Disaster and Emergency Management Activities in Turkey

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SUMMARY

After the two devastating earthquakes in the Marmara Region of Turkey in August and September of 1999, several disaster and emergency management agencies have been established and several activities have been carried out. This paper summarizes those activities in Turkey.

Management of disasters or emergency situations is to conduct preparedness, mitigation, response and recovery activities in a cycle to save life first and then save property. All the stages of this cycle give outputs according to the inputs entered. The quality and the effectiveness of the output acquired from the cycle depend on the quality and detail of the input given to system.

In Turkey, very few studies on data collection have been accomplished. For this reason the input data count and the quality are not enough to get the desired output information from disaster and emergency management cycles. Another issue on this is the disconnected studies for these kinds of activities. For example, in Istanbul many studies have been initiated on disaster management. However, the completed ones are not able to work together or use each others data. This inharmoniousness also affects those systems and the decision makers who use those systems. Istanbul has many institutions and agencies for disaster management. Those centers work separate from each other. This causes the creation of the non-unique systems works without coordination. Without managing the data in coordination, there is no easy way to get useful information from that data.

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1. INTRODUCTION

Because of the economic hearth of Turkey pulse in the Marmara Region, this region is highly vulnerable to natural and man made disasters especially earthquakes. The 1999 earthquakes show the importance of being prepared to natural disasters. This awareness has been a trigger for the beginning of the activities about disaster and emergency management in Turkey.

In 1999, August 17 and November 12 earthquakes caused more than 20000 people's life and approximately 5 billion US $ (Fig 1). The earthquakes also ruptured about 160 km of the northern branch of the North Anatolian Fault (NAF) which increased the probability of a major event (M=7.6) with and about 50% at the Marmara segments of the NAF in the next century (Yavasoglu et. al, 2005).

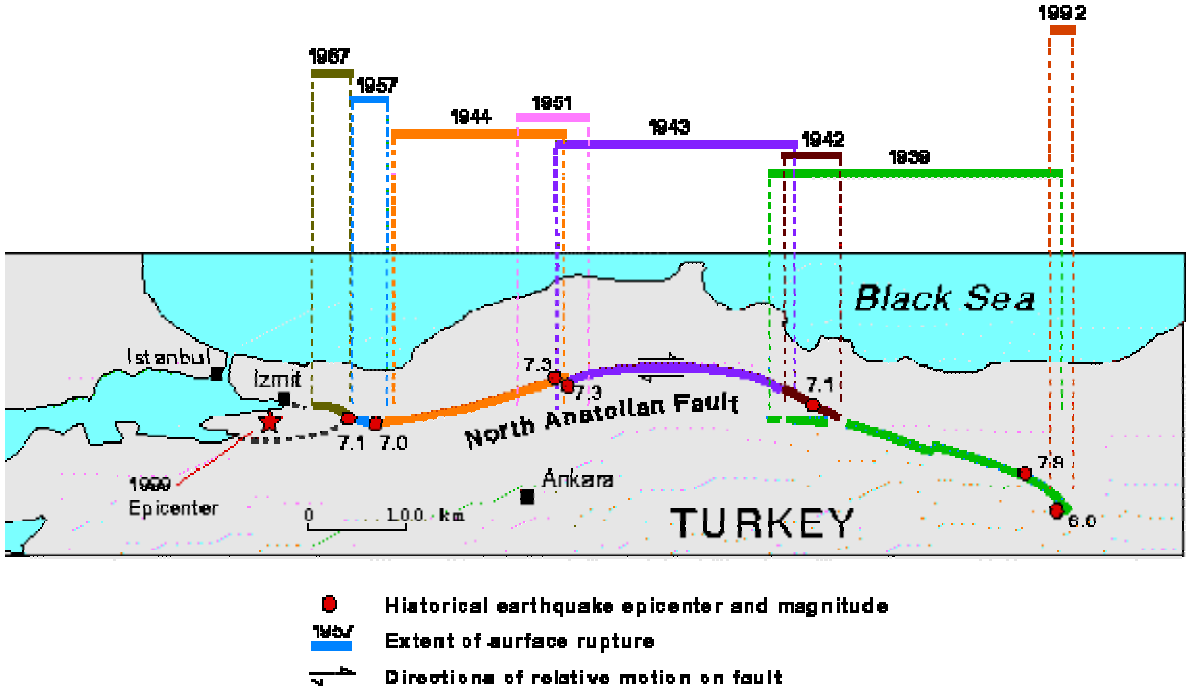

Fig.1. Locations of the 1999 earthquake and historic earthquakes on the NAF (USGS)

This increase on the probability of an Istanbul Earthquake has initiated some important agreements about hazard reduction 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. The name of the agreement is "A Cooperative Hazard Impact-reduction Effort via Education - ACHIEVE". 31 ITU staff members were

educated and trained in the contents of the project for 7 months by the FEMA. After the course completed 14 FEMA Books were translated into Turkish.
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)

2. DEVELOPMENT OF THE GIS STANDARDS (TABIS)

Turkey Disaster Information System (TABIS) is developed in the scope of the fourth project, "Development of a National Database Using GIS and Remote Sensing System and Standards for a Disaster Management Decision Support System" at the Istanbul Technical University. (Karaman and Sahin, 2004)

The first step of the project was to prepare standards with experts in different disciplines utilising related international standards and Turkish experiences. The duration of the first step was about eight months. Then, in the second step, two workshops were organised in order to discuss the outcomes of the standards. The first workshop took place in April 2002 with GIS software & hardware companies who work in Turkey. Then the second workshop was carried out in June 2002 with state and local authorities who performed GIS in their units. The standards were modified with the feedbacks from these two workshops. In September 2002, a symposium, called "International Symposium on GIS" was organised in Istanbul sponsored by the International Federation of Surveyors (FIG) in order to further discuss the standards on an international platform. Finally, the TABIS (**T**ürkiye **A**fet **Bi**lgi **S**istemi – Turkish Disaster Information System) was finalised and submitted to the Ministry of Interior of Turkey including four books: Manager Report, Fundamentals, Object Catalogue-Volume 1, and Object Catalogue-Volume 2 in November 2002. Then the Ministry ordered the project outcomes to be used for any GIS application in Turkey.

2.1 Types of Standards in TABIS

The concept, "standard" used in TABIS has more than one meaning in GIS as following:

- The standards regarding the spatial reference or the standards related to the modelling of the spatial. The concept, "spatial" contains urban and rural zones.
- Similarly, modelling of data with spatial & non-spatial reference related to the multi directional management of the earthquakes.
- Principles related to the institutional modelling for maintenance of the system.
- Examining of existing data for integrating into the system on the base of their location, unit, concept, and format and up-to-date.
- Software standards which will be used during and after the establishment of the system.

- Hardware which will be used during and after the establishment of the system.
- Gaining standards of meta data with different characteristics (geometric, attribute and meta) for different scales
- Rules determining the integration of the data obtained from different sources.
- Data exchange standards
- Standards related to the Cartographic products (maps) which will be produced by geometric data infrastructure with medium and large scales.
- Standards related to the data presentation (e.g. cartographic or other documents)
- Standards related to obtaining and marketing of the data
- Meta data standards.

2.2 TABIS Object Catalog (TABIS-OK)

The base of the Turkey Disaster Information System is Basic Spatial Database. The reference model of the TABIS system comes into existence from two vectoral 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 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)

The aim of the TABIS-TOK is the modeling of the concrete objects which are the characteristic parts of the topography of the region where the system will be constructed. Parallel to this aim, the components of the TABIS-TOK are named as “Basic Topographic-Spatial Object Domains”. TABIS-TOK is also has the quality of being a data standard for the country wide public and private institutions who want to set up a detailed spatial information system for their own purposes. Because of the object modeling, object definitions, attribute definitions, data types for the attributes and attribute values can be matched with analog topographic map contents, a disaster management based GIS which is constituted convenient to the TABIS-TOK model can work totally harmoniously with the other GISs of the same region. Even if the aims of the systems are different. Modeling approach of the TABIS-OK is given below under the name of TABIS Reference Model in Figure 2. (Karaman and Sahin, 2005).

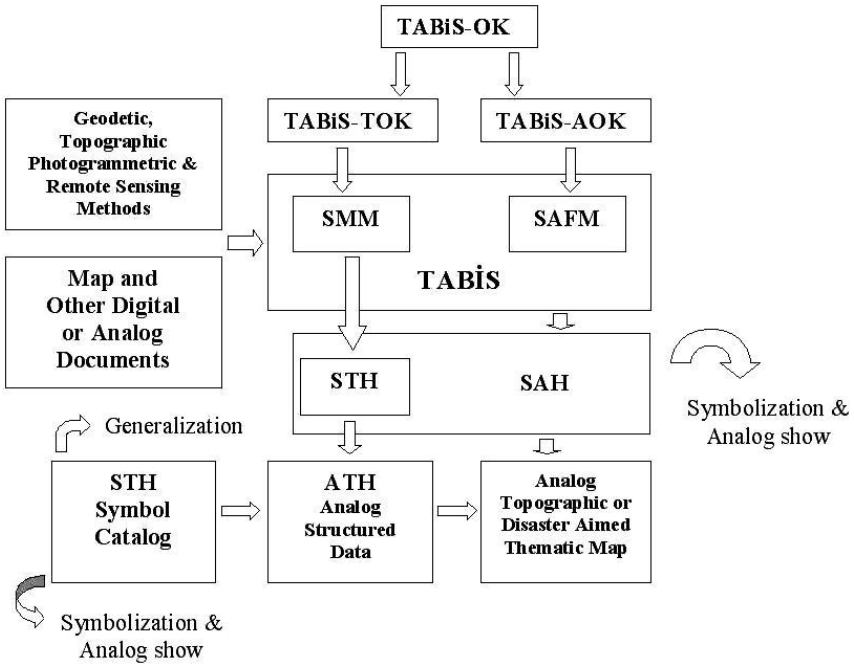

Fig.2. TABIS Reference Model.

3. ISTANBUL DISASTER INFORMATION SYSTEM

Another project for Istanbul is the application of the TABIS system for the city of Istanbul. The system will provide the user association to reach the current, correct, and consistent data. The aim of the project is to create an information system which has the capability to help the decision makers, ministries, governments and municipalities to conduct the planning, mitigation, response and recovery phases of the emergency management, by using modern satellite techniques and information systems, before, during and after the disaster occurs. This project will be an application for the city of Istanbul for an example to GIS based information and management system standard for the whole similar applications in Turkey. In this study, the southern costs of the Istanbul City will be taken into consideration because of the scientific reports which were published on this matter. All the scientific reports announce that the most risky areas of Istanbul are the southern costs of the metropolitan city (Sahin et.al, 2006). The main processes that will take most of the attention on this study are;

- Studies for modeling the space
- Configuring the data (whether spatially referenced or not) related to disaster management
- Creating the principles for institutional structuring to keep the system up to date
- Installing the system and determining the software and hardware for service
- Acquiring the different characteristic data (geometric, attribute, meta) for different scale
- Determining the integration way of data which were acquired from different sources

- Determining the presentation standard of data (cartographic of text document)
- Creating the communication and distribution ways of data.

This system will be supported by the current satellite technologies such as GPS and remote sensing and public improvement, cadastre, infrastructure, ground and superstructure and population data. Those data will have very detailed attributes for the reliable use in analysis, planning, decision support and response operations. Thus, during a potential disaster, the first aim of the emergency and disaster management and also the mentioned system, reducing the number of the casualties will be provided, and after that the loss of goods and loss of the country's economy will be minimized (Sahin et. al, 2006).

3.1 Proposed System Features

The system will show the following:

- What kind of and how much help is needed from a disaster region?
- Where can this help be obtained in a required time?
- Which kind of specifications are needed for the staff that will be in charge?

Parameters to be applied in the proposed study are: studies related to the spatial reference of the geographic information system, 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 prescibred 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 it can be understood from the listing, the subject requires a multi-dimensional expertise. It can't be possible to generate solutions to the listed tasks at a single phase (Sahin et. al, 2006).

This kind of a system helps to convey the response to the true place and to make the recovery phase less expensive. This case study is created based on Turkish Disaster Information System (TABIS).

4. ISTANBUL SEISMIC RISK MITIGATION & EMERGENCY PREPAREDNESS PROJECT (ISMEP)

The proposed project will initiate a process that aims at transforming Istanbul in the next 10-20 years into a city resilient to major earthquake. The overall goal of the proposed project is to save lives and reduce the social, economic and financial impacts in the event of future earthquakes. The specific objective of the project is to improve the city of Istanbul's preparedness for a potential earthquake through enhancing the institutional and technical capacity for disaster management and emergency response, strengthening critical public facilities for earthquake resistance, and supporting measures for better enforcement of building codes and land use plans (Sahin, 2006).

4.1 Components of ISMEP

4.1.1 Component A: Enhancing Emergency Preparedness

This component will enhance the effectiveness and capacity of the provincial and municipal public safety organizations in Istanbul to prepare for, respond to and recover from significant emergencies, especially those arising from earthquakes.

4.1.2 Component B: Seismic Risk Mitigation for Public Facilities

This component will reduce the risk of future earthquake damage to critical facilities in order to save lives and ensure their continued functioning in the event of an earthquake, through retrofitting of hospitals, schools and other priority public facilities.

4.1.3 Component C: Enforcement of Building Codes

This component will support innovative approaches to better enforcement of building code and compliance with land use plans.

4.1.4 Component D: Project Management

This component will support the Istanbul Provincial Administration to implement the project in efficient and transparent manner, and build the institutional capacity to sustain the implementation of Seismic Risk Mitigation and Preparedness program beyond the life of the project (Sahin, 2006).

4.2 Status of ISMEP

The following feasibility studies were initiated last year.

- Emergency Communication systems
- Disaster Management Information Systems
- Improvement of Emergency Response Capability
- Pilot Project for Strengthening Public Buildings (39 schools, 12 University Hospitals, 1 Student Dormitory, 2 Search & Rescue Buildings)
- Bakırköy Province Pilot Project for Strengthening Residences (350 buildings)
- Social Tendency Survey for Residence Strengthening (Sahin, 2006).

By the end of 2006, the application projects of the above feasibility studies are planned to be initiated.

5. INSTALLATION OF DISASTER MANAGEMENT AND METEOROLOGICAL EARLY WARNING SYSTEM IN RIZE PROVINCE AND URBAN INFORMATION SYSTEM IN RIZE CITY (RIZE ABMES-KBS)

Another project based on TABIS is Rize ABMES-KBS which is Installation of Disaster Management and Meteorological Early Warning System in Rize Province and Urban Information System in Rize City.

In this study, a new system will be established using Geographic information systems, remote sensing and meteorological early warning system in order to minimize the impact, loss of life, and loss of property against the disasters that will affect Rize city and provincial area. The project will be executed in three stages and these are;

- Design of a Municipality Information System for Rize city centre,
- Design of a Disaster Management Information System for Rize province,
- Establishment of a Meteorological early warning System for whole Rize city.

With the realization of the study, a system which can be used for disaster management, loss estimation and planning and application of emergency response will be available. Also, a decision-support system functioning for governmental and local authorities will be ready. This system will be a GIS based information and management system standard model and employed for Rize; also, it will be a prototype for Turkey. This approach has not been utilized in Turkey yet. Application of the project is demanded and expected by the local and governmental authorities because it will include the basic standards disseminated in Turkey Disaster Management Information System (TABIS) which is first and unique in Turkey. All of the mentioned stuff illustrate that the project will have sustainable and permanent usage.

6. DEVELOPMENT OF AN EARTHQUAKE LOSS ESTIMATION TOOL

The final activity for Turkey is the designing HAZTURK (Hazards Turkey) program nationwide to mitigate the long term effects of the natural disasters on human life at social and economic areas. The designing HAZTURK program will help on natural risk management, program development, development of the current lifelines of Turkey according to the seismic hazards, and designing more stable economy in addition to development and testing of methods for hazard characterization.

The proposed tool will support;

- Decision support for disaster mitigation: the evaluation of alternative scenarios for land use changes, building upgrades, and infrastructure improvements.
- Response, recovery and redeployment following disasters: determining which areas need help more and which areas are the most efficient the help.
- Planning for response and recovery efforts before disasters strike: fire, rescue, and health care needs, resources and lifelines.

– Finding new research areas: characterizing earthquakes, defining building fragilities, and improving data sets (Sahin and Karaman, 2006).

6.1 Key Objectives of the Tool

The key objectives for the HAZTURK are to:

– Develop an earthquake hazard characterization model for Turkey based on HAZUS.
– Create a comprehensive Turkish inventory database for loss estimation.
– Develop vulnerability functions for infrastructure at risk to supplement those in HAZUS.
– Develop parameters for casualties, shelter needs and economic loss that reflect conditions in Turkey.
– Provide improved near real time loss assessment capability based on Turkish information resources.
– Provide software that takes full advantage of state-of-the-art GIS platforms and internet capability.
– Provide user-friendly computer interface and support materials suitable for a wide variety of users in Turkey including emergency managers, scientific investigators and decision makers (Sahin and Karaman, 2006).

6.2 Project Workflow

To make the project realised, an international workshop called "1st International Workshop on An Earthquake Loss Estimation Program for Turkey" was carried out on December 1-2, 2005, with sponsorship of the following organisations:

- Technical & Scientific Research Council of Turkey
- Istanbul Technical University
- National Institute of Building Sciences, USA
- MAE Center, University of Illinois, USA
- Istanbul Gorvernor
- Istanbul Metropolitan Municipality
- Turkish Emergency Management Agency
- Ministry of Public Works & Settlements, General Directorate of Disaster Affairs of Turkey
- Turkish Earthquake Foundation
- The International Emergency Management Society

In the first day, presentations were accomplished. The second day was for the discussions on Risk Assessment Tool Development.

The purpose of the second day was to open a dialogue between the Turkish and US representatives concerning the kind of risk assessment tool desired and its characteristics.

How some of the methodology issues that affect tool development wiil be approached. What kind of project will be needed to realize tools development and how we can work together to achieve this objective.

7. CONCLUSION

There are several activities which have been carried out in Turkey since especially 1999 when the two devastating earthquakes occured that killed more than 20000 people and affected millions of people in Turkey. On the other hand, Turkey still have a problem with coordination between the units. There are several governmental departments and agencies that carry out the similar projects. Turkey first should coordinate the units that do projects on emergency management. Actually, in order to do this, Turkish Emergency Management Agency (TEMA) was established in 2000, as in US - Federal Emergency Management Agency FEMA), but TEMA still do not have enough power to coordinate those units. On the other hand, Turkish government and the people are aware of the importance of emergency management. Therefore, most of the projects related to emergency management are easily funded by the Technical National Bodies, such as Scientific & Technical Research Council, State Planning Department, Municipalities, Governors and others.

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He is a research assistant in the Istanbul Technical University, Faculty of Civil Engineering since 2001. He was born in 1979. He finished his BSc. in the Geodesy and Photogrammetry Eng. Department of Istanbul Technical University, Faculty of Civil Engineering. He received his MSc. from the Institute of Science and Technology of Istanbul Technical University in 2003. He is a PhD. candidate now in the Institute of Science and Technology in Istanbul Technical University. Now he is also a visiting researcher in Mid-America Earthquake Center in University of Illinois at Urbana-Champaign. His research interests include GIS, disaster information systems, emergency management and computer programming.

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He was born in Tekirdağ in 1977. He graduated from ITU-Geodesy and Photogrammetry Engineering in 1998, then took the MSc degree in 2001. He has been working as a research assistant in Surveying Techniques Division in Geodesy and Photogrammetry Engineering Department since 1999. He is a PhD student now. His research interests are GIS, Emergency Planning and related subjects.

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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 Techniques Division since September 2004. He was born in Pazar, a town of Rize where he finished his primary, secondary and high schools. He graduated from the Department of Geodesy & Photogrammetry, Istanbul Technical University in 1987. He received MSc & PhD from University College London and University of Newcastle upon Tyne, UK, respectively. He become an assistant professor in 1994, an associate Professor in 1996 and professor in 2002. His research interests include satellite positioning techniques, monitoring of earth crust using GPS, emergency management, disaster information systems, GIS based on emergency management.

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