MASTER PLAN CONCERNING
SEISMIC RISK ASSESSMENT, MITIGATION, AND EARLY WARNING IN THE HATAY PROVINCE ON THE BASIS OF MICROZONATION, VULNERABILITY, AND PREPAREDNESS STUDIES

Submitted by:

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Project Partners:

MKU – Mustafa Kemal University, Antakya/Hatay

TMMOB – Chamber of Civil Engineers Hatay Branch

AFET – General Directorate of Disaster Affairs, Ankara

METU – Middle East Technical University, Ankara

SDC – Swiss Agency for Development and Cooperation, Istanbul

1 Motivation

In recent years devastating earthquake disasters in Turkey lead to thousands of casualties and billions of economic loss. Not only the helplessness of local authorities and the circumstance of being not prepared in the immediate aftermath, but also the nonexistence of master plans able to minimize the primary and secondary effects of the natural disaster especially for the rural areas lead to the motivation of the present project.

Even though most of the harm and damage to be caused by these earthquake disasters in Turkey occurred in small to middle-sized towns, more or less all international discussions and attempts concerning seismic risk assessment, mitigation, and early warning measures are mainly directed to the Marmara region around the mega city Istanbul.

The main aim of the proposed project is the development of a master plan for mitigation and early warning concerning the earthquake risk for selected urban areas which could become a model for earthquake-prone regions in Turkey or Middle East.

The objective of this proposed study is to utilize current tools for earthquake risk mitigation within an environment where research entities from the European Research Area, local universities in Turkey and professional associations as well as local governments are enable to establish a unique partnership that would serve as a model for similar future endeavors.

2 Selected target area

Considering a variety of selection criteria, the South Anatolian province Hatay was selected as the target area being located in one of the most seismic endangered zones of Turkey (cf. Figure 1). Judging by historical precedence, major earthquakes on this branch of the Dead Sea-East Anatolian fault system establish a real potential to occur in most parts of this province. Although major events are missing during the last 20 years, an earthquake of magnitude Mw 5.8 occurred in Antakya (Hatay) on January 22, 1997 producing moderate structural damages.

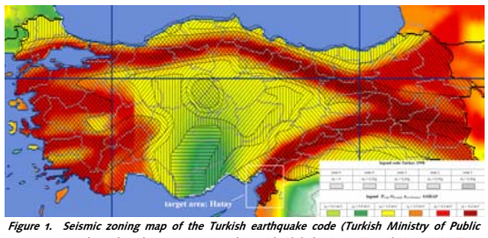

Figure 1. Seismic zoning map of the Turkish earthquake code (Turkish Ministry of Public Works and Settlement, 1998) overlain with Global Seismic Hazard Map (GSHAP).

Within the framework of the proposed project, master plans are to be elaborated for three different test cities (case studies) within the province Hatay: Antakya, Iskenderun, and Samandag.

As it can be taken from Table 1 the three selected urban settlements show quite different economic and social characteristics. In addition, the geological and topographical situations of the three cities are different: while the province capital Antakya is situated on the margin of an alluvial valley through which the river Asi flows being also characterized by steep slopes, both Iskenderun and Samandag are lying close to the seashore with plane topography and soft alluvial sediments.

Table 1. Economic and social characteristics of the three test cities

	Antakya	Iskenderun	Samandag
population (in 2000)	144.910	159.149	34.641
annual growth of population (since 1990)	+ 15.6 %	+ 2.8 %	+ 14.1 %
literacy rate	~ 90 %	~ 90 %	~ 86 %
type of economy	trade	trade, steel industry	trade

3 Tasks and activities

An intrinsic characteristic of the proposed project is the interdisciplinary attempt combining the research areas of structural earthquake engineering with engineering seismology and sociology. Thereby the applicants revert to experiences gained during reconnaissance missions of *German TaskForce* into earthquake disaster areas of Turkey for many years (Figure 2).

Tasks and activities of the engineering group, which is lead by Earthquake Damage Analysis Center (EDAC) of Bauhaus-University Weimar are:

- detailed inventory of the current (undamaged) building stock by on-site inspection
- engineering investigation of structural damage being caused by future earthquake events (cf. Figure 2)
- sophisticated inventory of "high-priority" buildings
- instrumental geotechnical measurements
- instrumental vulnerability studies on selected building structures
- seismic risk assessment studies on the basis of different earthquake scenarios likely to occur in the respective region
- identification/tagging of endangered settlement areas
- elaboration of strengthening and retrofitting measures
- provision of strengthening recommendations and strategies for public institutions, building owners, and local construction companies
- training of university staff, construction engineers, and control institutions
- elaboration of prevention and preparedness strategies (regarding self- and outside help measures, healthcare system, insurance policy)

The sociological investigations will include the following activities:

- performance of interviews with inhabitants to gather insights into the social structure, vulnerability structure, educational situation, and level of preparedness and risk awareness in different groups of population
- comparison of the vulnerability level of the building structures with the social vulnerability of inhabitants in several aspects
- interviewing representatives and staff at different governmental and organizational levels and private enterprises concerning the state of vulnerability, preparedness, mitigation, resilience, and early warning in order to identify a differentiated view on social vulnerability and societal vigorousnesses to earthquake disasters at different levels of society, the society's state of preparedness, risk awareness, and early warning systems

Figure 2. Documentation of structural damage by the engineering group of German TaskForce (EDAC staff) after the (left) 1999 Kocaeli and (right) 2003 Bingöl earthquake.

Figure 3. Capacity building: training of resident students by staff of Earthquake Damage Analysis Center (EDAC) during a field trip in September 2005 to test city Antakya.

Figure 4. Interview situations in one of the poorer districts of Antakya: students from Mustafa Kemal University (MKU) conducting the questionnaires prepared by ISOKIA.

4 Results

- ⇨ Definition and description of aims to be reached on several societal levels by developing a master plan, naming and describing of steps together with the regional governments and involved organizations of the target regions.
- ⇨ Monitoring and evaluation if the steps are reached within the described time schedule. Criteria and indicators for a sustainable development will be defined. Identification of preparedness, mitigation and early warning gaps and consulting of local governments in reducing these gaps.
- ⇨ Joint development of an information program to promote knowledge and enhance preparedness.
- ⇨ Initiation of consultation offices for the public on how to protect against earthquake hazards.
- ⇨ Promoting of knowledge about warning, evaluation whether warning messages are well understood and how they should be changed.
- ⇨ Workshops with participants of the region (including inhabitants) and external participants.
- ⇨ Developing of a compressed manual. The comprehensibility will be tested and developed in collaboration with organizations active in disaster prevention, disaster management, and early warning.

A master plan for the target region will be of high value to support already existing attempts and initiatives, which are – until now – of little effect because they stay mostly isolated.

5 Proceeding and realization

In 2005 the interdisciplinary works of engineers and sociologists started in the test city Antakya (cf. Figure 5), a historical and multi-ethnical town in which a heterogeneous cultural and religious population is coexisting peacefully. The availability of strong and engaged partners willing to support and join the project lead to the decision to start the on-site works here. The inventory of the city's building stock and the performance of sociological questionnaires with the local population were supported by a group of students from Mustafa Kemal University and local engineers from the Chamber of Civil Engineers Hatay Branch (cf. Figures 3 and 4).

The 2005 field trip into the test area Antakya revealed that the organizational structure between EDAC and ISOKIA is suitable for the preparation of the project's tasks and objectives. In addition to the on-site field works and analysis, seminars and workshops with practitioners on disaster prevention and measurement, and the development of an information program will be realized in strong cooperation.

Figure 5. Panoramic view of the inner city's building stock in test city Antakya, the province capital of Hatay.

6 Imprint

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Timeframe of the project: May 2006 – April 2009 (36 months)

Approximate funding needs: Euro 1,270,000,-

Results of the EWC III review process:

	Review #1 (ID 130)	Review #2 (ID 114)
Overall grade:	5 (strongly agree)	5 (strongly agree)
Recommendation:	A (accept as it is)	A (accept as it is)