SEISMIC RISK MANAGEMENT ON THE EXAMPLE OF MEDITERRANEAN COUNTRIES: EARTHQUAKE MASTER PLAN FOR ISTANBUL

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SUMMARY

The scope of Earthquake Master Plan for Istanbul was composed of nine basic themes: (1) Assessment of current situation; (2) Seismic assessment and rehabilitation of existing buildings; (3) Urban planning issues; (4) Legal issues; (5) Financial issues; (6) Administrative Issues; (7) Earthquake information infrastructure; (8) Educational and Social issues; (9) Risk and disaster management issues. The major aim was to provide a short, medium and long term plan for the activities in these fields, preparation of implementation programs, and identification of the responsibilities and responsible authorities for earthquake disaster mitigation works to be carried out in Istanbul.

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The project team was composed of two groups as given below

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3. *Administrative Structure (Prof.Dr.H.Kabasakal, BU, Department of Management)*
4. *Seismic Assessment and Strengthening of Buildings (Prof.Dr.N.Aydınoğlu; BU, Kandilli Observatory and Earthquake Research Institute, and Prof.Dr.Z.Polat; YTU, Civil Engineering Faculty)*
5. *Urban Planning (Asc.Prof.Dr. B.Şengezer; YTU, Department of City Planning)*
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7. *Finance (Prof.Dr. V.Akgiray; BU, Department of Management)*
8. *Education (Prof.Dr. G.Fişek; BU, Department of Psychology)*
9. *Risk and Disaster Management (Prof.Dr.G.Barbarosoğlu; BU, Kandilli Observatory and Earthquake Research Inst.)*

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2. *Evaluation of Administrative Structure, Urban Planning, Legal Issues and Finance: Prof. Dr. N.Z. Gülersoy (ITU, Faculty of Architecture), Prof. Dr. M.Balamir (METU, Faculty of Architecture)*
3. *Seismic Assessment and Strengthening of Buildings and Technical Training: Prof.Dr.E.Özer, Prof.Dr.Z. Celep (ITU, Civil Engineering Faculty), Prof. Dr. G.Özcebe (METU, Department of Civil Engineering)*
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INTRODUCTION

The Earthquake Master Plan for Istanbul [1] has been motivated by the request of the Metropolitan Municipality to a consortium involving four leading Turkish universities. This commitment was fulfilled by the two teams, the first team is composed of researchers from Middle East and Istanbul Technical Universities, and the second team is composed of researchers from Bogazici and Yıldız Technical Universities. The main guiding principle has been the self-evident fact that while no natural disaster can be prevented from happening, the incorporation of well-formulated planning and technical counter-measures will mitigate damages and losses significantly.

The way the issues have been identified and solutions offered are likely to be different submitted by the two teams. This is not unnatural because a comprehensive master plan is related in a complex way to legal, administrative, financial and social matters. Solutions in such contexts are not necessarily unique as in technical matters, and can reflect a multitude of syntheses leading to some different set of recommendations. This should not be interpreted as a development leading to complications, but as a conclusion offering a range of strategies for adoption. The realization of the Master Plan can not be accomplished only within the province of the local government, but requires support and close cooperation of the parliament and the executive branch of government. When matters move to such platforms, it must be admitted that a different set of dynamics may enter the process of shaping the final product, so a range of options for alternative approaches will then serve as an advantage.

ASSESSMENT OF CURRENT SITUATION

The findings from the two previous studies conducted for Istanbul

- The Study on a Disaster Prevention / Mitigation Basic Plan in Istanbul including Seismic Microzonation in the Republic of Turkey – Japan International Cooperation Agency and Istanbul Metropolitan Municipality [2],
- Earthquake Risk Assessment for Istanbul Metropolitan Area – Bogazici University (supported by the American Red Cross) [3]have indicated the high seismic risk of Istanbul. Thus the master plan for Istanbul need to address the issues related to the assessment of existing building stock, infrastructure, urban and public facilities in the light of available geological and geotechnical data, the determination of short, medium and long term measures and strategies for earthquake preparedness of Istanbul, the identification of legal, technical, financial and social responsibilities, including implementation plans at selected pilot project areas.

Earthquake disaster mitigation efforts for Istanbul should be multi-disciplinary and have a broad vision. These efforts will be pioneering examples of Urban

Development Projects and Local Transformation Programs, or total "Action Planning" for Turkey. The four universities which took part in the project have set up several working groups consisting of expert faculty members, and approached the project with such a perspective and studied in detail the works to be done for earthquake preparedness of Istanbul.

The apparently unavoidable possibility of the occurrence of a major earthquake that will affect Istanbul necessitates the determination of existing conditions with respect to pre and post earthquake disaster preparation and management methods to be employed. The expected effects of an earthquake on physical and social environments have to be assessed quantitatively. The studies done in this aspect are complied in the "Current Situation" chapter. The available seismic data and risk assessment reports comprised the basis for the seismic risk assessment for Istanbul. Both deterministic and probabilistic approaches are employed in seismic risk assessment studies. The available information about buildings, urban infrastructure (transportation, natural gas, water, electricity, and telecommunication networks) and industrial facilities are evaluated with respect to seismic performance and social losses.

SEISMIC ASSESSMENT AND REHABILITATION OF EXISTING BUILDINGS

The main goal in assessment of seismic safety of building type structures in Istanbul is to predict the probability of earthquake damage on an individual building basis and especially to determine the probability of building damage that will cause human casualties and the areal distribution of such buildings.

The seismic assessment of buildings is proposed to be done in three stages. The first stage inspection/evaluation works are also referred as "street survey" and correspond to preliminary assessment. The goal of these works is to make a preliminary grading of all buildings in Istanbul with respect to their seismic performance, and therefore to collect limited data on buildings by visual inspection from outside which can be processed in a rational manner for seismic assessment. This will enable to set priorities for second stage assessment at both individual building basis and regional basis.

In the second stage assessment, starting with the high priority buildings and regions, more detailed investigation/evaluation works will be executed for seismic assessment of buildings. The goal of these studies will be to make reliable performance evaluations which will enable to reach final decisions on as many as possible number of buildings and leave as few as possible number of buildings for third stage detailed assessment.

The third stage investigation/evaluation works will comprise especially high rise residential and office buildings and public buildings, and will be carried out by registered expert engineering firms in accordance with specified methods and performance criteria and will include detailed engineering analysis.

For the first and second stage assessment more than one method of investigation/evaluation based on alternative approaches are recommended. The validity and suitability for use of these methods are proposed to be checked at a pilot study area, and compare the results with each other and those of more sophisticated methods known to yield more reliable results.

Several methods are proposed for seismic strengthening of buildings. These methods are compiled under "simplified strengthening" and "comprehensive strengthening" headings. The simplified strengthening methods are proposed to be applied on a larger number of buildings.

URBAN PLANNING ISSUES

The comprehensive approach to earthquake mitigation in Istanbul would be preparation of a CONTINGENCY PLAN based on the definition and elimination of risk sectors in all fields related the city and social life, and implementation of ACTION PLANS at regions of high priority which are indicated as high risk areas in the contingency plan.

There are several risks generated from the natural conditions as well as building and land use practices. These risks are needed to be defined within a limited number of sectors. Their interaction and damage potentials are to be analyzed, and methods and measures are to be developed to reduce their risk levels. For each sector, RISK MANAGEMENT techniques and methods should be developed and the operational duties of responsible agencies should be clearly defined. For each risk sector, certain legal and administrative arrangements, and implementation methods for reduction or elimination of risks are to be developed.

A narrow and single disciplinary approach to the problem, with conventional urban planning concepts and tools will be insufficient and invalid. Conceiving that measures within ordinary administrative and legal structure will be sufficient would be underestimating the dimensions of the situation.

Within the scope of urban planning studies a Strategic Plan for Disaster Mitigation in Istanbul has been developed. This plan's secondary goal will be the improvement of natural and urban environmental quality, and this also supports the main goal of diminishing the destructive effects of a possible major earthquake.

The problems in Istanbul concerning the earthquake risk range from the poor quality or depreciation of buildings from an engineering point of view to the poor urban environment generated by social, economic and physical deterioration as well as by uncontrolled urban growth and an inflexible planning system which remains incompatible with the dynamics of the city. In this context, alternative implementations vary respectively on a palette of solutions including reinforcement, reconstruction of individual buildings, preservation of historical urban fabric, regeneration of urban areas, creating new settlements or alternative urban centres within a regional perspective, etc. The approach to the disaster (earthquake) problem must be holistic in nature, i.e. comprising economic, political, social and cultural visions, and strategic in application, i.e. flexible and relying on the effective participation of various actors. To this end, it is attempted to aforementioned tools within a broad planning framework.

LEGAL ISSUES

Earthquake risk mitigation works are closely linked with the legal structure at every stage. All efforts towards the risk mitigation will be implemental only as far as they are described in the legal framework. With this respect, first the problem areas in the Turkish legal system are identified. Especially the laws concerning planning and building rules are examined taking into account the new law proposal, and recommendation are produced for additional clauses for risk mitigation. The study of legal issues have focused on problems encountered in Istanbul, identification of the problems, the solution of such problems and the recommendations about changes in the existing laws and new laws needed to implement the proposed solutions. In addition to discrepancies and problems in legal structure, a fundamental problem is recognized to be the deficiency in enforcement of the laws, and recommendations are developed to enhance enforcement including effective inspection and participation concepts.

FINANCIAL ISSUES

An important aspect of the Master Plan was the determination national and international financial resources needed for all pre-and post-earthquake work on mitigation and risk management, and also to design a financial model for a properly coordinated allocation of resources. Given the fact that the currently available resources for this purpose are very limited, the first step need to be the identification of the areas of need and estimation of the total demand for financing.

The list of items that require financing for pre-earthquake works are (1) Studies on earthquake vulnerability and security; (2) Technical investigation and strengthening (or re-location) of public structures (hospitals, schools, key government buildings, infrastructure, bridges, dams, etc.); (3) Technical investiga-

tion and strengthening (or re-location) of private buildings (residential, commercial and industrial buildings) and (4) Other related works mentioned in the Master Plan.

The list of items that require financing for post-earthquake works are: (1) Provision of shelter, food, medical and social services to people; (2) Technical investigation, repair and reconstruction of public and private buildings and structures.

It should be recognized that the more successful the pre-earthquake plans and their implementations are, the lower will be the financial burden after the earthquake. Moreover, the allocation of funds before an earthquake occurs is certainly needed for humane reasons, and also technically easier. This fact is fully considered in the development of the financial model. The basic principles of the financial model are made to be compatible with the current social and economic facts of the city of Istanbul and also of the country.

ADMINISTRATIVE ISSUES

The organizational structure expected to carry out the pre- and post-disaster management activities has been critically evaluated and suggestions for improvement are investigated. For this purpose, the current legal structure and organizations are evaluated, distribution of authority among the central and local government bodies is analyzed, responsibility and coordination mechanisms are identified, and the problems and insufficiencies in the system have been determined. In addition, disaster management models that are operational in other countries are analyzed and parts of these models that can be adapted to the Turkish system have been integrated into the proposed model. Furthermore, the model included the findings of in-depth interviews with administrators and individuals involved in disaster–related organizations and a field survey that were conducted with citizens in two neighbourhood areas.

EARTHQUAKE INFORMATION INFRASTRUCTURE

Earthquake information infrastructure studies have been conducted under five main headings: (1) Standards; (2) data layers; (3) Software, hardware and network infrastructure; (4) data collection and updating, and (5) reliability of data and computer systems.

Developing and adhering to standards is of utmost importance in the design of information systems. Large systems such as urban information system or a disaster information system necessitate the coordination and information sharing of many institutions. In many cases, a distributed information system formed by different

databases may be appropriate. In order for this work without problems, it is essential that standards be used, developed and adhered to.

The data layers that should be present in a disaster information system are discussed under the heading "functional classification". "Software, hardware and network infrastructure" alternatives on geographical information systems, database systems, server hardware, and network infrastructure of a disaster management system are presented and some recommendations are made. Procedural and technological suggestions on the management of the data over time and updating of data are presented in the section of "data collection and updating". The reliability of data and computer systems are discussed, information about reliable hardware and software, and backup procedures are presented.

EDUCATIONAL AND SOCIAL ISSUES

For earthquake disaster mitigation and preparedness public education and awareness campaigns and community organizations are very important. In Turkey, education of public disaster preparedness and disaster mitigation has been under the responsibility of the central government (department of civil defence, department of education). Local governments and non-governmental organizations are not given to play a sufficient role in these issues. Education about earthquake risk is offered in primary and high schools, but there is no systematic education program for general public.

Development of standards for public education and community organizations, reaching the public at large, active participation of public, training the trainers and production of training materials are the important issues. Within the scope of educational and social studies for earthquake disaster mitigation, the works to be done to increase public awareness and preparedness to improve response and rehabilitation abilities, and thus increase the capacity of local communities to overcome effects of disasters are evaluated and suggestions are made.

RISK AND DISASTER MANAGEMENT ISSUES

Risk and Disaster Management model proposed in the Master Plan does not only consider the post-earthquake response actions to mitigate the negative effects of the disaster, but it also considers the planning phase to manage the activities effectively. The proposed model is prepared to cover four stages of disaster management (risk mitigation preparation and planning, response and recovery).

Response dominated emergency management model is focused on four main actions: (1) Coordination; (2) Incident Command System; (3) Resource Manage-

ment; (4) Training. The emergency management model incorporating the above components and the training requirements are presented.

SUMMARY

As the summary above presented the Istanbul Earthquake Master Plan is truly the name of an ambitious risk management plan with few global precedents. It is of relevance to all sectors of the social structure in the city. The realization of a plan is often far more challenging that preparing it. The two research teams that collaborated in preparing the Final Report hope that the issues they have recognized and identified in it, and the solution they submit will prove to be beneficial for the citizens and government of Istanbul.

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