator and group users
Prerequisite	Requirement : (G1)

Table2. Definition of Use Case (Creating User)

Definition of Use Case TABIS Project	
Use Case	(U6) Creating User
Group	Authorization
Summary	System administrators are able to add the new user.
Actors	System administrator
Prerequisite	Requirement : (G1,G2) Use Case : (U1)

- Queries for determining infrastructures and critical structures which are heavily damaged during disaster can be performed in application.
- A mapping system is developed for giving useful information in debris removal works in application.
- A mapping system is developed to coordinate search and rescue works.
- An application is developed for performing the analysis for determining socio-economic situation of disaster through the data that will be added to TABIS VT.
- In addition to implemented works above, application interfaces for data entry from disaster management centers are designed for users who can make data updates by remote connection.
- Applications software provides access to disaster plans in system with both local and remote network connections.

- The outputs for all of the queries are produced both in graphic and text format.

### **Ongoing Works in Istanbul Disaster Information System Project**

- Software updates are regularly made for improving GIS server capabilities for the project.
- Flood plains and basins will be analysed by taken into consideration the meteorological parameters.
- The completion of the data which are needed for the pilot region district (Zeytinburnu) will be insured.
- Because of the lack of alternative solutions so far, the data needed for the ISTABIS database has been integrated to system benefiting from various data processes. However, data integration and acquisition should be made depending on the GIS guide of the Internal Affairs and GIS services provided by IMM GIS Unit. For that reason, GIS services and spatial data matching will be made available.
- Although TABIS data catalogue presents various analysis types for different disaster situations, it may be required for reviewing and revising the disaster plans which are developed for specific purposes.
- Some works should be implemented with the integration of probabilistic models such as HAZTurk Project especially for the earthquake risk estimation.
- In order to provide the interaction between all end-users and developers in Turkey there will be made an international workshop and project outcomes and experiences will be discussed.

### **Conclusion**

By the completion of the project, every kind of national information system studies will be constituted according to defined standards and will be able to relate the national information systems to the system that is planned to be developed. The aim is to unite all independent studies and to enable the exchange and management of the valuable data for disaster management.

With the help of the study, a comprehensive spatial 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.

### **Acknowledgement**

We would like to thank to the State Planning Department of Turkey for financial support of the project.

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