



URBAN SEISMIC RISK MANAGEMENT: THE EARTHQUAKE MASTER PLAN OF ISTANBUL (EMPI)

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ABSTRACT

Although few in number, approaches to urban seismic risk management could be considered broadly in two groups. Often seismic properties of sets of individual buildings are investigated by geophysical and engineering analysis, and recommendations for retrofitting/removal made according to technical and economic feasibility criteria. A second family of management efforts focuses on urban systems vulnerabilities due to natural hazards and undertakes scenario analyses. The propositions of this latter approach are often in the form of technical measures to be conducted by urban authorities, via processes of land-use control and tools of urban planning. The Earthquake Master Plan of Istanbul (EMPI) completed in 2003 has provided the opportunity for an alternative to the existing methods of urban seismic risk management. The approach considers hazards of natural and human origin in combination, within a framework of 'risk sectors', and proposes lines of action to involve all factions of the urban society. The purpose is to bring together and activate in every risk sector, related components of public administration, business and industry, NGOs and local community representation in the long-term management of urban risks, to draw mutual agreements of conduct and control, and to run various sub-project packages. Altogether, 13 relatively exclusive risk sectors have been identified for the whole city. The nature of risks in each sector are exhibited, methods of 'avoiding, minimizing, and sharing' of risks demonstrated, and the agents responsible and to be involved indicated. High-risk districts are designated as areas for Action Planning, where comprehensive rehabilitation/ transformation projects are recommended for immediate implementation. A reassessment of existing city administration procedures, enriched powers of implementation, new tools for physical planning, encouragement of partnerships and private investments in comprehensive rehabilitation are complementary aspects of EMPI.

Approaches to Urban Risk Management and Planning

Planning for the purposes of post-disaster rebuilding activities in urban areas is the more widely practiced form of public or private service (Spangle, 1991). Although the potential role of urban planning in the mitigation of earthquake damages is often mentioned, the number of cases as plans or implementation in this area is very rare. Methods and tools that could be employed in such professional and administrative interventions remain therefore relatively undeveloped. Work in this area focus mostly on 'scenario

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analyses', implicitly considered by many as the only possible method of approach in the latter context. These are predictive models for decision makers, whose merits depend on the built-in assumptions, rather than operational tools that help local authorities or communities in action. Methods and tools for urban risk determination and management are scarce commodities also within the prescriptive and action-oriented body proper of urban planning theory and practice.

Four different types of planning could be identified in relation disasters. Planning of the post-disaster reconstruction stage may overwhelmingly involve conventional land-use and physical planning activities. Yet these cover a wider frame of work with compensations and programs devised for social and economic healing, and can be identified in general as 'recovery planning'.

Planning for emergency preparedness is also a common form of planning often formally undertaken by local administrations as a legal obligation. This public responsibility is given to all provincial administrations in Turkey by the so called 'Disasters Law' which describe chapters of preparation and methods and standards of 'preparedness planning'. These are commonly drawn by simple officials that are not necessarily experts in the area. Often the central authorities issue mandates as to how this task should be fulfilled and training be given.

It is the third type of planning activity that deserves to be elaborated today in order to reduce the overall impact of hazards in urban areas. The approach can be identified as 'mitigation planning' and described as an attempt to avoid, minimize, and share the costs of likely disasters (Kreimer, et.al, 1999). This activity is necessarily based on the identification and analysis of risks, and the development of methods for the management of urban risks. An intensive collaboration of the disciplines is required, orchestrated preferably by the planners.

Still further, a fourth category could be described as 'resilience planning' that aims to monitor development dynamics of the economy and society for sustainable in-built urban safety. It should involve the long-term structuring of the agents and legal systems, shaping the cultural background for greater awareness of hazards, and improving the capacity of communities in the management of emergencies. This multi-task operation requires the integration of programs prepared in distinct areas and aims to generate a lasting synergy based on coordination.

It is in the third category that the Earthquake Master Plan for Istanbul (EMPI) takes place. Precedents to this approach are not many. Functions attributed to forms of urban planning concerning mitigation and risk management are only a few and most recent. Coburn (1995) has provided a description of requirements at the urban scale, and in a previous work the subject is given a limited treatment (Coburn and Spence, 1992, 149) allocating most of the attention to 'improving earthquake resistance of buildings'. Thus mitigation efforts at the urban scale have largely been omitted.

The work carried out under the UN program of IDNDR during the last decade also promisingly concentrated on cities as entities subject to earthquakes and disasters. Some of this work has provided methods of investigating the probabilities of disasters and simulating their effects. However, these have not necessarily generated a comprehensive framework within which prescriptive response and action for mitigation could take place.

Another work that deserves attention is that of the Columbia University (2001) planners. In the study and preparation of 'Disaster Resistant Caracas', the work has relied on geological information and geographical analysis to start with, identifying the spatial distribution of the likely intensity of earthquake hazards. This enabled the determination of damages and losses upon which alternative courses of action

could be evaluated. The response agenda is then developed to include public training and preparedness operations as well. The fundamental subtitles that explain the logic of work is given below.

“Elements of a Disaster Preparedness Plan”

(Columbia University 2001, p. 87)

- Hazard Identification (microzonation)
- Assessment of Critical Assets, Fragilities and Activities at Risk (infrastructure and lifelines, critical facilities, industries)
- Loss Estimation (economic modeling)
- CBA for Optimal Mitigation Strategy
- Risk Reduction (zoning, early hazard warning, improve codes, give incentives, reduce fragilities, increase resilience)
- Training Response Teams
- Communication and Education

This work is significant in its treatment of the urban entity in its totality as an object of planning and management. However, it considers ‘disaster preparedness’ largely as a technical task to be fulfilled once and carried out by the authorities. Secondary processes triggered are the implicitly expected mechanisms for the sustainability of the approach. The need therefore for a comprehensive urban mitigation mode of conduct that extends conceptions of ‘preparedness’, and serves for sustainable resilience is a real one.

The Need for Urban Disaster Mitigation Planning in Turkey

It may be true that ‘mitigation’, rather than ‘emergency preparedness’ could be a far more vital function for some economies than others. Dozens of reasons could be produced as evidence of the relevance of the former in Turkey.

The Anatolian traditions of building construction that evolved over the centuries had optimized resources and safety in this most seismic part of the world. The use of timber and infill materials was not only recyclable methodology but also extensively spared life in the event of major earthquakes. With macro-economic changes, growth of population and high rates of urbanization after 1940s, this delicate ecological balance could not be maintained any longer. With the introduction of reinforced concrete in Turkey, a new era in constructional activity ruled the day, and despite low levels of capital accumulation, a phenomenal rate of building stock formation and urban growth took place. **Figure-1** is only a gross underestimation of events however, if the following are taken into consideration:

- a) The UN statistics for countries other than Turkey comprise both new construction starts and rehabilitation permissions, the latter of which has a high proportion in a context where building stock is already relatively larger than new construction. This implies that for most of the other countries, the new construction activity curve must be lower than that observed.
- b) Figures for Turkey, on the other hand, refer only to formal new construction starts, which excludes the unauthorized constructional activity that consist at least one third of the statistic given in the average, during the period. The curve denoting the new construction performance levels should be much higher than depicted in the figure.

Figure-2 indicates that the driving force behind this phenomenal growth has been the production of multi-unit housing blocks. The method of investments and construction of such reinforced concrete blocks of

flats relied on the innovative forms of new ownership relations in property (Balamir, 1975). This implied a rapid production process of buildings with little or no supervision, and therefore the formation of a stock of high vulnerability. Under the circumstances given, most of the growth of this stock took place as urban spread, on seismically the least appropriate land. The powerful local families of local towns were also traditionally the owners of the more fertile and often (therefore) seismically most disadvantageous tracks of land, on which the urban plans were inevitably forced to extend. This eroded the technical and scientific basis of urban planning in practice, and led to the most susceptible settlement formations in the country. The 1999 earthquakes indeed have been the first observable wide-scale consequence of this unchecked performance of physical growth. **Figure-3** indicates how over the decades, the urban planning system in Turkey has been left vacuously devoid of any concern in its provisions and procedures of tools and means for maintaining seismic safety. It is on this background that the experiences of 1999 are evaluated and high risks involved in Istanbul emerged as a real problem perceived today by almost everyone.

THE EARTHQUAKE MASTER PLAN OF ISTANBUL

The 'Earthquake Master Plan of Istanbul' (**EMPI**) has been requested and procured (November 2002-July 2003) by the Metropolitan Municipality of Istanbul (**MMI**), following the JICA analysis. The latter was concerned with the EQ hazard, and the assessment of magnitudes of likely damages in the city. The JICA and the following Red-Cross Reports provided the background information and the 'diagnosis' of threats the metropolitan area faces. Upon this diagnosis, it was the task of EMPI to identify the whole scope and method of action, the formulation of a comprehensive and effective 'prescription' for mitigation.

Two teams of research universities (METU-ITU and BU-YTU) responded to the MMI tender for EMPI. However, MMI considered it politically more feasible to hire all of the four in collaboration. This was a difficult task since the 8 month term was hardly sufficient to develop a common understanding between the universities and between the different disciplines. This made it imperative to clarify objectives and express the need for an integrated approach. The approach and numerous work of the METU-ITU team have been shaped within the framework explained here.

The METU-ITU approach is distinctly based on the concept of risk, the sociological and philosophical tenets of which are to be found in the expositions of Ulrich Beck (1998, 1997, 1992) and others. This does not confine the work and the analyses of risk to an academic exercise, but provides a methodology for action and a framework for the democratic involvement of the whole society in 'risk analysis and management'. This proactive approach exclusively describes '**risk sectors**' in the Istanbul metropolitan area, for which independent risk analyses could be conducted, based on methods described in detail in the main report. Secondly, parties involved in each risk sector are identified with a description of tasks of risk management (risk avoidance, risk minimization, and risk sharing) attributed to each. This demands agreements and protocols between these parties on collective and organised action. Stake-holders in each risk sector are thus to be activated in relation to a general 'road map' that combines all action in independent risk sectors.

Altogether 13 risk sectors have been described within the EMPI framework. These are outlined here, in terms of 'Scope, Observed Problems, Possible Risk Management Methods, Responsible Bodies, and Proposals for Action'. The expectation is that the city administrations lead the way to bring the stakeholders together in the management of each risk sector, draw the necessary protocols in which responsibilities and tasks are identified with reference to the overall **Contingency Plan** that integrates all risk sectors.

In the high risk areas of Istanbul, **Action Planning** is recommended, as a set of activities to take place especially by means of comprehensive local rehabilitation projects directly involving the residents of the area. Such processes are expected to be initiated by means of a few local projects guided by local and international expertise in pilot areas.

The project also contains recommendations on:

- Methods of procurement and use of resources
- Revisions in legal provisions and devices
- Formation of 'Local Community Administration's
- Public education and local community training

Thanks to the availability of a most valuable GIS database comprising information on each building in the city, even though obtained late in the project, that it has been possible to carry out demonstrative analyses in many of the Risk Sectors. Risk analyses for premises in which hazardous substances are processed, or risks in special locations as water-front, down-stream valleys of dams and areas with landslide potential could be determined. Furthermore, locational efficiency of emergency facilities like hospitals could be assessed. This database could constitute the basis of a Comprehensive Contingency Plan for the city, and a source for carrying out most of the project packages described in EMPI. Such analyses have been reproduced and indicated on plans of the city.

A number of issues may be considered to stand on the way of implementation of EMPI:

- MMI may choose to stand on the conventional side preparing plans and implementing them without consulting to local people, ignoring the great potential of carrying out political roots action;
- MMI could be confined to its own internal structure ignoring the collaboration opportunities with the Governorate and the central government;
- MMI could not assume the proactive role in developing collaborations with the municipalities and in activating the NGOs;
- EMPI could be deliberately reduced to an operation of retrofitting of some part of the building stock alone, with the support of WB in this vein, ignoring all of economies and opportunities of improving the urban fabric as a whole, and under-estimating the contributions of community participation, i.e. reducing the whole operation to a structural engineering exercise rather than comprehensive social engineering;

Currently, the World Bank is in the process of developing a project for Istanbul. It is expected that the World Bank projects for Istanbul take into consideration the reasoning of EMPI, and hopefully do not contradict or compete with the projects described therein, and if possible, aim to spread the available resources to the projects described within EMPI, generating a more effective overall impact.

The Purposes, Scope and Principles of EMPI

EMPI is a comprehensive coordination of mitigation measures to be implemented in the face of the impending earthquake in Istanbul, developing a special approach to the problem. It essentially draws the framework for a series of Social Contracts indicating to the operations necessary, and the responsibilities of all administrative units, private bodies, and the ordinary citizens.

- EMPI is an integrated plan to synchronize all physical, financial, legal, organisational measures with the aim of developing risk management methods according to the causal structures and spatial distributions of hazards and risks; Reducing risks in existing urban environment and avoiding vulnerabilities in the formation of new developments;

- EMPI is envisaged as a framework for social contracts to be drawn between MMI, the Governorate, local municipalities, unincorporate municipalities, institutions, enterprises, NGOs, local community administrations, and individual citizens with the aim of determining the active role of the parties involved, and facilitating their participation and contributions;
- The over-all purpose of EMPI is to enhance safety and total quality of life in the city by:
 - Reducing infrastructural deficiencies
 - Gradually eliminating the unauthorized stock
 - The integration of city management processes
 - Protection of the natural and historical assets
 - Reclaiming urban quality and identity
 - Participation of the local communities in the management of the city
 - Comprehensive rehabilitation of high risk areas
 - Retrofitting or removal of buildings according to the local revision plans

Since the task was an unconventional one, special terminology and spelling of principles were necessary during the preparation phases of EMPI to keep the work within track:

EMPI is not

- An operation confined to the ‘retrofitting’ of specific buildings in the metropolitan area; Rather, the urban environment is considered in its totality, with its life-lines, emergency facilities, land uses and management processes.
- A conventional ‘development plan’ describing simply some future physical state, employing solely the devices of methods of physical rearrangements and standard land-use planning apparatus; Rather, EMPI has to generate tools to monitor organizational and economic tendencies and processes.
- An exercise in strict confines of existing ‘legal and administrative constraints’; Rather, proposals are made for the development of new methods and tools of enforcement, and the revision of existing legal frameworks.
- A ‘one-shot’ undertaking; Rather, sustainable mechanisms and institutions for a safer and more robust city and resilient communities are to be introduced.
- An excuse to allow further expansion of the city, generating new waves of demands over the forests and water basins; Rather, it is a comprehensive methodology for upgrading the existing built-up areas in safety and quality, and protecting the natural assets.
- A program for post-disaster activities or a form of crisis management plan, but a comprehensive plan to cover all forms of action for the long-term minimization of damages or loss in the city.
- A simple exercise of diagnosis, but a scenario of action and steps to be followed.

EMPI TERMINOLOGY

RISK SECTORS: are relatively exclusive sets of causal relations focused on specific urban risks or vulnerabilities.

CONTINGENCY PLAN: the overall plan to coordinate all documents related to risk sectors, to identify risk management measures, the actors, supervision methods, and the protocols to be drawn between related and responsible bodies, specifying their obligations and lines of action.

EMERGENCY FACILITIES: Public or private property and facilities designated to provide emergency rescue and care services.

REHABILITATION AREAS: High risk areas to be comprehensively managed (in terms of replanning and reallocation of property for improved efficiency/quality and safety, resident cooperation, improvements in building stock and infrastructure) with enriched powers, for the reduction of risks by various physical

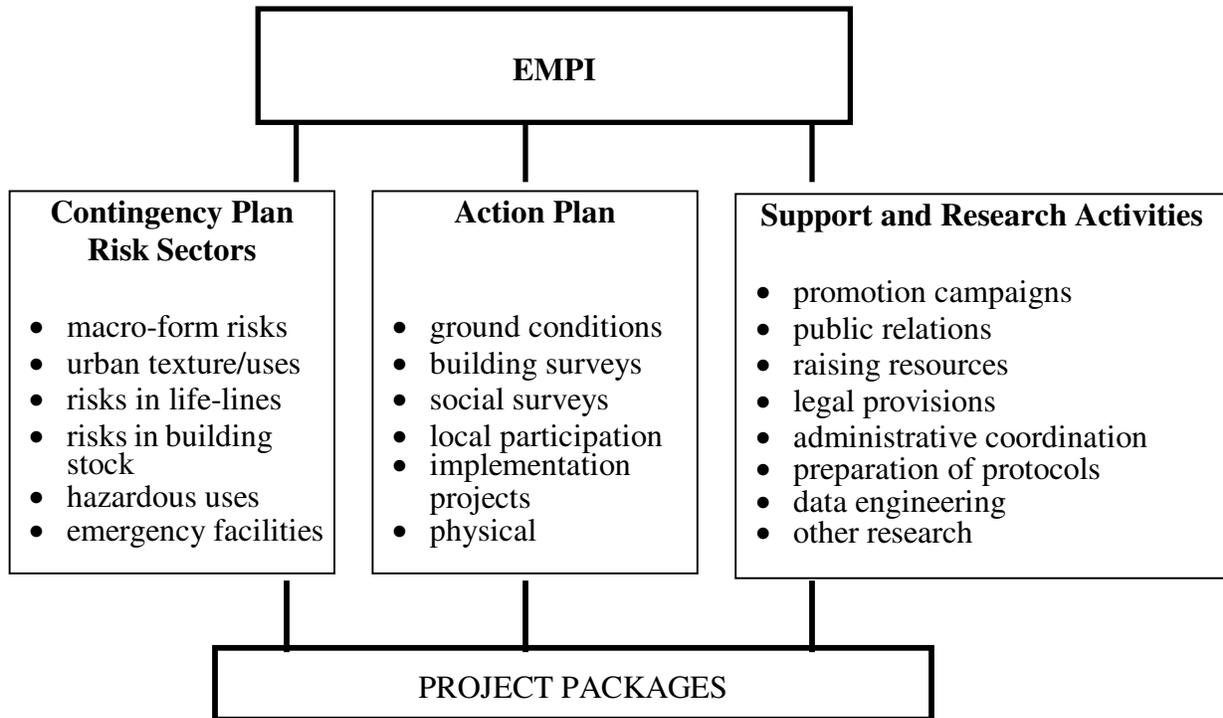
measures (property rights rearrangements, lowering of densities, retrofitting, removals, etc.) and sustainable community regeneration.

ACTION PLANNING: methods of immediate intervention in rehabilitation areas to coordinate property owners and inhabitants, to allow public and private partnerships, with special public powers to synchronize resources and physical development.

PROJECT PACKAGES: work to be independently fulfilled by third parties as part of the EMPI, subject to tender agreements.

EMPI COMPONENTS

It is possible to envisage EMPI in terms of three components as described in the following chart. The Contingency Plan refers to analyses and risk management activities for the total metropolitan area. Whereas Action Plan refers to local comprehensive rehabilitation projects that cover physical transformation and community regeneration programs. Some of the Support and Research Activities have been accomplished during the EMPI preparation stage, others will have to take place at the implementation stage.



IMPLEMENTATION OF EMPI

Various activities will have to be followed in line with the recommendations advanced in EMPI:

- Information Dissemination and Promotion Campaigns
- Formation of Action Platforms with Private Sector and NGOs
- Administrative Cooperation and Coordination Protocols
- Cooperation of Related Parties in Risk Sectors through Protocols
- Tendering of Project Packages described in the Contingency Plan
- Initiation of Pilot Action Plans
- Formulation of Legal and Administrative Changes Required and Monitoring
- Procurement of Resources for Implementation
- Public Relations and Information Engineering

Risk Sectors of the Contingency Plan

Abbreviations: MMI: Istanbul Metropolitan Municipality; MPWS: Ministry of Public Works and Settlement; SPO: State Planning Organization; SIS: State Institute of Statistics; SHAT: State Highways Administration of Turkey; SAWW: State Administration of Water Works; NGO: Non Governmental Organizations; ICI: Istanbul Chamber of Industry; ICT: Istanbul Chamber of Trade; UCAET: Union of Chambers of Architects and Engineers of Turkey; CAT: Chamber of Architects of Turkey; CET: Chamber of Engineers of Turkey; LCA: Local Community Administrations (as proposed by EMPI)

1. Macro-form Risks

Scope: Risks involved in the structure of main access system and compatibility with urban settlement area sizes, densities and configurations, natural boundaries to expansion, water basins, long-term development tendencies, attraction points and investments of metropolitan scale, all investigated in relation to micro-zones;

Problems: High density building in hazardous locations, unauthorized developments, developments in forest and water-basin zones, uncontrollable urban growth;

Risk Management: Micro-zoning, density reduction and intensification areas, protection zones, designation of action planning zones, and marginal areas for new urban development; tools of property exchange, transfer of development rights, and differential property taxation;

Responsible Bodies: MMI, municipalities, MPWS, SPO, Governorate;

Proposals: A follow-up Committee formed by the representatives of responsible bodies, universities, professional chambers, NGOs, ICI, ICT; An Evaluation Symposium will be organized by this Committee every year; Recommended changes in the Development Law and the Property Taxation Law.

2. Risks in Urban Texture

Scope: Independent of the building safety, determination of Risks in the differential formation of urban fabric comprising plots, building coverage and density, access roads and car-parking, ownership pattern, and other environmental properties;

Problems: Great disparities of risk between various types of urban pattern, and unauthorized changes in due course are observed;

Risk Management: Differentiation of urban texture zones in development plans, and long-term physical policies for redevelopment, collective or singular buildings; differentiated property taxation and obligatory insurance enforcements;

Responsible Bodies: MMI and municipalities, LCAs;

Proposals: Formation of an inter-municipality working committee, functioning with improved powers of municipalities in development, supervision of construction, differential property taxation, municipal assessment in the determination of obligatory insurance; Legal changes in Municipalities (1580), Development (3194), Property Taxation (1319) Laws, and modifications in the Obligatory Earthquake Insurance Draft Law.

3. Risks Related to Incompatible Uses

Scope: Analysis of Risks arising from adverse affects of incompatible urban uses in neighboring areas, buildings or within a building in the event of an earthquake;

Problems: Difficulty of land-use and building occupations control; Change of use taking place without permission;

Risk Management: Finer land-use zoning and explicit designation of uses to be avoided in development plans; Obligatory renewal of use permissions on a periodical basis; Formation of municipal data-base of uses combining district administrators' (*mukhtars'*) information and municipal permissions; Standards for

mixed-use, conditions for neighboring housing-office, housing-manufacture uses; Promotion of local auto-control of uses;

Responsible Bodies: MMI, municipalities, ICI, ICT, UCAET, LCAs, other NGOs;

Proposals: Formation of municipal working committees with necessary data-base for the surveillance of local uses; Committee public reporting of problems every six months; provisions in Municipality (1580), Development (3194), and Flat Ownership (634) Laws.

4. Risks of Productivity Loss

Scope: Investigation of seismic sensivity of industrial enterprises and Risks of productivity losses in the industrial establishments, in the case of earthquakes, based on their size, location, building and facilities robustness, technology employed, materials processed, and dependencies on infrastructures, access, input-output relations, etc.;

Problems: Many industrial enterprises are extremely vulnerable in terms of location and building quality; Resilience of the city is largely dependent on the sustainability of the productive potential of the city in many direct and indirect ways;

Risk Management: Carrying out essential research on vulnerability classes of the industry; Building a data-base and developing methods of mitigation; Promoting local and sectoral cooperation between industries; Provision of credits for different types of mitigation; Imposition of obligatory insurance; Compulsory early warning systems; Training for emergency; Information dissemination;

Responsible Bodies: MMI, ICI, ICT, Ministry of Industry, Universities, Business Associations, UCAET, and other related NGOs;

Proposals: A 'Safe Industry' Committee to be established by the representatives of responsible bodies, with information and inspection teams, facilitating the special mitigation measures each enterprise has to take; Supervision functions of the Committee; Enabling with provision of information, and credits for retrofitting and other safety measures; Building up a technical information pool, with standards and regulations of safety;

5. Risks in Special Areas

Scope: The seashore, infill areas, dams and down-stream basins, river beds and other areas subject to liquefaction and landslide are areas that require detailed and special analyses of risks;

Problems: Often super-impositions of risks are observed in such areas; large populations and significant urban assets are at stake;

Risk Management: Designation of special risk areas in the urban plans; Salvation plan preparation tasks and priority of vacating emergency facilities and other infrastructure and public services; Special powers of enforcement; Constraints in land-use; Removal of night-population; Retrofitting of life-lines; Requirement of special geophysical investigation from private property owners;

Responsible Bodies: MMI, municipalities, Governorate, SAWW, UCAET, and NGOs, Ministry for Culture and Tourism, 'Protection Committees of Natural and Cultural Assets'; Sea-faring Enterprises, The Navy;

Proposals: MMI-municipalities special commissions to prepare implementation plans; Vacated areas to be designated as open and green areas only; Priority implementations, rapid compulsory purchase, special fund allocations, exchange of property, transfer of development rights; Special supervision of the areas; Revisions in Development (3194) and Greater Municipalities (3030) Laws, and Law 4650.

6. Open Space Scarcity Risks

Scope: If open areas (green, car-park, sports-fields, etc.) are not of sufficient size, not in proximity to residential districts, and are not appropriate for the emergency requirements, than scarcities prevail and so do Deficiency Risks; The distribution of available and appropriate open areas is investigated in relation to densities and pattern of built up areas;

Problems: High density residential districts are deprived of open spaces; Over-fragmented nature of open spaces and green areas; No specially designated and designed space for emergencies; Low level of maintenance and control;

Risk Management: Increasing the ratio of open spaces by combining existing ones; Reduction of densities in high risk areas; Vacating land to create continuous strips of open space between major land-uses; Avoiding development and removing existing buildings in river beds, potential land-slide and liquefaction areas; Facilitating local community use and control; Provision of bands of open spaces along major roads, regional car-parks, and heliports;

Responsible Bodies: MMI, municipalities, NGOs, LCAs;

Proposals: Preparation of local 'Open Spaces Implementation Plan' by special task groups of MMI and municipality planners and representatives of LCAs and NGOs in view of a 'Macro Open Spaces Policy'; Ordinary and emergency uses of each plot of open space will be determined by the implementation plan; Designation of open spaces to LCAs; Provisions in rapid compulsory purchase Law (4650), Changes for exchange of property and transfer of development rights in Development Law (3194), Special regulation by MMI on the standards and procedures of urban open spaces provision (3030), Changes in Flat Ownership Law (634) for LCAs.

7. Risks Related to Hazardous Materials

Scope: Urban uses that process, store, and distribute combustible, explosive, poisonous and pollutant materials are sources of further risks, the location, environment and routes of which should be separately investigated;

Problems: Unauthorized and ignorant operators; Ineffective regulatory devices and standards; Disregard of the need for contingencies, waste management and responsibilities; No supervisory system; Uncontrolled spatial spread and levels of concentration;

Risk Management: Survey and determination of enterprises that deal with hazardous materials, development of a comprehensive data base; Classification of enterprises according to the potential risk contained, and their spatial distributions; Developing a unified permit system, periodical inspections and warnings to neighboring uses;

Responsible Bodies: MMI, Governorate, Ministry of Energy, LCAs, environmentalist NGOs.

Proposals: MMI-Governorate protocol for comprehensive control over the Province; Instituting a permits and inspection system in line with EU standards and procedural constraints; Access to the spatial data-bank and transparencies in management and information; Proficiency requirements in the sector; Lists of hazardous materials as used by international organizations; Enterprises processing and/or distributing hazardous materials to share insurance costs of neighboring uses; Obligation of warning the neighbors by the enterprise dealing with hazardous material; Preparation of a special regulation by IMM (3030); Obligatory earthquake insurance of the enterprise; Changes necessary in Property Taxation (1319), and Environment (2872) Laws.

8. Vulnerabilities of Historical and Cultural Heritage

Scope: Buildings of historical and cultural significance demand special analysis of structural and other forms of risks; A priorities list of the registered stock need to take into consideration the ground conditions, historical and architectural significance of the building and its environs, the other forms of vulnerabilities the building or complex may have in the face of earthquake;

Problems: Surveys and registers are not comprehensive; Inventories and spatial information are incomplete; Scarcity of resources and experts; Unique buildings have very indeterminacies in terms of design, structure and materials;

Risk Management: Generating a priorities program taking into consideration the micro-zonation findings and ground conditions; Accomplishment of special surveys of priority buildings; Fund raising campaigns for implementation and detailed surveys;

Responsible Bodies: MMI, Ministry of Culture and Tourism, Protection Committees, universities, enterprises in the tourism and culture sector, foundations, municipalities, Governorate and NGOs, UCAET, media enterprises;

Proposals: Constituting a campaign commission with the representatives of responsible bodies based on the protocol made between responsible bodies for the joint effort; Preparation of a long-term campaign program with phases and assignments to each party; each school, facility for tourism, hotel, restaurant, etc. in the campaign will work for the promotion of their locally assigned specific heritage; Fund raising in national and international art, culture, and tourism activities; Assigning special buildings to international promoting institutions; Channeling part of archaeological expenditures and expertise to Istanbul; Organizing conferences on the issue; Preparation of a regulation in the framework of Law of Protection of Cultural and Natural Heritage (2863), and Law of Promotion of Tourism (2634)

9. Risks in Lifelines

Scope: Analysis of life-lines in terms of structure of networks, routes, service area, volume of flow, construction and materials, with reference to microzonation and ground conditions; The access network; Vulnerable points and congestion risks;

Problems: Incremental growth of networks; Fragmented nature of authority and information; Network design mistakes and bottlenecks; No contingency measures;

Risk Management: Determination of weak-spots in the systems and retrofitting; Introducing redundancy in the systems; Redesign of networks and rerouting, considering the priority positions of Emergency Facilities, and service areas; Determination of allowable risk category areas; Improvements in construction performance and quality of materials; Over-all supervision;

Responsible Bodies: MMI, municipalities, infrastructural services enterprises, LCAs, NGOs;

Proposals: Development of an integrated data-base; Formation of a Risk management team with representatives from municipalities and the Governorate; Preparation of a regulation concerning design and risk management in infrastructural systems by MMI (3030).

10. Risks in Building Stock

Scope: Evaluation of private and public buildings in their design and constructional performance; Classification of stock and assessment of retrofit feasibilities;

Problems: Great volume of unauthorized buildings; Little information on the state of building stock, and extensive structural changes; Deficiencies in public buildings and emergency facilities; Many special cases as in the case of historic buildings;

Risk Management: Determination of building robustness in relation to surveys and microzonation information; Determination of retrofitting methods feasible for the different categories of buildings; Determination of comprehensive rehabilitation and action planning areas with respect to the concentration of deficient buildings;

Responsible Bodies: MMI, municipalities and the Governorate; LCAs; NGOs;

Proposals: Surveying by visual inspection and scanning of the total stock of around a million buildings in stages and three phases; Building up a detailed spatial data-base for the building stock for multiple purposes; Developing retrofitting models for standard cases; Facilitating decisions for retrofitting with modifications in Flat Ownership Law (634); Changes in Development Law (3194) in special high risk zoning and enforcement capacities for comprehensive rehabilitation;

11. Risks Related to Emergency Facilities

Scope: Hospitals, schools/ dormitories, communications centers, fire-stations, police-quarters, major commercial centers and storage facilities, banks, and other public and private buildings that are expected to provide emergency services after the earthquake are investigated for their satisfactory functioning; Their malfunctioning imply further risks for the city;

Problems: Structural risks of the emergency facilities are beyond tolerable limits; Facility management is not geared to emergency conditions; Locational and spatial risks are high; Disregard of an integrated planning approach prevails;

Risk Management: Structural safety of emergency facilities as part of an integrated emergency plan is a first step; A second aspect is the intra-risk management within each facility; Thirdly, inter-facility management has to be reviewed as part of the integrated emergency city-plan; Fourthly, safety of location and spatial distribution of facilities with respect to predicted emergency service demand has to be evaluated, complementarities and substitutive nature of facilities verified;

Responsible Bodies: Governorate, MMI, municipalities, Ministry of Education, Ministry of the Interior; Ministry of Health, SHAT, infrastructure managing corporate enterprises; private enterprises, NGOs, media enterprises;

Proposals: A joint 'Emergency Risks Committee' of Governorate and the MMI to develop a comprehensive plan of mitigation measures for emergency; The 'Emergency Facility' status should provide priorities as in services and special infrastructural support, and special pecuniary and non-pecuniary benefits or exemptions as of tax or insurance costs; Emergency Facility status could be granted to public, or if necessary to private buildings; Production of emergency facilities system map of the city and its dissemination to citizens; Preparation of a special regulation by the MMI, specifying mitigation standards and prerogatives of the municipalities in Law 3030; other prerogatives to be provided in Property Taxation (1319); Changes in Disasters Law (7269), Law of Municipalities (1580), empowering the joint Committee; provisions necessary also in the National Health, Education, and Civil Defense Laws.

12. External Risks

Scope: These cover all possible forms of deliberate or macro accidental events or actions that would nullify the mitigation measures taken against the earthquake, or make emergency activities less effective, or inflict damages; The risks that could materialize as losses in the face of unfavorable weather conditions, or acts of sabotage or terrorism; Investigation of factors to give rise to reactionary spontaneous movements of social unrest or actions to disrupt public order;

Problems: Difficulties in prediction;

Risk Management: Security units, Governorate and the MMI regular commission meetings; Assessment of global and regional security conditions, technological advances; Worst possible scenario studies;

Responsible Bodies: Governorate, MMI, Police, Ministry of the Interior, Secret Service, Gendarmerie, General Directory of Meteorology;

Proposals: Formation of an 'Alert Group' with the representatives of responsible bodies, periodically meeting on worst possible scenario; Public awareness raising programs; Provisions to be included in the Disasters Law (7269).

13. Risks of Incapacitated Management

Scope: Investigation of risks due to incapacities of the city administrations in risk management and emergency circumstances;

Problems: Hierarchic and bureaucratic structure of administrations to defy lateral interactions; Absence of expert personnel, facilities, and equipment deficiencies of the administrations; Missing cooperative work habits, sharing of information and infrastructure;

Risk Management: Introduction of expertise of risk management to the city administrations; Reconsideration of administrative structure and prerogatives of branches;

Responsible Bodies: MMI Disaster Center (AKOM), Governorate Disasters Center, General Directory of Emergency Management of Turkey;

Proposals: Formation of MMI special task unit for risk management; Inter-operability of personnel, equipment, data-bases and information; Drawing of a protocol for cooperation with the Governorate and

municipalities; Training of IMM personnel for risk management, and use of consultants; Administrative redundancy creation for the emergency circumstances; Capacity building for employing volunteer groups, and challenging work against time; Provisions in the Disasters Law (7269), the Municipalities Law (1580), and in Local Administrations Draft Law.

LOCAL ACTION PLANNING

EMPI has envisaged a number of model-zones in its risk assessments of the Metropolitan jurisdiction area. These model-zones represent specific policy implementation preferences or biases to be followed in these areas, with respect to type of risks and potentials observed in the area. Altogether 6 different special zones could be designated within EMPI. The implementation and monitoring powers and procedures in these areas will present deviations from that of ordinary planned areas.

1. New Development Areas

Even though a surplus of housing stock could again be accounted in Istanbul, an attribute more typical of the other metropolitan cities in Turkey, marginal growth areas may have to be designated in the overall city. These should represent seismically safer pockets in the macro-form as indicated by microzonation investigations, in-fill areas efficiently employed, without infringing the precious water-basins of Istanbul region. The physical standards of design will be centrally imposed, strict supervision services are to be followed, and in organizational terms, preferably housing cooperatives with municipal partnership, (low-interest) credited by the Housing Administration. Some of this stock could be temporarily occupied, or exchanged for the condemned and evacuated housing in high risk areas.

2. Accelerated Development Areas

Seismically safe areas that could justify more intensive development in terms of existing and potential infrastructure and means of access could be designated as ADAs. This would prove still more efficient a policy if the existing lower density developments largely comprise unauthorized stock and irregular, deficient, and substandard urban environmental development. Often, developments in such areas are originally unauthorized, authorized later by some special legal provision, without necessarily improving the original standards of the buildings structurally or otherwise. If the areas are considered appropriate in terms of metropolitan transportation, several forms of incentives could be concentrated here to form special urban black-bodies, to absorb most of all metropolitan development demands. Small scale production, business and office functions, services and residential uses are expected to snowball in these areas, generate economic gravitation, and improve standards as intensive new urban sub-centers. Public infrastructural investments, facilities and rapid transportation means are provide high intensity life-lines and generate real attraction nodes. These nodes will serve to curb extensive spill of metropolitan development and generate new waves of redevelopment and rehabilitation. Special development and monitoring apparatus could be exploited here:

- Financial and administrative means to facilitate formation of development and management associations made available to property owners
- Priorities to feasible development projects with privileged development rights in funds and credits
- Municipality rights to join such associations as partners
- Powers for rearrangements in property to designate new physical shares to owners
- Powers of rapid public purchase

3. Special Risk Areas

Special powers to intervene the private and public property are essential in areas of special risks which may cover shores, downstream valleys of dams, areas subject to liquefaction and landslides.

- Evacuation and transfer of public buildings and urban facilities

- Obligatory structural and safety investigations in private property
- Provision of options to owners of property declared unsafe, and enforcement of exchange of property, TDR, removals, retrofitting, constraints in use, annual occupation permit obligations, etc.

4. Historical and Cultural Areas of Significance

Areas, buildings and monuments under obligatory protection of Law are surveyed and listed by the Ministry of Culture and the local commissions. These need special treatment for their safety structural and otherwise. Apart from the official obligations, EMPI recommends that every local institution like schools declare a special relation to such buildings in their district, and develop activity programs for sustainable supervision and fund raising. Facilities like hotels, restaurants, shopping malls, etc. are also expected to join and spearhead such campaigns of protection and promotion in their tourism services. Those who actively contribute to such campaigns will be supported by the Ministry and the MMI.

5. General Safety Improvement Incentives in Buildings and Urban Environment

A number of incentives and enforcement tools are identified in EMPI for the improvement of safety standards in general:

- The article 39 of the Development Law should be revised to provide powers of direct intervention in the case of structural vulnerabilities
- Majority decisions should be sufficient for retrofitting or redevelopment in blocks of flats in areas declared “highly vulnerable”. In all other areas, a ‘qualified majority’ will be required for the same purposes, rather than the current condition of consensus.
- Minor infringements of the Development Code should be tolerated in the case of measures to retrofit existing buildings, as in the case of ground floor expansions to carry building protrusions
- Online surveillance of unauthorized building activities and immediate removal powers should be upgraded
- Public provision of local car-parks and open spaces in blocks of plots to encourage collective retrofitting operations

6. Comprehensive Rehabilitation Areas

Areas of high vulnerabilities either due to their seismic properties or deficient building stock contents could be designated for Comprehensive Rehabilitation. Responses for the improvement of safety levels in such areas could not be confined to individual buildings but will be determined according to the economies and purposes of the urban operation. This would often imply the total re-planning and re-design of the area, public reinvestments in infrastructure, organization of local residents, procuring financial means, rearrangement of properties, provision of special development rights, removal or retrofitting of buildings, etc. Such comprehensive action is especially relevant in areas where individual building retrofitting is economically unfeasible or possible. Here, all possible forms of development tools and financial incentives are necessary to accomplish a full-scale transformation of the area without necessarily however generating social processes of ‘gentrification’:

- Greater development rights could be granted for buildings that need be demolished for structural, economic, or planning reasons.
- Powers of to compel owners form partnerships for coordinated redevelopment and management of property, and give incentives to owners to participate in such organizations.
- Provision of legal measures to enable the ‘majority’ of owners in a specific locality, establish partnerships for carrying out redevelopment action.
- Enhancement of property values with the introduction of public facilities and provision of credits and subsidies for local social development projects
- Introduction of revisions in the Development Law concerning rearrangement powers of the municipalities.

- Rapid compulsory purchase and compensation
- Introduction of annually renewable use permits in high risk areas

It is particularly the latter cases of Comprehensive Rehabilitation and Local Action Planning that programs and know-how need be developed in Turkey. Pilot studies in Istanbul must concentrate on such cases of social and physical upgrading. A model of project preparation procedures is proposed within EMPI as reproduced here. Implementation in such areas particularly require new forms of public intervention. Comprehensive Rehabilitation and Local Action Planning in various scales is not only a requirement of the safe city, but a general need in the Turkish city throughout the country. Therefore methods and tools developed for the purpose in Istanbul will find way in most of urban practice for the coming decades.

Local Action Planning demands proactive, direct communications with the local residents and interests. Local Information, Surveying and Planning Offices are part of such interactive planning, an approach that has no precedents in this country. Such practice will help residents express their needs and expectations and enable them participate in decisions concerning their environment. Such planning efforts are likely to cover activities to:

- Identify high risk areas and publicly declare the microzonation maps of the area
- Prepare local physical and social data-base
- Formally condemn the high risk buildings
- Prepare comprehensive social and physical development projects
- Establish partnerships for comprehensive redevelopment
- Encourage Local Community Administration and participation
- Program public investments
- Develop other legal-financial implementation tools

Institutional And Legal Provisions

EMPI has introduced a set of administrative and legal recommendations. These proposals even if expressed in the various parts of the reports could be grouped in three fundamental areas:

- Administrative and Organizational Issues
- Physical Planning and Property Rights
- Resources Generation and Management

More specifically these are either related with existing laws, or proposed as new regulations attached to these laws. A list of such recommendations are listed below indicating what specific laws have to maintain what kind of functions:

DEVELOPMENT LAW

- Obligation of preparing Micro-Zonation Maps
- Obligation of preparing Contingency Plans
- Powers of Project Area Management
- Extending the operational content of Articles 18. & 39. of the Development Law
- Partnership Model for Rehabilitation
- Development Right Transfer or Exchange
- Obligation to protect documents

OBLIGATORY EQ INSURANCE

- Separate Pool for Mitigation investments
- Retrofitting of Public Buildings

Municipal role in the adoption of insurance policies and eligibility to credits

PROPERTY TAXATION

Enhanced tax rates for high risk buildings

Deductions from insured and subervised buildings

LAW OF DEEDS

Registration of property in high risk areas, buildings constructed under supervision, retrofitted buildings

Rapid public purchase of property in areas of high risk

New Regulations:

Microzonation reports and mapping and their use in Plan preparation; standards in building technical infrastructure

Safety in building furnishing; Safety standards in Urban Risk Sectors

Others:

Other provisions in Laws 1580, 3030, supervision of plans and buildings, terms of proficiency, training

Formation of Local Community Administrations

Project Packages of the Istanbul Contingency Plan

SP1. RISKS RELATED TO URBAN PHYSICAL PROPERTIES

SP1.A. Macroform Risk Analyses and Management

SP1.B. Risks Related to Urban Physical Texture Properties and Mitigation

SP1.C. Risks Related to Incompatible Urban Uses and Risk Management

SP2. METHODS FOR BUILDING STRUCTURAL SYSTEM ANALYSES AND RETROFITTING

SP2.A. Preparation of Training Materials for Technical Personnel to Carry Out I. and II. Phase Assessments

SP2.B. Training of Personnel to Carry Out I. and II. Phase Assessments

SP2.C. I. and II. Phase Data-Base Design, Data Processing and Evaluation

SP2.D. Preparation of Training Materials for Engineers to Carry Out Retrofitting Supervision

SP2.E. Training of Engineers to Carry Out Retrofitting Supervision

SP3. RISKS IN LIFE-LINES

SP3.A. Risks in the Macro Level Transportation Network and Mitigation Methods

SP3.B. Risks in the Macro Level Infrastructure Networks

SP4. RISKS OF LOSS OF PRODUCTIVE CAPACITIES

SP4.A. Analyses of Types, Causes, and Impacts of Loss Distributions in Industry

SP4.B. Local and Sectoral Cooperation for Mitigation of the Industrial Units

SP4.C. Training of Industrial Managers for Mitigation in Production Processes

SP4.D. Training of Labor for Workplace Mitigation

SP4.E. Material Incentives Opportunities and Needs for Mitigation

SP4.F. Training and Support of Labor for Residential Safety

SP5. RISKS IN HISTORICAL ENVIRONMENTS AND HERITAGE, AND RISK MANAGEMENT

SP5.A. Design and Management of a Campaign for the Preparation of the Istanbul World Cultural and Historical Heritage to Earthquakes

- SP5.B. Improvement of the Spatial and Digital Data-Base of Cultural Heritage in İstanbul
- SP5.C. Risk Assessments in the Individual Historical Buildings
- SP5.D. Design and Management of the ‘İstanbul Heritage Repossession Campaign’ of Elementary and other Schools Activities Component
- SP5.E. Design and Management of the programs concerning the tourism sector of the ‘İstanbul Heritage Re-possession Campaign’ with local assignments of specific heritage to hotels, restaurants, etc. participating in the campaign

SP6-8. MANAGEMENT OF SPECIAL RISK AREAS

DAMS AND DOWNSTREAM BASINS

SP6.A. DESIGN EXAMINATION OF THE EXISTING DAMS FOR THE PROBABLE EQ

SP6.B. DEVELOPING DAM DAMAGES AND FLOODING SCENARIA, FEASIBILITY AND CBA OF ALTERNATIVE COURSES OF ACTION

SP6.C. Risk Management and Planning in Downstream Basins

SP6.D. Investigation of Viaducts in Downstream Basins

SP6.E. Improvement of river-beds in Downstream Basins

SP6.F. ENFORCEMENT OF LAND-USE CONSTRAINTS AND TRANSFERS IN DOWNSTREAM BASINS

SP6.G. Removal of Emergency Facilities and Public Buildings in Downstream Basins

SEASHORE STRIPS

SP7.A. Probable Subsurface Landslide Areas

SP7.B. Determination of Tsunami Impact Areas

SP7.C. Protection of Vessels and Passengers at Sea

SP7.D. Safety of Public Buildings and Emergency Facilities at Seashore

SP7.E. Infill areas at Seashore Landslide, Liquefaction and Flooding Area

SP8.A. PLANNING AND LONG-TERM MEASURES IN AREAS SUBJECT TO LANDSLIDE, LIQUEFACTION AND FLOODING

SP8.B. LIQUEFACTION IN RIVERBEDS AND DEVELOPMENT OF GREEN BELTS

SP9. RISKS OF HAZARDOUS USES

SP9.A. Identification and Management of Risks Related to the Distribution of Hazardous Materials

SP9.B. Risks in Petrol and LPG Stations and Access Roads

SP9.C. Fire Station Locations and Distribution of Fire Potential in the Metropolitan Area

SP10. EMERGENCY FACILITIES

SP10.A. Identification and Management of Risks in Emergency Facilities Related to Structural Capacities

SP10.B. Identification and Minimization of Risks Related to the Management of Emergency Facilities

SP10.C. Identification and Management of Risks in Emergency Facilities Related to Location

SP10.D. Medical Services for Emergency

SP11. OPEN SPACES

- SP11.A. Development of Urban Open Spaces System
- SP11.B. Identification of Principles for the Design and Development of EQ Parks
- SP11.C. Design and Implementation of Continuous Open Space Bands along Circulation, Infrastructure and Buffer Zones

- SP12. PROMOTION OF ISTANBUL EARTHQUAKE MASTER PLAN
- SP12.A. Determination of Activities, and Preparation of Dissemination Materials
- SP12.B. Conduct of Campaigns
- SP12.C. Evaluation of Campaign Results
- SP12.D. Preparation of a Program and Related Material for International Campaigns

<i>SP12.E. Formation and Conduct of Municipal Follow-Up Committee for Risk Management</i>
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<i>Project Packages for Local Action Plans</i>
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- EP1. PREPARATION AND IMPLEMENTATION OF LOCAL ACTION PLANS
- EP1.A. Organization, Task Modules, and Procedures in Local Action Plans
- EP1.B. Investigation of Local Ground Conditions
- EP1.C. Compilation of Infrastructure Data
- EP1.D. Social and Economic Data Compilation
- EP1.E. Household and Land-Use Surveys
- EP1.G. Principles and Procedural Rules for Action Plan Implementation

- EP2. BUILDING STOCK EVALUATION
- EP2.A. Compilation of Building Properties by means of I. Stage Street Observations, and Evaluation
- EP2.B. Compilation of Building Properties by means of II. Stage Surveys in the Interiors, and Evaluation
- EP2.C. Detailed Analyses of Most Vulnerable Buildings Identified
- EP2.D. Preparation of Retrofitting Projects for Buildings Identified and Supervision
- EP2.E. Retrofitting Activities and Supervision

- EP3. FACILITATING LOCAL COMMUNITY PARTICIPATION AND ORGANIZATION IN DISASTER MANAGEMENT
- EP3.A. Preparation of Educational Materials
- EP3.B. Training of Facilitators for Instituting Community Participation
- EP3.C. Application of Community Participation Action Plans

- EP4-5. PROJECT PACKAGES FOR COMMUNITY EDUCATION AND PARTICIPATION
- Community Education: Basic Awareness Raising*
- EP4.A. Preparation of Educational Materials
- EP4.B. Training of Trainers
- EP4.C. Implementation of Community Education
- EP4.D. Monitoring and Evaluation of Community Education
- Training of Lay Audience: Practical Training for the Volunteers*
- EP5.A. Preparation of Training Materials
- EP5.B. Determination of Trainers, Their Training and Certification
- EP5.C. Training of the Volunteering Citizens
- EP5.D. Evaluation of the Volunteer Citizen Training

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Figure 1

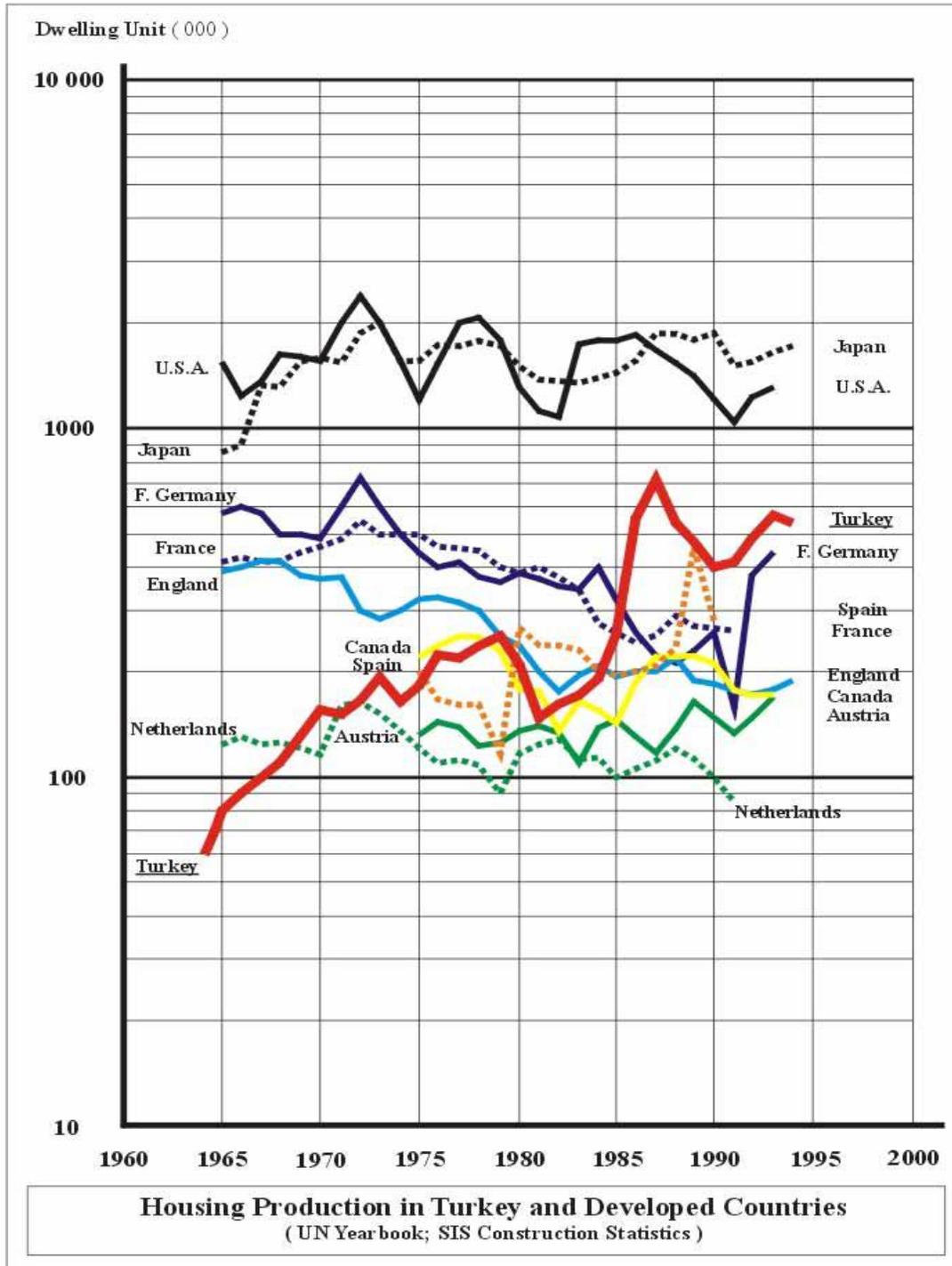


Figure 2

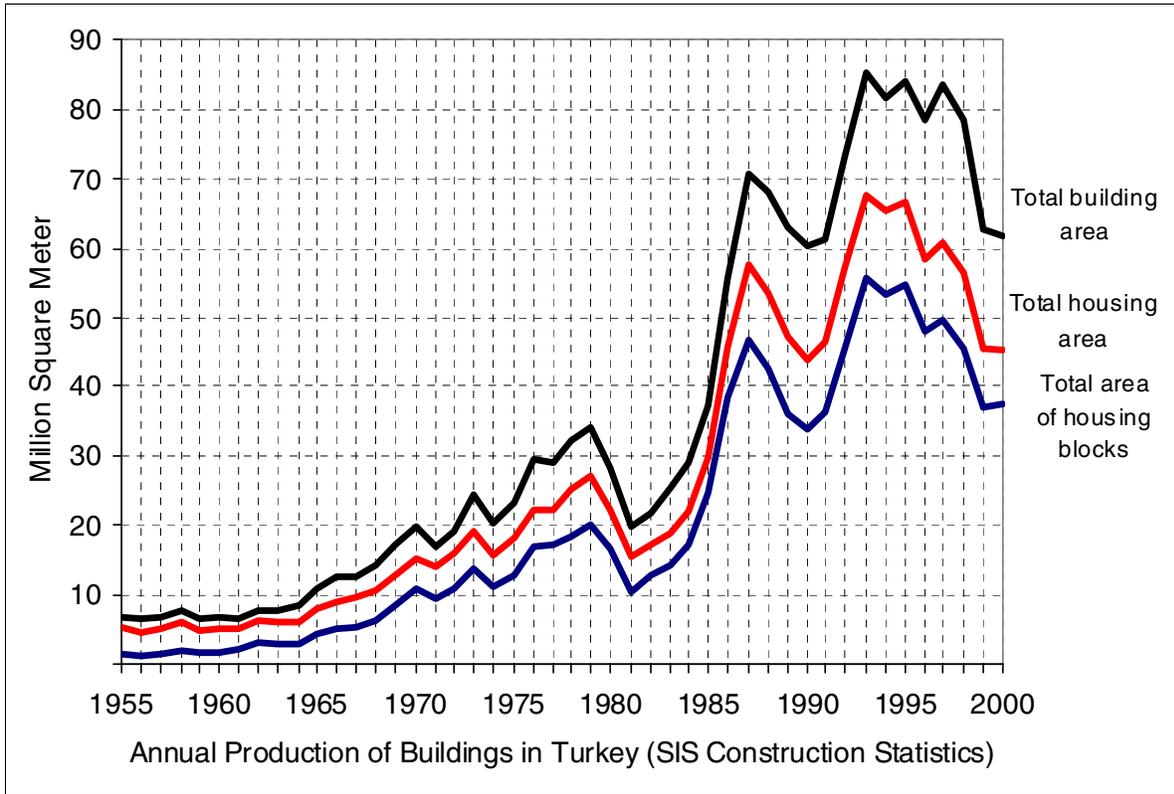


Figure 3

HOW TURKEY WASTED ITS RESOURCES IN THE EARTHQUAKES OF 1999

