ASPECTS OF URBAN SEISMIC RISKS:
A COMPARISON OF RISK FACTORS IN THE METROPOLITAN CITIES OF TURKEY

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ASPECTS OF URBAN SEISMIC RISKS:
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ABSTRACT

ASPECTS OF URBAN SEISMIC RISKS:
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Chronic seismic hazards and resulting secondary impacts are due to the geological conditions of Turkey and the nature of current response mechanisms. Local know-how of building and settlement that evolved over centuries eroded with the growth in population, and the introduction of reinforced concrete building economics. This makes cities the most vulnerable geographical and social entities in Turkey.

A basic formal reference of disaster management is the National Seismic Hazard Map indicating zones of hazard probabilities which are directly related to different measures in construction. This is hardly a sufficient disaster policy tool however, as cities may have very different risk profiles independent from the hazard probabilities. City level risk variations are not considered in the Seismic Hazard Map.

This study intends to establish indicators for different risk levels in urban areas other then those implied by the National Seismic Hazard Map.

Apart from local morphological and geological conditions, attributes of building stock, rates of unauthorized buildings and social conditions represent vulnerability indicators and could be effective in the determination of local risk levels.

One specific description of risk levels is available in the obligatory reporting of the local authorities about the "most likely level of disaster losses". This information, as an obligatory task of the governorates represents a local assessment of the most likely disaster losses and it is available from the GDDA. The city-level statistics of building stock on the other hand are available from the Turkish Statistical Institute.

Correlation and Regression analyses are employed to determine what combinations of the independent variables might best denote city-level risks, and these may vary independently from their positions in the Hazard Map.

The research may thus generate information for a more effective disaster policy.

Keywords: Urban Seismic Risk, Disaster Policies, Mitigation Planning, Disaster Risk Management

ÖZ

KENTSEL SİSMİK RİSKLERİN BELİRLENMESİ:
TÜRKİYE BÜYÜKŞEHİRLERiNDE RİSK OLUŞTURAN ETKENLERİN KARŞILAŞTIRILMASI

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Türkiye, jeolojik konumu ve yetersiz yasal düzenlemeleri nedeniyle kronik sismik tehlikeler ve ağır sonuçları olan afetlerle karşı karşıyadır. Yapı ve yerleşimlerin inşaasında yüzyıllardır süregelen yerel teknikler ise nüfusun hızlı artışı ile yetersiz kalmıştır. Tüm bu bileşenler Türkiye'de şehirleri coğrafi ve sosyal açıdan en hassas ve zarar görebilir duruma getirmiştir.

Afet yönetiminin en temel resmi ölçütü olan ve tehlike bölgelerini içeren Türkiye Deprem Bölgeleri Haritası ise şehirlerin tehlike olasılıklarından bağımsız olarak çok farklı risk profilleri olabileceği gerçeğini dikkate almadan hazırlanmış ve birinci derece tehlike bölgesinde yer alan bir yerleşimin ikinci derece tehlike bölgesinde yer alan bir yerleşimden daha düşük risk seviyesinde olabileceği gerçeğini göz ardı etmiştir. Dolayısıyla sadece şehirlerin tehlike durumlarına göre hazırlanan bu harita hiçbir şekilde risk durumları hakkında bilgi vermemekte ve çok yetersiz kalmaktadır.

Bu çalışmanın amacı, kentsel risklerin farklı risk sektörleri, farklı doku ve yaşam çevreleri açısından incelenmesi ve kentsel riskleri tahmin edebilme yöntemlerinin geliştirilmesidir.

Yerel morfolojik ve jeolojik özelliklerden bağımsız olarak, bina stoku değişkenleri, ruhsatsız yapıların oranı ve bunların yanı sıra farklı kullanıcı gruplarının temsil ettiği sosyal değişkenler yerel risk seviyelerinin belirlenmesinde etkili olacaktır.

Risk seviyelerinin belirlenmesinde, valikler tarafından hazırlanmış olan ve Afet İşleri Genel Müdürlüğü'nde toplanan "İl Afet Planları" içerisinde yer alan deprem senaryoları ile Türkiye İstatistik Enstitüsü'nün konut ve nüfus sayımları gibi yayınlanmış istatistikleri çalışmanın ilk değişkenlerini oluşturacaktır.

Kentsel risklerin hangi bağımsız değişkenlerle en fazla ilişkili olduğu ve hangilerinin Deprem Bölgeleri Haritasından bağımsız olarak değiştiğini belirlemek için Korelasyon ve Regresyon analizleri kullanılacaktır.

Bu çalışma daha etkili bir afet politikasının oluşturulması için bilgi ve katkı sağlamayı amaçlamaktadır.

Anahtar Kelimeler: Kentsel Sismik Risk, Afetler Politikası, Sakınım, Afet Risk Yönetimi

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LIST OF ABBREVIATIONS

AHP	Analytical Hierarchy Process
CIS	Commonwealth of Independent States
EMPI	Earthquake Master Plan of Istanbul (Istanbul Deprem Master Planı - IDMP)
GDCD	General Directorate of Civil Defense (Sivil Savunma Genel Müdürlüğü - SSGM)
GDDA	General Directorate of Disaster Affairs (Afet İşleri Genel Müdürlüğü - AIGM)
GNP	Gross National Product
HAZUS	Hazards United States
IATF/DR	Inter-Agency Task Force on Disaster Reduction
ICPD	International Conference on Population and Development
IDNDR	International Decade for Natural Disaster Reduction
IFRC	International Federation of Red Cross and Red Crescent Societies
ISDR	International Strategy for Disaster Reduction
JICA	Japan International Cooperation Agency
MDG	Millennium Development Goals
MPWS	Ministry of Public Works and Settlement (Bayındırlık ve İskan Bakanlığı, 1983 - …)
MRR	Ministry of Reconstruction and Resettlement (İmar ve İskan Bakanlığı, 1958 - 1983)
MSK	Medvedev-Sponheuer-Karnik scale
NAF	North Anatolian Fault Line (Kuzey Anadolu Fay Hattı - KAF)
NGO	Non-governmental Organization (Sivil Toplum Örgütleri - STK)

OECD	Organization for Economic Co-Operation and Development
PGA	Peak Ground Acceleration
TCIP	Turkish Catastrophe Insurance Pool (Doğal Afet Sigortalar Kurumu - DASK)
TEMAD	Turkish Emergency Management General Directorate (Türkiye Acil Durum Yönetimi Genel Müdürlüğü - TAY)
TRCS	Turkish Red Crescent Society (Türk Kızılayı)
TURKSTAT	Turkish Statistical Institute (Türkiye İstatistik Kurumu - TÜİK)
UN	United Nations
UN/ISDR	Inter-Agency Secretariat for the ISDR
UNDP	United Nations Development Program
WCDR	Word Conference on Disaster Reduction
WSSD	World Summit for Social Development
WSSD	World Summit on Sustainable Development

CHAPTER 1

INTRODUCTION

1.1. Description of the Problem and Its Context

Report on Disaster Reduction prepared by the Republic of Turkey for the World Conference on Disaster Reduction in Kobe (2005) reveals that the approach in Turkey to risk assessment, risk reduction and risk mapping are deficient and remains limited due to development of regulations that can not be fully implemented (See Appendix A and Appendix B).

Accordingly, hazard maps in Turkey consist of;

1. The Earthquake Hazard Map of Turkey prepared by the General Directorate of Disaster Affairs (GDDA) of the Ministry of Public Works and Settlement,
2. Active Fault Map of Turkey prepared by the Mineral Research Institute,
3. Some regional multi-hazard mapping projects carried out by the GDDA that include landslides, rock falls, floods and snow-avalanches information in special hazard maps.

Official Earthquake Hazard Zoning Map of Turkey based on probabilistic considerations has been commissioned in 1996. The map segments the country into five macro-level regions, as determined by the statistical occurrence of seismic events.

Earthquake Hazard Zoning Map is then referred by a regulation of the 'Disasters Law' for engineering design safety of buildings, with variant design standards imposed in each region. At the micro end, information about natural conditions is once again formally requested at the individual building site as building permissions are issued by municipalities.

Seismic Hazard Map of Turkey is currently used for two purposes only. One of these is concerned with the building design standards.

Secondly, it is used as a basis for calculating insurance costs for the purchasers of obligatory earthquake insurance, the responsibility of managing the Turkish Catastrophe Insurance Pool (TCIP) entrusted with a special organization (DASK).

Both purposes could have been better served if differentiations of locations were made on risk-basis. This demands the identification of relative risk categories of risks in settlements.

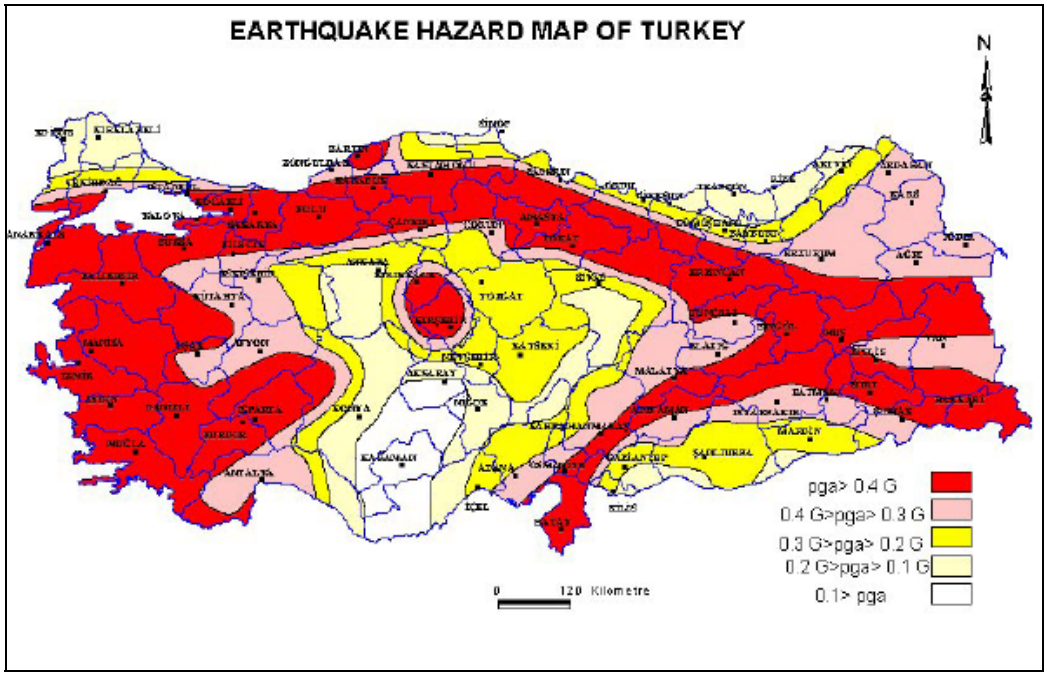

Figure 1.1 Earthquake Hazard Zoning Map of Turkey
(Source: GDDA, 1996)

The hazard map only indicates hazard exposure levels of provinces and settlements without providing any information about risk levels. Although both of these two notions represent distinct concepts, such distinction is not made in most policy orientations and hazard is often confused with the notion of risk.

Yet, two communities located in hazard-prone areas with similar physical settings cannot be described as of equal in risk if they differ in their vulnerabilities to the hazard.

Consequently, the official hazard map does not consider primary factors of risk, neither social vulnerabilities nor attributes of the building stock.

As recent international policy emphasis has focused on risks and mitigation, the issue of risk identification and measurement are the primary objectives of the study.

1.2. The Aim, Objectives and Scope of the Study

The World Conference on Disaster Reduction in Kobe provided a unique opportunity to promote a strategic and systematic approach to reducing vulnerabilities and risks to hazards. It is a guiding framework on disaster reduction for the twenty-first century.

The Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters determined five priorities for action:

1. Ensure that disaster risk reduction is a national and a local priority,
2. Identify, assess and monitor disaster risks and enhance early warning,
3. Use knowledge, innovation and education to build a culture of safety and resilience at all levels,
4. Reduce the underlying risk factors,
5. Strengthen disaster preparedness for effective response at all levels.

The primary purpose of this research is to evaluate how these priorities are served in Turkey especially; in the identification, assessment and monitoring of disaster risks, and the reduction of the risk factors.

As designated by the Kobe Conference, the key activities listed below, under the related priorities are the main points of this study which aims to contribute to the identification and assessment of disaster risks. These are;

1.Develop, update periodically and widely disseminate risk maps,

2. Develop systems of indicators of disaster risk and vulnerability at national, sub-national scales,
3. Record, analyze, summarize, disseminate, compile and standardize statistical information and data on disaster occurrence and disaster risks, impacts and losses,
4. Support the development and improvement of relevant databases,
5. Promote the application of geographic information systems, hazard modeling and prediction,
6. Establish and strengthen the capacity to record, analyze, summarize, disseminate, and exchange statistical information and data on hazards mapping, disaster risks, impacts and losses; support the development of common methodologies for risk assessment and monitoring.

With this point of view;
The aim of this research is to examine the factors that determine urban risks and establish if analysis of seismic risks in cities and living environments could be determined on the basis of a set of attributes of the building stock. The scope is to exhibit and analytically compare such factors in a sample of cities in Turkey.

1.3. The Approach and Method of the Study

In order to examine and compare urban risks in the sample of settlements and metropolitan cities of Turkey, statistical surveys and statistical analyses are used. Quantitative information about a set of attributes of settlements selected is investigated statistically to determine which of the factors contribute most to urban risks described locally.

The archives and official documents of the General Directorate of Disaster Affairs and statistics published by the Turkish Statistical Institute, like census and housing data have a leading contribution to make. These secondary sources of information help to compose the database for a series of comparisons in the risk levels of cities.

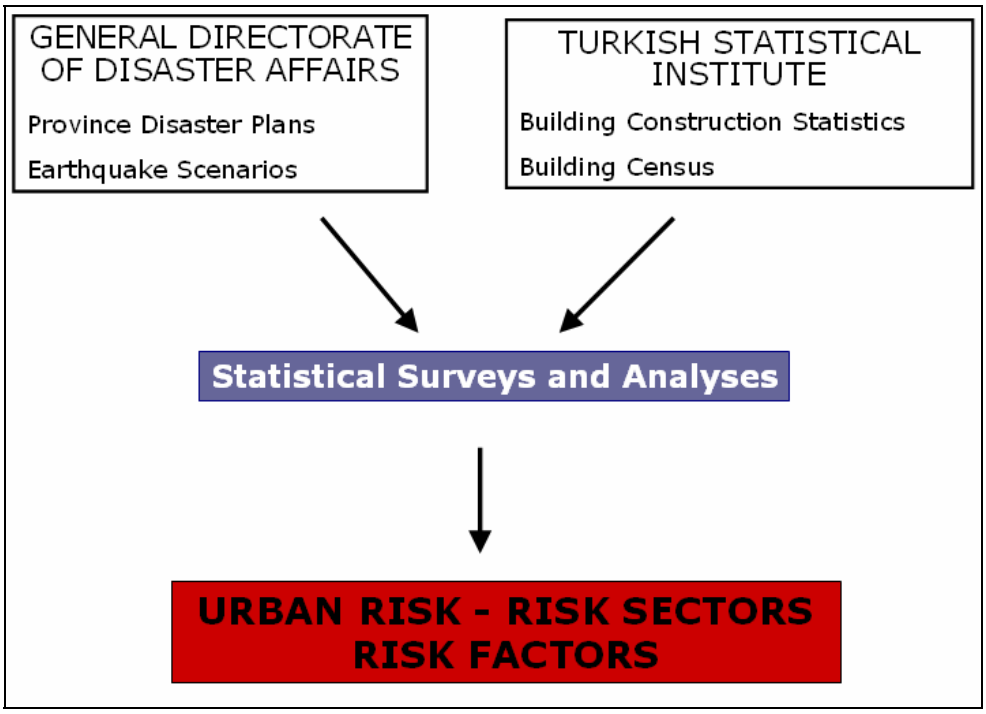

Figure 1.2 Method of the Study

In the determination of risk factors, the Earthquake scenarios identified in Province Disaster Plans, prepared by governorships in each settlement and copies of which are collected in General Directorate of Disaster Affairs provides the dependent variables of the research.

Y_{1a} Y_{1b} and Y_{1c} are dependent variables of the research and composed from the ratio of killed, injured and affected people numbers to the urban population.

$\mathbf{Y_{1a}}$ = Killed / Urban Population x 10000

$\mathbf{Y_{1b}}$ = Injured / Urban Population x 10000

$\mathbf{Y_{1c}}$ = Affected / Urban Population x 10000

Y2 is the other dependent variable of the research and composed from the ratio of destroyed, units to the building stock.

$\mathbf{Y_2}$ = Destroyed Units / Building Stock x 10000

The independent variables of the research are composed of the building stock changes and rates of unauthorized buildings and related attributes of building stock in each settlement obtained from Turkish Statistical Institute. 'Building Construction Statistics' prepared by Turkish Statistical Institute is the main book that is used within this research.

Information in the Building Construction Statistics is based on the construction and occupancy permits for new buildings by province, municipality and number of dwelling units, structural systems, materials used, and types of investors.

Independent variables of the research are;

X1 = (Floor area emergency facilities / floor area of general total) x 100

X2 = (Floor area of Apartment House / Floor Area of Residential Building) x 100

X3 = (Total Buildings subject to Amnesties / General Total of Building) x 100

X4 = Population Growth Rate (‰)

X5 = Unauthorized Building Stock Rate (%)

X6 = Rates of Stock of 3+ Store's (%)

The study is expected to provide information about the critically vulnerable assets in cities, whether this could be considered as a function of hazard-proneness, and whether or not these attributes are consistently correlated with the hazard maps of Turkey.

Otherwise, interpretations of the most effective attributes that could describe vulnerabilities best and be related to risk information in cities could be explored. Findings of such analysis could provide guiding criteria for mitigation policies in Turkey.

With this point of view, the dissemination and sustainability of findings could be very relevant for official decision-makers or the stakeholders of the research.

A brief explanation of such stakeholders is submitted in Appendix C, as described for the UN grant provided by Provention Consortium.

CHAPTER 2

RISK AND SEISMIC RISK CONCEPTS

2.1. The Concept of Risk

"The concept of risk has been defined in a fragmentary way in many cases, according to each scientific discipline involved in its appraisal. Therefore "Risk" can be defined in a number of ways according to the relevant field, specific application on situational contexts." (Cardona, 2004)

"The word 'risk' derives from the early Italian *risicare*, which means 'to dare'. In this sense, risk implies a choice rather than a fate. Activities undertaken by individuals, organizations, or governments all involve some degree of risk through choice. All activities expose people to a potential loss or gain of something they value; their health, money, career, social position, the environment, and so on." (Britton, 1998)

"Over recent years our use of the word risk has altered. Risk used to be considered, at least in part, as a conscious relationship. People could choose to "take a risk", implying an active engagement between the human subject and objective reality. Nowadays, many references to risk are prefixed by the word *at*. We are now increasingly perceived of as being *at risk* in numerous situations. This reveals and reflects a growing sense of human passivity, disconnection or impotence in the face of what are assumed to be implacable or inevitable external processes." (Furedi, 2002)

According to Wikipedia-The Free Encyclopedia, the literal use of risk can be observed to stand for;

- an unwanted and undesirable event which may or may not occur,
- the cause of an unwanted event which may or may not occur,
- the probability of an unwanted event which may or may not occur,
- the statistical expectation value of unwanted events which may or may not occur,
- the exposition to the chance of injury or loss.

In many ways we have been limited by these definitions of risk as a negative concept and risk is often used synonymously with the probability of a loss in everyday usage.

The Royal Society (1983) defined risk as the probability "...That a particular adverse event occurs during a stated period of time, or results from a particular challenge." They also state that "as a probability in the sense of statistical theory, risk obeys all the formal laws of combining probabilities".

After this definition, in 1984 Hertz & Thomas have suggested that "... Risk means uncertainty and the result of uncertainty… risk refers to a lack of predictability about problem structure, outcomes or consequences in a decision or planning situation."

Simon Priest (1990) defined risk as "the potential of losing something of value" and in 1999 Smith defined risk as a decision expressed by a range or possible outcomes with attached probabilities. When there are a range of possible outcomes but no assumed probabilities, there is only uncertainty.

From the perspective of Carreno (2006), risk requires a multidisciplinary evaluation that takes into account not only the expected physical damage, the number and type of casualties or economic losses, but also the conditions related to social fragility and lack of resilience conditions, which favor the second order effects (indirect effects) when a hazard event strikes an urban centre.

The different approaches to the risk concept according to the different disciplines or fields mainly take part in finance, insurance, statistics and scenario analysis fields. These are;

- "Financial risk is often defined as the unexpected variability or volatility of returns, and thus includes both potential worse than expected as well as better than expected returns" (Zimmermann, 2005).

- "Insurance industry defines risk as, any uncertainty about a future event that threatens your organization's ability to accomplish its mission" (Curtis, 2002).

- In statistics, risk is often mapped to the probability of some event which is seen as undesirable. Usually the probability of that event and some assessment of its expected harm must be combined into a believable scenario which combines the set of risk, regret and reward probabilities into an expected value for that outcome. (Zimmermann, 2005)

- In scenario analysis risk is distinct from threat. A threat is a very low-probability but serious event - which some analysts may be unable to assign a probability in a risk assessment because it has never occurred, and for which no effective preventive measure is available. The difference is most clearly illustrated by the precautionary principle which seeks to reduce threat by requiring it to be reduced to a set of well-defined risks before an action, project, innovation or experiment is allowed to proceed. (Zimmermann, 2005)

Although all of these definitions are acceptable, the most comprehensive and relevant definition about risk concept for our field of thesis is made by ISDR (International Strategy for Disaster Reduction) in 1994.

According to the ISDR risk is;

"The probability of harmful consequences, or expected losses (deaths, injuries, property, livelihoods, economic activity disrupted or environment damaged) resulting from interactions between natural or human-induced hazards and vulnerable conditions."

Conventionally risk is expressed by the notation;
Risk = Hazard (a probability) x Vulnerability (value of likely losses)

While, **Hazard** is a potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation,

Vulnerability is the conditions determined by physical, social, economic, and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards.

So, risk is the probability that a hazard will turn into a disaster and we can easily say that vulnerability and hazards are not dangerous, taken separately. But if they come together, they become a risk or, in other words, the probability that a disaster will happen. (Greene, 2000)

As is seen above, the risk and hazard concepts are different from each other, while “Hazard” is a property or situation that in particular circumstances could lead to harm, “Risk” is a combination of the probability or frequency of occurrence of a defined hazard and the magnitude of the consequences of the occurrence.

Accordingly, two communities located in hazard-prone areas with similar physical settings cannot be described as equal in risk if they differ in their vulnerabilities to the hazard.

Although each of these two notions represents a distinct concept, this obvious distinction between the risk and hazard concepts are not known properly and hazard is often confused with the notion of risk. This distinction, and misuses between these concepts, consists the starting point of this study.

Total risk = Impact of hazard ´ Elements at risk ´ Vulnerability of elements at risk (Blong, 1996, citing UNESCO)
"'Risk' is the probability of a loss, and this depends on three elements, hazard, vulnerability and exposure". If any of these three elements in risk increases or decreases, then risk increases or decreases respectively. (Crichton, 1999)
Risk = Hazard ´ Vulnerability ´ Value (of the threatened area) ¸ Preparedness (De La Cruz-Reyna, 1996)
"Risk (i.e. 'total risk') means the expected number of lives lost, persons injured, damage to property and disruption of economic activity due to a particular natural phenomenon, and consequently the product of specific risk and elements at risk. "Total risk can be expressed in pseudo-mathematical form as: $Risk_{(total)}$ = Hazard ´ Elements at Risk ´ Vulnerability" (Granger *et al.*, 1999)
Risk = Probability ´ Consequences (Helm, 1996)
"Risk is a combination of the chance of a particular event, with the impact that the event would cause if it occurred. Risk therefore has two components – the chance (or probability) of an event occurring and the impact (or consequence) associated with that event. The consequence of an event may be either desirable or undesirable…In some, but not all cases, therefore a convenient single measure of the importance of a risk is given by: Risk = Probability × Consequence." (Sayers *et al.* 2002)
"Risk is the actual exposure of something of human value to a hazard and is often regarded as the combination of probability and loss". (Smith 1996)
"Risk might be defined simply as the probability of the occurrence of an undesired event [but] be better described as the probability of a hazard contributing to a potential disaster…importantly, it involves consideration of vulnerability to the hazard". (Stenchion 1997)
Risk is "Expected losses (of lives, persons injured, property damaged, and economic activity disrupted) due to a particular hazard for a given area and reference period. Based on mathematical calculations, risk is the product of hazard and vulnerability". (UN DHA, 1992)

Figure 2.1 Selected Definitions of Risk from Literature
(Source: Kelman, 2003)

2.2. The Concept of Seismic Risk and Urban Seismic Risk

Seismic risk is an assortment of earthquake effects that range from ground shaking, surface faulting, and land sliding to economic loss and casualties. The probability that social or economic consequences of earthquakes will equal or exceed specified values at a site, at several sites, or in an area, during a specified exposure time.

Although the term seismic risk is occasionally used in a general sense to mean the potential for both the occurrence of natural phenomena and the economic and life loss associated with earthquakes, it is useful to differentiate between the concepts of seismic hazard and seismic risk.

Seismic hazard may be defined as any physical phenomena that result either from surface faulting during earthquakes or from the ground shaking resulting from an earthquake and that may produce adverse effects on human activities. Seismic hazard is the study of expected earthquake ground motions at any point on the earth. This is usually described in terms of 'peak ground acceleration' (pga), and secondary impacts like surface faults, liquefaction or landslides.

Urban seismic risk is a special subset of the general term seismic risk. It involves the specific problems of cities when they are subjected to earthquakes.

"Under conventional understanding of disasters, public authorities and some of the professional approaches tend to assume that cities are only agglomerations of individual buildings, and methods to achieve robust buildings would therefore suffice for seismic safety in a city. This is a misconception if not a deliberate distraction for the sake of maintaining a monopoly in mitigation on behalf of specific professional interests" (Balamir, 2007).

"Cities as distinct physical systems have their own complex functional integrity, and are subject to failure should any of the sub-components receive a natural or human-made hazard impact. Cities are vulnerable in very many different ways, and manifest a multitude of risks. Mitigation planning is a most relevant and rewarding effort therefore particularly at the level of settlements. Secondly, cities are usually managed in their totality by an authority explicitly responsible for its functioning and safety. Risk avoidance/ reduction/ sharing as part of such responsibilities are however, a recent awareness, and often an imposed obligation. These may set some of the reasons why seismic risk mitigation should be streamlined into city planning functions and must have a formal basis" (Balamir, 2007).

According to Balamir (2007), recent attempts at clarifying urban risks and methods of coping with them could be grouped in a number approaches:

(a) Urban planning services are usually demanded for the post-disaster reconstruction stages and rehabilitation works, either relocating the settlement or rebuilding it in situ. Methodological know-how is available in this area, based on case experiences and theoretical discourse (Spangle Assoc., 1991, 1997; Schwab, et.al., 1998).

(b) Turning to risk mitigation efforts prior to disasters, one basic approach seems to concentrate at macro assessments of loss. These usually focus at national level policies (Godschalk et. al., 1999). In general, most of pre-disaster management of seismic risks in settlements is either confined to engineering tactics at the individual building level, or to the simulation modeling efforts (as in the case of HAZUS) at system level (Coburn and Spence, 1992; Coburn, 1995). Both approaches rely on expert decision-making and DSS in the monitoring of city systems, rather than community action and local participatory processes (Balamir, 2007).

(c) A third category often implicitly assumes that city-level risks could be identified based on engineering concepts and tools employed in the analysis of risks in building structures. City-level risks are equated to the sum of risks of the urban building stock. The discourse to justify the approach claims that "after all it is the buildings that kill people" (Sucuoğlu, 2006). For this reason it is the robustness of buildings and life-lines in the city (engineering studies) that need be investigated, and mitigation efforts focused in these systems will suffice for the achievement of safety in the city (Scawthorn, et.al. 2006; Cozzi, Menoni, 2006 et.al.; Rosetto, 2006).

(d) Another set of pre-disaster efforts could be identified to fall closer to conventional land-use planning. Burby (1998) considers that land-use planning could provide sufficient means for mitigation by itself. It is most relevant to survey and register geological attributes of land and local geographical features to determine the hazard zones, and then the appropriate zoning of uses and designation of types of buildings for safer city development and functioning. Based on past experience, high hazard zones are avoided for residential purposes, but buildings for storage or animal husbandry could be permitted. Public buildings and emergency facilities must accordingly be allocated to less hazardous zones. Fault lines must have immediate strips of zones for total building ban, restricted zones for specific uses further away, constraints relaxed with distance. Mitigation decisions are confined to land-use impositions in this approach according to estimations of local hazards (Balamir, 2007).

(e) Cases that directly confront the problem of seismic mitigation, and intend to develop methods in comprehensive urban planning, rather than that of land-use planning tools alone, are few and recent.

Two exercises undertaken by the Columbia International Urban Planning Studio of the post-graduate program, in coordination with other research units, have been dedicated to the seismic problems of highly vulnerable cities of Caracas and Istanbul (Columbia University, 2001, 2002).

This approach does not only consider the city systems in their entirety, but develops also a multi-disciplinary framework. Main work modules of the study given in the following box reveal a more comprehensive approach than conventional land-use planning, and define the boundaries of a new form of planning practice (Balamir, 2007).

The Columbia University planning program, following a research format developed in the case of Caracas city, studied the earthquake prone Istanbul in 2002 with the intention of exploring planning and mitigation possibilities. The time and data constraints have largely constrained the Istanbul analyses, and reduced findings to a set of broad recommendations (Balamir, 2007). Yet there are a number of significant elements within the scope of the study:

1. A post-event analysis focused on a prioritization of ‘essential facilities’: (a) medical, water, transportation, shelter, communication; (b) fuel, fire, hazardous materials, electricity, food; (c) reserved space, sanitary facilities, and identified the priority of urban activities that have greater contributions as: ‘management’, SAR, ‘law enforcement/security’ (Balamir, 2007).

2. Safety implications of various macro-form alternatives were explored. Comparisons were made between centralized metropolitan growth and satellite settlements configurations. The latter was preferred, taking into consideration also the impacts of alternatives on conservation policies (Balamir, 2007).

"Elements of a Disaster Preparedness Plan for Caracas Venezuela"

- 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 Methods (zoning, early hazard warning, improvement of codes, giving incentives, reduction of fragilities, increasing resilience)
- Training Response Teams
- Communication and Education
- Distribution of Risks by Insurance

Figure 2.2 Elements of a Disaster Preparedness Plan for Caracas Venezuela (Source: Balamir, 2007)

3. A sample of neighborhoods were investigated, followed by recommendations in infrastructure improvements, urban design propositions, social policies, 'resistance action plans', regulation of building densities and restrictions, and disaster response plans (Balamir, 2007).

Even if the attempts were inconclusive in developing a methodology in mitigation planning, the approach of the Columbia University is in the necessary direction. The study is not trapped in a simple understanding of equating city-level risks solely to those of the building stock. It is not either confined to the narrow scope of conventional land-use planning. The approach considers the urban mitigation issue in terms of a multi-disciplinary attitude in its determination of hazards, specifying an array of risks, assessments of loss, and in its propositions of policies. The major deficiency in this approach lies in the implicit assumption that mitigation is a one-way technical and administrative project imposed by the local authorities. Participation methods and interactive involvement processes, which should have been the concomitant of each policy proposition, are omitted in the urban mitigation planning. Temporary public awareness-raising programs are obviously no substitutes for generating a total mobilization (Balamir, 2007).

(f) The risk analyses and urban mitigation planning approach envisaged for the Earthquake Master Plan of Istanbul (EMPI, 2003) explained in the following sections is still another alternative perhaps based on a methodology with wider implications (Balamir, 2006a, 2004, 2001a, b, 1999, 2001d).

A survey of recent attempts in city-level mitigation reveals the nature of the gaps in understanding settlement safety, and the need for the development of a systematic response to risks in urban planning (Balamir, 2007).

The city however is not just an aggregate of buildings, but a complex system comprising its own nested sets of 'risk sectors', as well as buildings of various categories to acquire different functions and priorities in the context of urban mitigation planning (Balamir, 2007).

Sectors of risk are distinctly manageable clusters of vulnerabilities at the city-level for which a coordinated action is necessary. Different levels of spatial units (national, regional, city, local) could have entirely different sets of vulnerability and risk definitions, definitely different from risks at the building level (Balamir, 2007).

As cities have their own complex functional integrity, they are vulnerable in very different ways and very different risk sectors. Risk sectors are areas of causal relations on specific risks according to Earthquake Master Plan of Istanbul (EMPI). More than a dozen of city-level risk-sectors have been identified in Istanbul. Risk-Sectors of EMPI are given below;

• Risks in Macro-Form and Growth Tendencies (settlement configuration alternatives)
• Urban Fabric Risks (building height/proximity, plots, density, roads, car-parks, etc.)
• Incompatible Land-Use Risks (buildings and districts)
• Risks of Productivity Loss (industrial plants)
• Risks in the Building Stock, Infrastructure and Lifelines
• Risks in Emergency Facilities and Lifelines (hospitals, schools, etc.)
• Special Risk Areas/ Special Buildings (landslide, flooding/historic buildings)
• Risks in Hazardous Uses (LPG and petrol stations, etc.)
• Open Space Deficiency Risks

CHAPTER 3

GLOBAL POLICY CHANGE

Over the past 30 years, disaster reduction has become an increasingly important issue on the international agenda and there has been a continuous evolution in the practice of crisis or disaster management. These bodies of practice have been known, variously, as civil defense, emergency assistance, disaster response and relief, humanitarian assistance, emergency management, civil protection, disaster mitigation and prevention, and total disaster risk management.

The risk concept became popular in the academic literature after 1990's, and the rise of risk reduction concept begs our understanding which accompanied a phenomenal quantitative growth in references to risk.

3.1. A Brief History of Global Disaster Management Process, Risk Assessment and Reduction Approaches

UN Conference on the Human Environment in 1972 in Stockholm, Sweden was the first occasion that attention was drawn to the concept of "Risk" and the need for international cooperation to achieve this. Therefore, the Conference in Stockholm is accepted as the starting point of the International Disaster Management Process within the study.

Subsequent to the Conference in Stockholm, United Nations convened the Habitat I Conference in Vancouver, Canada-1976, Conference on Environment and Development in Rio de Janeiro, Brazil-1992 and International Conference on Population and Development (ICPD) in Cairo, Egypt-1994.

Following this idea, a series of declarations of interest and determination to reduce risks have taken place at the international context (Balamir, 2005).

These are; World Summit for Social Development in Copenhagen, Denmark-1995, Habitat II Conference in Istanbul, Turkey-1996, Millennium Declaration and Development Goals-2000, World Summit on Sustainable Development Johannesburg-2002

An increase in human casualties and property damage in the 1980's motivated the UN General Assembly in 1989 to declare the 1990's the International Decade for Natural Disaster Reduction (IDNDR).

During the 1990's, stimulated by the IDNDR, many researches dealing with risks and disasters were developed around the world. The topic gained importance and it is being increasingly recognized that the terms hazard, vulnerability and risk have had different meanings and implications from both the methodological and practical angles (Cardona, 2004).

In 1999, UN decided to continue the activities on disaster prevention and vulnerability reduction carried out during the IDNDR. It thus established the International Strategy for Disaster Reduction (ISDR), which is supported by the scientific and technical expertise and knowledge accumulated during the IDNDR.

Subsequent to IDNDR, World Conferences on "Risk Reduction" in Yokohoma, Japan-1994, Toronto, Canada-2004 and Kobe, Japan-2005 have extended and sharpened this awareness about natural hazard risks and efforts of risk reduction on global agenda.

The Yokohama Strategy for a Safer World and its Plan of Action was a cornerstone point of reference for disaster reduction, comprising a range of commitments and identifying specific activities that have since served as an international blueprint in the field (Briceno, 2004). The Yokohama Strategy sets guidelines for action on prevention, preparedness and mitigation of disaster risk.

The Yokohama Strategy for a Safer World and its Plan of Action stressed that; "... each country has the sovereign responsibility to protect its citizens from the impact of natural disasters" and adopts the following ten principles;

1. "Risk assessment is a required step for the adoption of adequate and successful disaster reduction policies and measures.

2. Disaster prevention and preparedness are of primary importance in reducing the need for disaster relief.

3. Disaster prevention and preparedness should be considered integral aspects of development policy and planning at national, regional, bilateral, multilateral and international levels.

4. The development and strengthening of capacities to prevent, reduce and mitigate disasters is a top priority area to be addressed so as to provide a strong basis for follow-up activities to the Decade.

5. Early warnings of impending disasters and their effective dissemination are key factors to successful disaster prevention and preparedness.

6. Preventive measures are most effective when they involve participation at all levels from the local community through the national government to the regional and international level.

7. Vulnerability can be reduced by the application of proper design and patterns of development focused on target groups by appropriate education and training of the whole community.

8. The international community accepts the need to share the necessary technology to prevent, reduce and mitigate disaster.

9. Environmental protection as a component of sustainable development consistent with poverty alleviation is imperative in the prevention and mitigation of natural disasters.

10. Each country bears the primary responsibility for protecting its people, infrastructure, and other national assets from the impact of natural disasters" (UNISDR, 1994).

The World Conference on Disaster Reduction (WCDR) in Kobe 2005 presents a milestone opportunity to bring together local, national and international decision-makers active in social and economic development and environmental management; disaster risk managers and practitioners; civil society; and community groups, setting a new international agenda to build disaster-resilient communities (Briceno, 2004).

The WCDR in 2005 has the following five specific objectives;

1- " To conclude and report on the review of the Yokohama Strategy and its Plan of Action, with a view to updating the guiding framework on disaster reduction for the twenty-first century;

2- To identify specific activities aimed at ensuring the implementation of relevant provisions of the Johannesburg Plan of Implementation of the World Summit on Sustainable Development (WSSD) on vulnerability, risk assessment and disaster management;

3- To share good practices and lessons learned to further disaster reduction within the context of attaining sustainable development, and to identify gaps and challenges;

4- To increase awareness of the importance of disaster reduction policies, thereby facilitating and promoting the implementation of those policies;

5- To increase the reliability and availability of appropriate disaster-related information to the public and disaster management agencies in all regions, as set out in relevant provisions of the Johannesburg Plan of Implementation" (UNISDR, 2005).

With this point of view, the examination of the risk and seismic risk concepts with an overview of current understanding and the evolution of the subject from its academic and scientific beginnings to its political implications in the realm of sustainable development of today constitutes one of the most important points of the study.

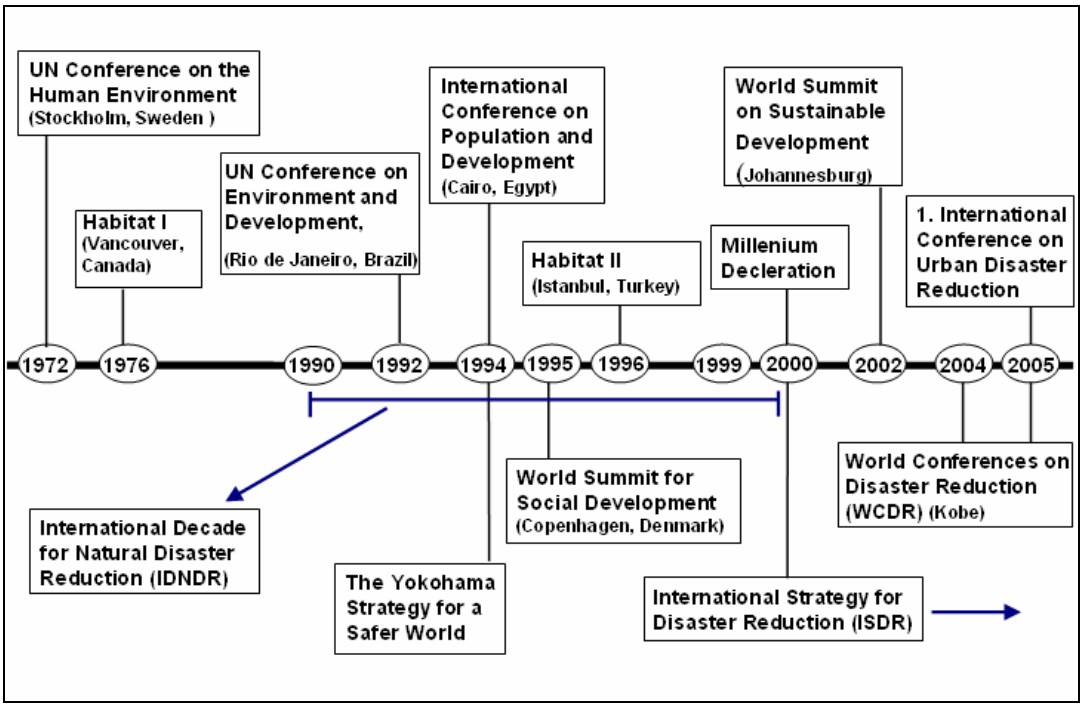

Figure 3.1 Chronology of International Disaster Management Policy Development Process

3.2. The Kobe Conference Framework for the Assessment of the current status of National Disaster Reduction Policies

The World Conference on Disaster Reduction was convened in Kobe, Japan in 2005. National authorities and platforms on disaster reduction were invited to provide information to identify needs and develop future policy recommendations for consideration at the Conference.

ISDR requested governments to provide a national reporting and information on disaster reduction, which encouraged national authorities and platforms for disaster reduction to provide information, to identify needs and elaborate policy recommendations for the preparatory process of the WCDR.

The guidelines, provided by the secretariat of the ISDR to facilitate the preparation of the national information, described a reporting structure based on the components and priority areas specified in the ISDR / UNDP “Framework for disaster risk reduction for guidance and monitoring”.

The following themes serve as a core set of principles to understand, guide and monitor current status of disaster risk reduction and therefore provide a common basis for consolidated observations: (see Appendix A)

1. Political Commitment and Institutional Aspects;
2. Risk Identification;
3. Knowledge Management;
4. Risk Management Applications and Instruments;
5. Preparedness and Contingency Planning (UNISDR, 2005).

This section provides an overall summary of countries' views and activities on disaster risk reduction, followed by more detailed preliminary observations based upon the five main components mentioned above.

The information provided by countries served as one of the main inputs for the "Review of the Yokohama Strategy and Plan of Action for a Safer World. The original national reports submitted by countries are available in the UN/ISDR website under country information. Information Reports on Disaster Reduction prepared by the governments for the WCDR reveals the approaches of 113 countries to risk assessment, risk reduction and risk mapping.

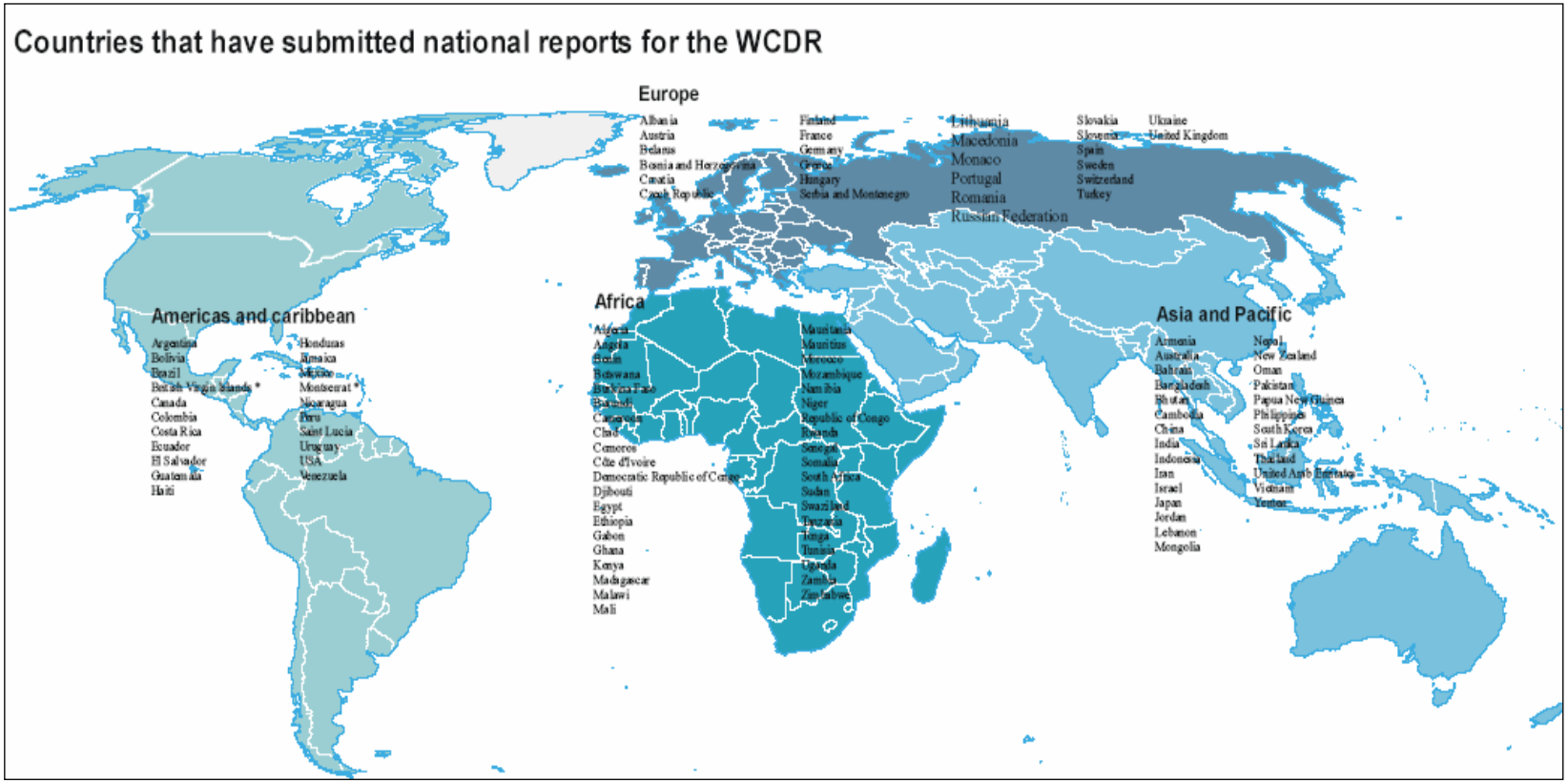

Figure 3.2 Countries that have submitted national reports for the WCDR

(Source: UNISDR, 2005)

According to the distribution by income groups of countries that have submitted national reports for the WCDR; the highest number of participation is from middle income countries with 34 % and the lowest number of participation is from high income countries with 16 %.

Turkey is in group of middle income countries that have the highest number of participation.

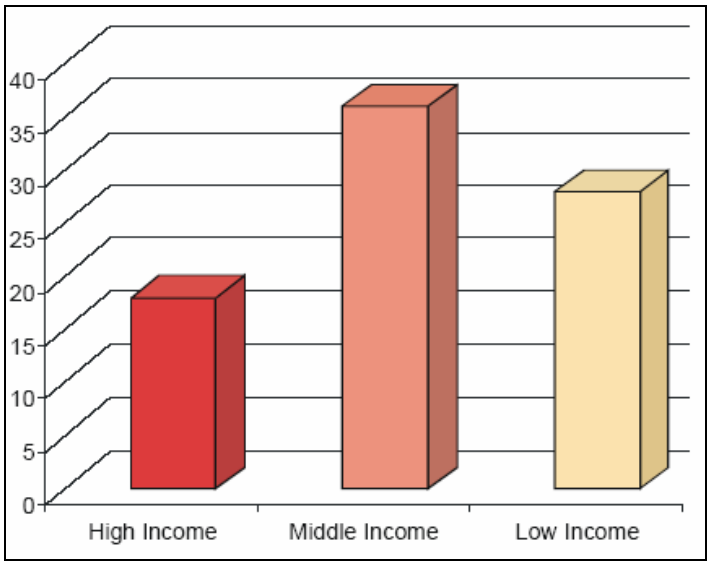

Figure 3.3 Distribution of national reports by income groups
(Source: UNISDR, 2005)

The more detailed preliminary observations based on five main components expressed in the ISDR/UNDP policy framework to understand, guide and monitor current status of disaster risk reduction is provided below.

3.2.1. 'Political Commitment and Institutional Aspects'

The role of political commitment as an essential ingredient for sustained risk reduction efforts is recognized by a significant number of countries.

Existing legislation in the form of decrees and laws, national policies or strategies were cited by over three quarters of the countries, although less frequently have these yet related in the context of National Policies (UNISDR, 2005).

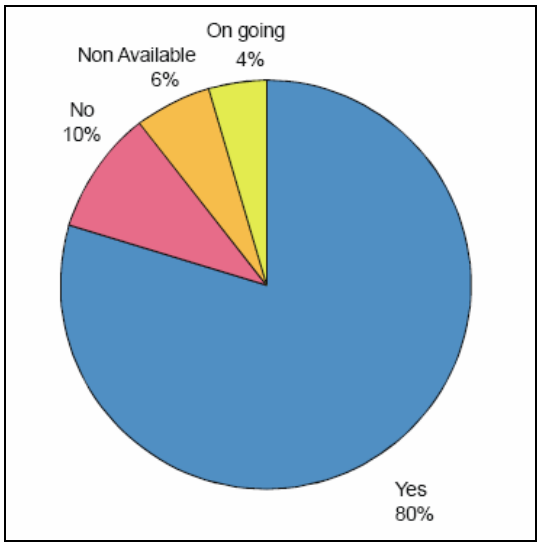

Figure 3.4 Percentage of countries reporting on decrees-laws, national policies, strategies (Source: UNISDR, 2005)

National bodies for the realization of multi-sectoral coordination are very much reflected in the high majority of the countries' information. A range of good practices was offered on this issue particularly from Austria, Canada, Israel, Slovenia and Sweden. (UNISDR, 2005)

Disaster reduction and development

Although statistical projections provide an encouraging indication of disaster risk reduction being integrated into development plans, a significant number of countries neither stated nor denied this integration process. (UNISDR, 2005)

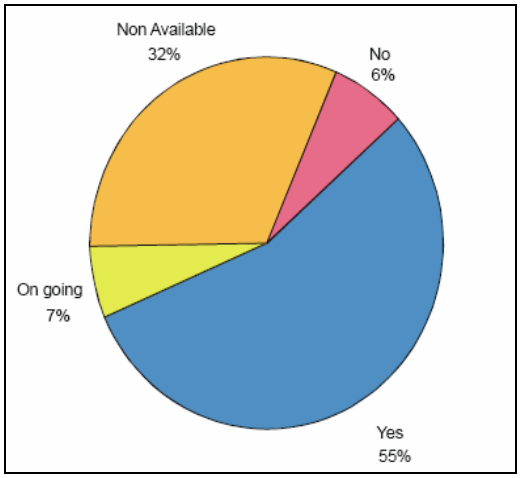

Figure 3.5 Percentage of countries incorporating risk reduction in sustainable development plans

(Source: UNISDR, 2005)

People-centered and community-based approaches

Community actions and public participation are recognized as successful factors to advance risk reduction measures. Overall, national responses offered a good variety of success stories and initiatives. Local community involvement has succeeded in providing indispensable support to those needing help. Good examples of this were found in India, Iran, Turkey, Latin America and the Caribbean after the occurrence of earthquakes. (UNISDR, 2005)

The private sector has generally been less involved in the national picture of disaster risk reduction compared to community initiatives. Nonetheless, Japan, among others, provided an example of integration of the private sector. (UNISDR, 2005)

3.2.2. 'Risk identification, assessments, monitoring and early warning'

Hazard mapping, vulnerability assessments and monitoring

Many countries stated that hazard mapping resulted from government collaboration with scientific agencies, academic and research institutions both at central and local levels. Vulnerability and capacity assessments were often mentioned as the result of joint efforts.

Some national information particularly from African countries indicated that annual assessments are undertaken, often jointly by the Governments, United Nations, NGOs and in a fewer cases private sector. (UNISDR, 2005)

Monitoring and risk mapping were a constant factor in countries' reported approaches to disaster risk reduction although different levels of implementation are currently being realized in various countries. In some cases, as in Nicaragua, national monitoring mechanisms are linked to regional ones by the use of sophisticated satellite technology. Some countries indicated the importance of expanded levels of monitoring and risk mapping from a national level to a regional one as a coherent development and improvement of national monitoring and risk mapping. (UNISDR, 2005)

Systematic socio-economic and environment impact and loss analysis

More than half of the countries reported efforts in the creation of socio-economic and environmental impact loss analyses. In many instances though such analyses were reserved mostly for major disasters and adhoc hazards, highlighting the necessity of applying a more systematic approach to the issue. Reports that have highlighted this necessity include those provided by Bangladesh, Brazil, Colombia, Ghana, Macedonia, Romania and Turkey. (UNISDR, 2005)

Early Warning Systems

In such countries as like British Virgin Islands, Ethiopia, Mauritius and some other small island developing states, accomplishments have been expressed regarding more effective early warning systems. Others have specifically referred to the growing need and evident application for early warning systems in relation to technological hazards, in particular CIS countries and Europe. (UNISDR, 2005)

3.2.3. 'Knowledge management'

Information management and academic research as common links to national-local institutions

Some good examples of information databases were indicated as being available at country level and internationally through the web, provided by, among others, Nicaragua, Russia and Switzerland. Although progress with regard to information databases was found to be encouraging in many cases there is no systematic approach to the issue (UNISDR, 2005).

Good examples are provided by, among others, in the CIS countries' Interstate Program of Joint Scientific-Technical Investigations and in the Caribbean Disaster Emergency Response Agency. In some cases information among countries is exchanged on a regular basis particularly in relation to certain hazards. (UNISDR, 2005)

Education Programs and Training

More than half of the countries reported having some form of education program related to disaster risk reduction in the school system. This overall encouraging situation is put into practice by a great variety of educational initiatives, although in many cases they simply express security procedures in the schools' immediate environment. (UNISDR, 2005)

Most of the countries report having some form of schooling informative sections running from elementary school up to high school level. In many occasions, disaster awareness was not specifically categorized as a subject in its own right but rather it was integrated into science subjects. (UNISDR, 2005)

Quite a few countries are reporting currently undergoing an update review process in their educational material. The general perception of the ongoing revisions is that disaster risk reduction might be integrated with the often still predominance of specific emergency-related educational material. (UNISDR, 2005)

In a few cases, disaster risk reduction oriented university degrees or a PhD, are available as in Morocco, Sweden and Switzerland. Educational material has been reported in a few cases as joint initiatives between ministries of education and specialized commissions dealing with disaster risk reduction issues. The number of actors involved in the preparation of educational material seems to be varying with the involvement of specific multi-agencies committee in a few cases. (UNISDR, 2005)

In a minority of cases, legislation will specifically address public education strategies on the subject. In New Zealand, for instance, Civil Defense Emergency Management Public Education Strategy and a multi-agency Committee overviews the development of initiatives on the subject. (UNISDR, 2005)

Different types of training programs are reported as being available in the majority of the countries but the information has equally been matched by calls for strengthening training capacities.

The Government and technical staff related to disaster risk reduction benefit from training in the subject both at national and local levels although training is still in need of more systematic approaches. In some cases National Disaster Centers and technical bodies organize training aimed at civilians with the involvement, occasionally, of NGOs and Local Government Unit. Overall it should be highlighted that training is almost exclusively focused on disaster preparedness and response. (UNISDR, 2005)

Traditional indigenous knowledge

The importance of traditional knowledge is visible in the national information, however it is not systematically reflected in the use of traditional mitigation and coping practices as a means of achieving greater community self-reliance in dealing with disaster. (UNISDR, 2005)

Generally, traditional knowledge is widely mentioned by African, Asian and Pacific countries. In High-Income OECD countries, in Europe and in the CIS, traditional knowledge is acquired from training initiatives, consultation processes and the specific collection of information contrary to Africa, Asian and Pacific, circumstances in which traditional knowledge is still passed on routinely between generations. (UNISDR, 2005)

National public awareness initiatives

The vast majority of the countries have reported some form of awareness initiatives relating to disaster risk reduction. Only a few have developed a strategy on communication and awareness specifically addressed to the spread of a prevention culture like in the case of Nicaragua and Venezuela among others. Many national information reports provided some excellent examples and ideas on public awareness. Among others, Algeria, with its "Caravanes" disseminates messages to the most remote parts of the country by theatrical representations, and Finland promotes "Children's Safety Olympics." (UNISDR, 2005)

3.2.4. 'Risk Management Applications and Instruments'

Linking Environmental Management to Disaster Risk Reduction

Examples of the creation of national strategies or legislation are provided, among others, by Bangladesh, Ethiopia, Germany, Namibia and South Korea. Community-based, networking experiences and partnership initiatives were mentioned by Austria, El-Salvador, India, Thailand and Uganda and generally from Latin America and Caribbean countries. (UNISDR, 2005)

Financial Instruments

Financial instruments are increasingly recognized as useful means for reducing risk and self-reliance in recovery. Forms of insurance, calamity funds, catastrophe bonds, and micro finance are overall utilized by more then half of the countries providing information.

The use of insurance as a tool to spread the burden of risks appears to be difficult to implement in low-income countries, particularly in Africa. Cash compensation and distribution of seeds has been adopted as a form of recovery trying to produce a temporary alternative instrument to insurance policies. In some cases insurance programs have been identified as urgent but their implementation is challenged by financial constraints. (UNISDR, 2005)

Technical measures or programs on disaster risk reduction

A large number of countries provided examples of technical measures or programs on disaster risk reduction. Technical measures such as flood control techniques, foreshore projects, soil conservation practices and earthquake resistance are among the most common examples offered. (UNISDR, 2005)

Advanced technologies are found to be in widespread use or, when missing, regarded as a necessary tool to improve risk management. Techniques related to remote sensing, information and communication technologies are mentioned quite often. Although building codes on disaster resistant constructions are recognized and in existence, it is widely known and accepted that, for a variety of reasons, they are often not enforced or adhered to. (UNISDR, 2005)

3.2.5. 'Preparedness and Effective Response'

Disaster contingency plans

The majority of countries' information refers to the existence of disaster contingency plans at both national and local levels. Civil protection seems to play an active role especially in disaster preparedness requiring specialized skills and public mobilization. Community participation in disaster preparedness and response is proved to be recognized while NGOs involvement is more predominant in low-income countries. (UNISDR, 2005)

Government emergency funds and facilities

Some forms of emergency funds or facilities are indicated in almost all the national information received. It is equally evident that low income countries have difficulties providing both emergency funds and facilities, but they express a higher presence of solidarity funds. (UNISDR, 2005)

A wide variety of specifications on the subject have been provided by national information. In a few cases as in some CIS countries, there have been specifications on solidarity funds expressed by a prescribed compulsory part of income from private sector. These funds, maintained on special companies' accounts and other legal subjects are annually transferred to solidarity funds. (UNISDR, 2005)

The previsions of government emergency funds are, in a few cases, explicitly mentioned as overcoming national dimension. Annual allocation for regional emergency management and disaster response appears to be standard practices in a few cases, among others New Zealand for the Pacific region and the Russian Federation for CIS countries. (UNISDR, 2005)

Actors responsible for Coordinating Disaster Response

National information shows a growing recognition that a well-organized disaster management system will be expressed by units representing multiple actors responsible of coordinating disaster response. (UNISDR, 2005)

An encouraging level of decentralization, expressed by local autonomy, has been indicated in many of the reports submitted. (UNISDR, 2005)

3.2.6. 'Examples of Good Practices'

About three quarters of national information provided examples of good practices with a quality that illustrates enriched social, technical, organizational and capacity patterns.

There is an even distribution of good practices conveyed in the five main components of disaster risk reduction.

These comprehensive practices suggest that accomplishments in disaster risk reduction are being pursued throughout the core principals reflecting the Yokohama Strategy and Plan of Action for a Safer World.

A similar balance is reflected in the geographical distribution and income aggregates. (UNISDR, 2005)

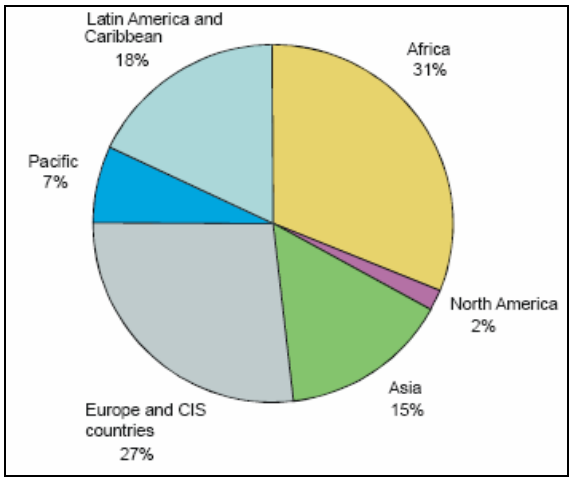

Figure 3.6 Good practices provided by countries according to main components
(Source: UNISDR, 2005)

3.2.7. Deficiencies of the National Disaster Policy in Turkey

Turkish disaster policy has mainly focused on the post-disaster period. No incentives or legislation existed to encourage risk analysis, risk mitigation or risk spreading approaches.

The conventional legal provisions and organizational habits in Turkey decisively target the post-disaster period. The 'Disasters Law' is a regulatory device primarily for 'healing the wounds' and the Development Law ignores the reality and risks of earthquakes and contains no mechanism or procedure in itself to secure environmental, building and implementation standards for mitigation control. Therefore, a double bias for post-disasters has been the dominant nature of policy in Turkey. (Balamir, 2001)

The disaster information system in Turkey need to concentrate on settlements, and this system be managed by some central authority to maintain the high standards and rigour in upkeep. Settlements under high risks have to revise their development plans according to the micro-zonation information provided, and update them as new information becomes accessible and as new assessments of risks are made based on this set of data. This should necessitate minor amendments in the Law of Organization of the Ministry of Public Works and Settlements, to set up the technical unit entitled to carry out the function. 'Integrated Disasters Maps' need be institutionalized and incorporated in the Development Law, making such maps a prerequisite for all plan preparations and revision activities which in turn need be restructured to allow greater local community participation. (Balamir, 2001)

Consequently, Report on Disaster Reduction prepared by the Republic of Turkey for the World Conference on Disaster Reduction in Kobe (2005) reveals that the approach in Turkey to risk assessment, risk reduction and risk mapping are deficient and remains limited due to development of regulations that can not be fully implemented.

Furthermore, the answers of Turkey to the questions are very optimist and not realistic. Especially the answers of the questions about risk assessment, risk monitoring, risk mapping and risk analyses.

CHAPTER 4

RISK ASSESSMENT AND DISASTER RISK REDUCTION APPROACHES IN TURKEY

4.1. Natural Disaster Profile of Turkey

Turkey is a disaster-prone country and has always been vulnerable to various kinds of natural hazards, because of its geology, topography, and meteorological conditions. These hazards, coupled with high physical and social vulnerability, have caused excessive losses of life, injury, and damage to property. (Jica, 2004)

According to the Summarized Table of Natural Disasters (Table 4.1), 139 natural disaster events occurred in Turkey since 1903 and these disasters can be classified in seven groups as earthquakes, epidemic, extreme temperature, flood, slides, wild fires and wind storms.

Table 4.1 Summarized Table of Natural Disasters in Turkey from 1903 to 2006
(Source: EM-DAT, The OFDA/CRED International Disaster Database)

	Number of Events	Killed	Injured	Homeless	Affected	Total Affected	Damage US$ (000's)
Earthquake	71	88538	92866	1160880	5620850	6874596	16096600
Average per event		1247	1308	16350	79167	96825	226713
Epidemic	8	609	0	0	204847	204847	0
Average per event		76	0	0	25606	25606	0
Ext.Temp.	6	98	150	0	8000	8150	0
Average per event		16	25	0	1333	1358	0
Flood	33	1319	211	99000	1649520	1748731	2193500
Average per event		40	6	3000	49985	52992	66470
Slides	8	591	208	185	1905	2298	0
Average per event		74	26	23	238	287	0
Wild Fires	4	13	0	350	500	850	0
Average per event		3	0	88	125	213	0
Wind Storm	9	100	139	0	13500	13639	2200
Average per event		11	15	0	1500	1515	244

91.268 people lost their lives, 93.574 people injured, 1.260.415 people become homeless, 7.499.122 people affected as a result of 139 natural disaster events in Turkey from 1903 and 2006 and the total damage of disasters is 18 billion USD.

When we examine these 139 natural disaster events, we can see that earthquakes come in the first place with 51% according to the number of events.

Other ratios of natural disasters are as follows: 23.7% floods, 6.5% wind storms, 5.8% landslides, 5.8% epidemics, 4.3% extreme temperature and 2.9% wild fires events.

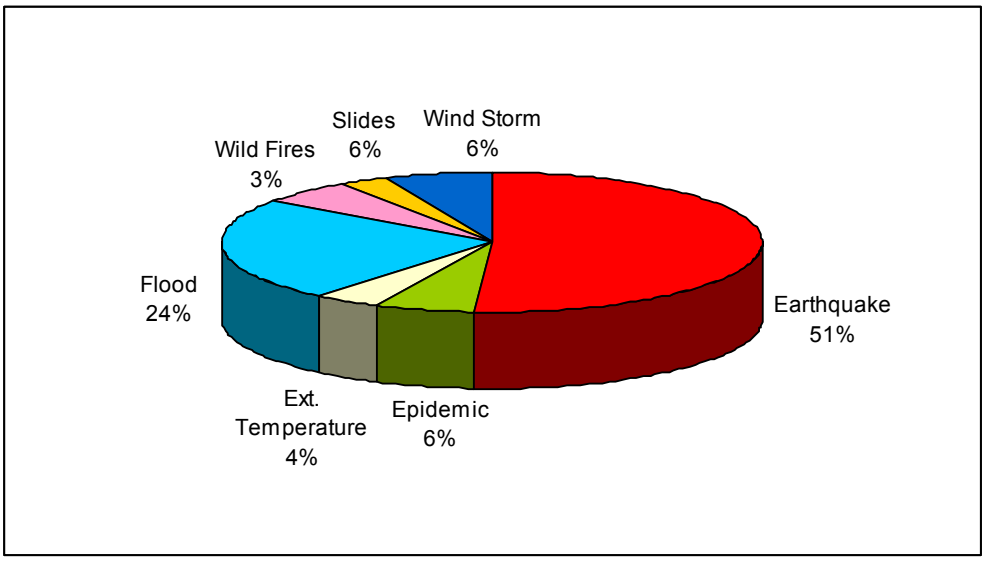

Figure 4.1 The ratios of natural disasters according to the number of events
(Source: EM-DAT, The OFDA/CRED International Disaster Database)

The ratios of natural disasters according to the number of deaths are as follows: 97% earthquakes, 1.4% floods, 0.7% epidemic, 0.6% slides, 0.1% extreme temperature, 0.1% wild fires, 0.1% wind storms.

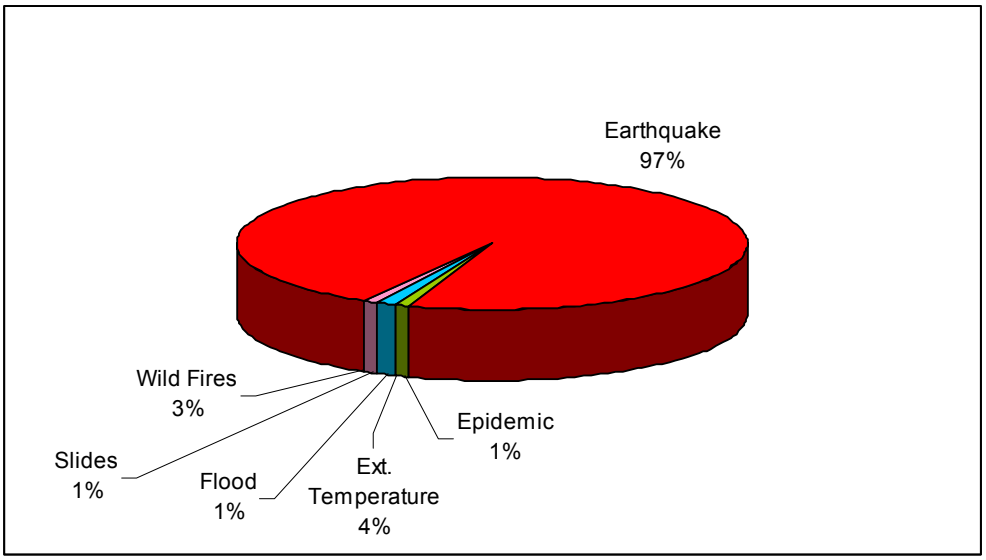

Figure 4.2 The ratios of natural disasters according to the number of deaths (Source: EM-DAT, The OFDA/CRED International Disaster Database)

The statistics of number of events, death ratios, injuries and all the other values exposed that earthquakes are far and away in the first place and the biggest portion of the losses is related to the earthquakes. This portion is 51% of events, 97% of deaths, 99% of injuries, 92% of homeless, 75% of affected people and 88% of total damage.

Measured in terms of direct economic losses, natural disasters have, accounted for 1 % of gross national product (GNP), with earthquakes accounting for 0.8 % of this.

According to the natural disasters “Top 10” lists of Turkey, which is sorted by number of people killed, number of people affected and amount of economic damages, 100% of most deadly natural disasters, 80% of economic damages and affected people caused by earthquakes.

Table 4.2 Top 10 Natural Disasters in Turkey (number killed)
(Source: EM-DAT, The OFDA/CRED International Disaster Database)

Disaster type	Date	Location	Killed
Earthquake	26.12.1939	Erzincan	32962
Earthquake	17.08.1999	İzmit, Kocaeli, Yalova	17127
Earthquake	29.04.1903	Malazgirt	6000
Earthquake	26.11.1942	Niksar-Erbaa	4000
Earthquake	1.02.1944	Gerede	3959
Earthquake	24.11.1976	Muradiye	3840
Earthquake	20.12.1942	Niksar-Erbaa	3000
Earthquake	26.11.1943	Ladik	2824
Earthquake	19.08.1966	Varto	2394
Earthquake	06.09.1975	Lice	2385

Table 4.3 Top 10 Natural Disasters in Turkey (economic damage)
(Source: EM-DAT, The OFDA/CRED International Disaster Database)

Disaster type	Date	Location	Damage US* (000's)
Earthquake	17.08.1999	İzmit, Kocaeli, Yalova	20000000
Flood	20.05.1998	Zonguldak, Karabük	1000000
Earthquake	12.11.1999	Düzce, Bolu, Kaynaşlı	1000000
Earthquake	13.03.1992	Erzincan	750000
Earthquake	28.06.1998	Adana, Ceyhan, Hatay	550000
Flood	27.10.2006	Cinar, Bismil	317000
Earthquake	01.10.1995	Dinar-Evciler	205800
Flood	18.06.1990	Giresun, Gümüşhane	150000
Earthquake	01.05.2003	Diyarbakır	135000
Earthquake	03.02.2002	Bolvadin	95000

Table 4.4 Top 10 Natural Disasters in Turkey (number affected)
(Source: EM-DAT, The OFDA/CRED International Disaster Database)

Disaster type	Date	Location	Number of Affected
Earthquake	28.06.1998	Adana, Ceyhan, Hatay	1589600
Earthquake	17.08.1999	İzmit, Kocaeli, Yalova	1358953
Flood	20.05.1998	Zonguldak, Karabük	1240047
Earthquake	30.10.1983	Horasan, Pasinler	834137
Earthquake	18.09.1984	Olur-Şenkaya	375038
Earthquake	18.10.1984	Erzurum-Şenkaya	375035
Earthquake	13.03.1992	Erzincan	348850
Earthquake	22.07.1967	Zonguldak, Karabük	326073
Flood	04.11.1995	Zonguldak, Karabük	306617
Earthquake	01.05.2003	Diyarbakır	290520

Table 4.5 Dwelling Units Destroyed by Natural Disasters in Turkey
(Source: Jica, 2004)

Type of Natural Disaster	Number of Destroyed Units	Percentage of Total
Earthquakes	495000	76
Landslides	63000	10
Floods	61000	9
Rock Falls	26000	4
Avalanches	5154	1
Total	650654	100

The number of dwelling units destroyed by natural disasters in Turkey is 650.654. The biggest portion of destruction is caused by earthquakes with the number of 495.000 dwelling units and with the ratio of 76%. Landslides and floods follows earthquakes with 63.000 (10%) and 61.000 (9%) dwelling units.

Consequently, we can easily say that the disaster history of Turkey is dominated by earthquakes.

Therefore, earthquake is synonym with the disaster in Turkey (Ergunay, 2003).

4.1.1. Earthquakes in Turkey

Turkey is one of the most earthquake-prone countries in the world. There occurs at least one earthquake magnitude of 5 or over almost every 1.1 years in Turkey and the probability of an earthquake which causes damage occurs in a year is 63 %.

According to the number of occurrences of earthquake disasters by countries, Turkey is in the high risky position with the earthquake occurrence over 10.

When we examine high risky countries according to the earthquake occurrence numbers; China is the first country with 77 earthquakes, Iran is the second country with 62 earthquakes, Indonesia is the third country with 59 earthquakes and Turkey is the fourth country with 33 earthquakes.

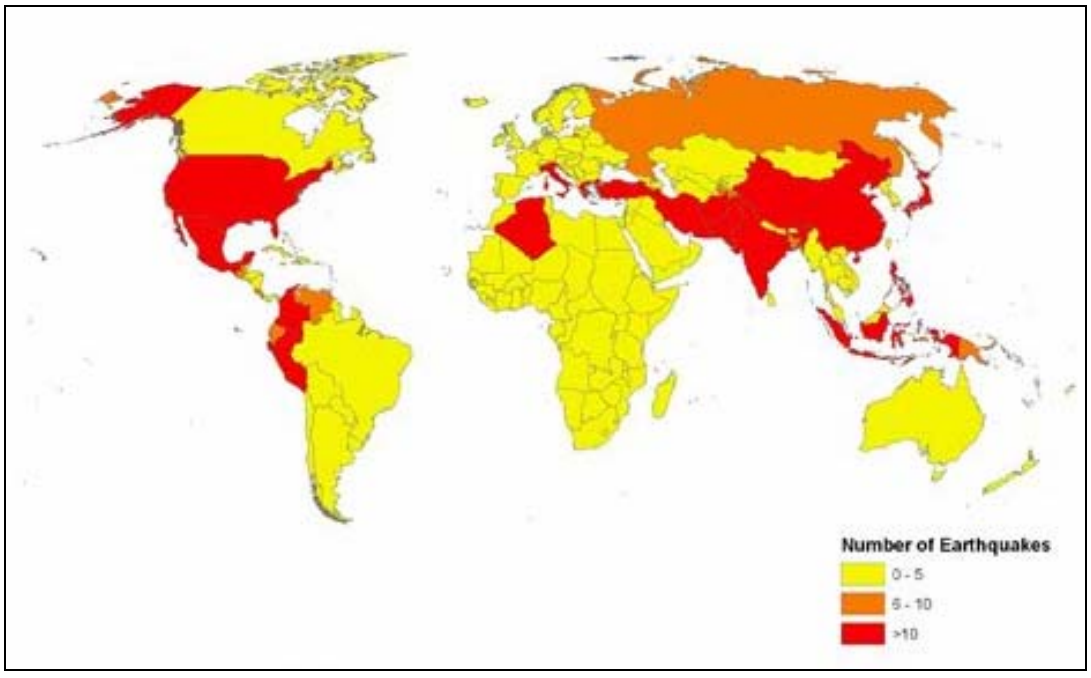

Figure 4.3 Number of Occurrences of Earthquake Disasters by Country: 1974-2003
(Source: EM-DAT, The OFDA/CRED International Disaster Database)

The United Nations Development Program (UNDP) announced Turkey as the third country after Iran and Yemen according to the number of deaths as a result of earthquakes (See Figure 4.4).

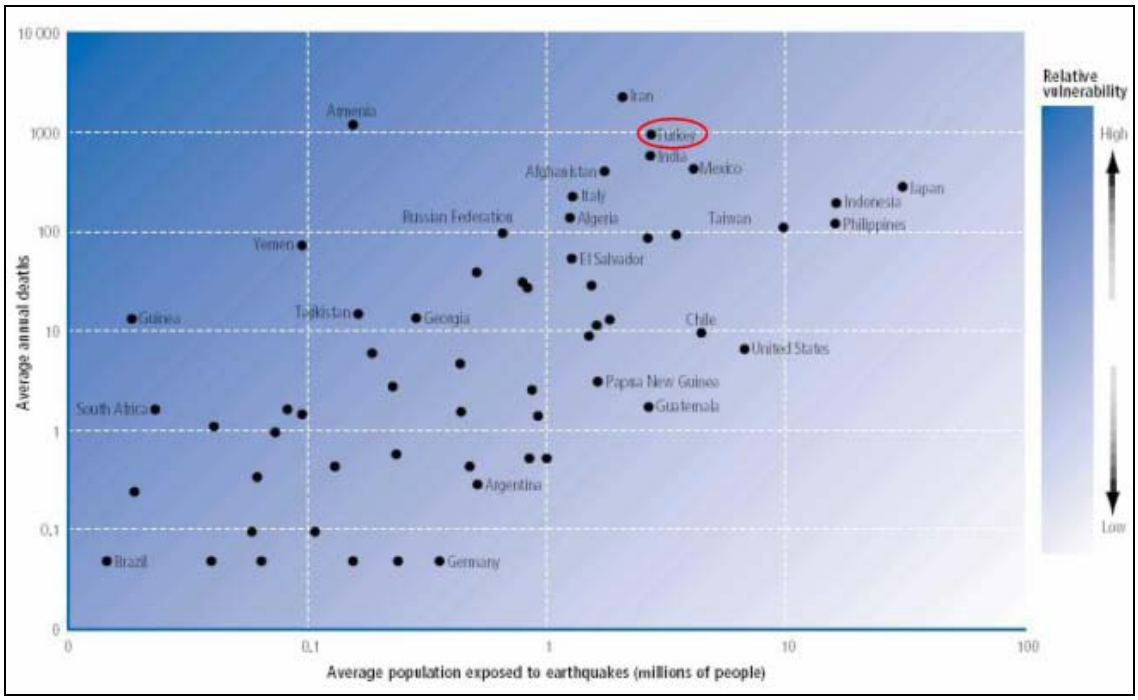

Figure 4.4 Relative Vulnerability for Earthquakes, 1980-2000
(Source: EM-DAT, The OFDA/CRED International Disaster Database)

From 1903 till now, the number of major earthquakes occurred in Turkey is 71 (See figure 4.5). 88.538 people lost their lives, 92.866 were injured, more than 495.000 housing units were totally or moderately damaged and 1.160.880 people lost their homes because of these earthquakes and the economic damage of earthquakes is 16 billion USD.

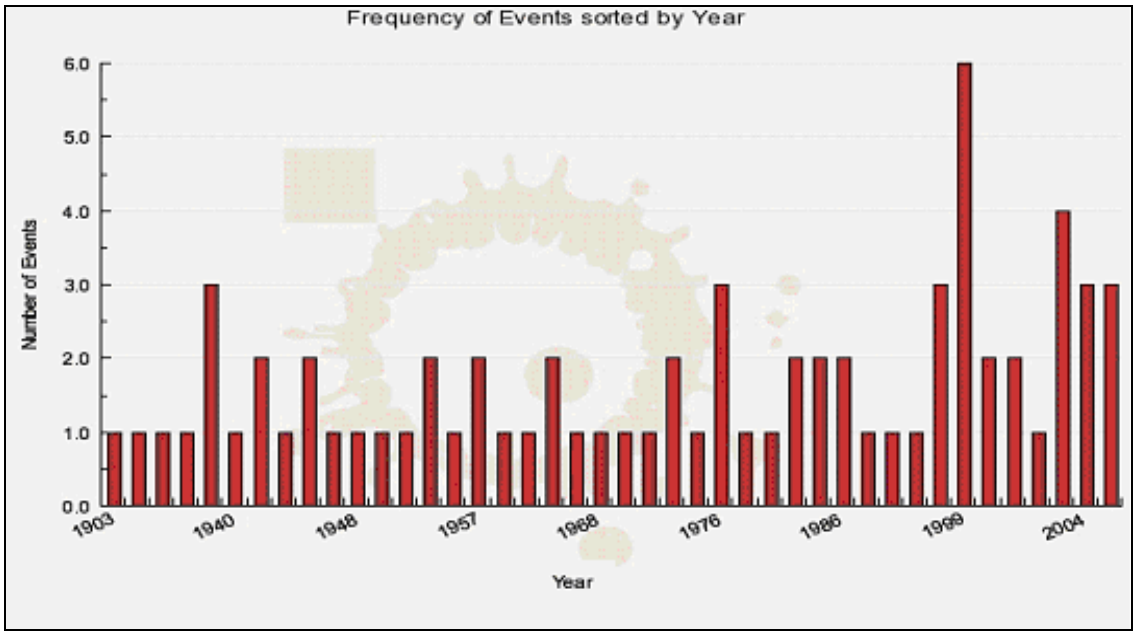

Figure 4.5 Earthquake events in Turkey: 1903-2006
(Source: EM-DAT, The OFDA/CRED International Disaster Database)

Turkey is located in one of the most seismically active regions of the world. It lies within the Mediterranean sector of the Alpine- Himalayan orogenic system and surrounded by three major: African, Eurasian and Arabian and two minor plates: Aegean and Anatolian (Jica, 2004).

The relative motion between the Eurasian and Arabian plates and westward motion of the Anatolian block under this compressional plate motion are the main causes of earthquake hazard in Turkey.

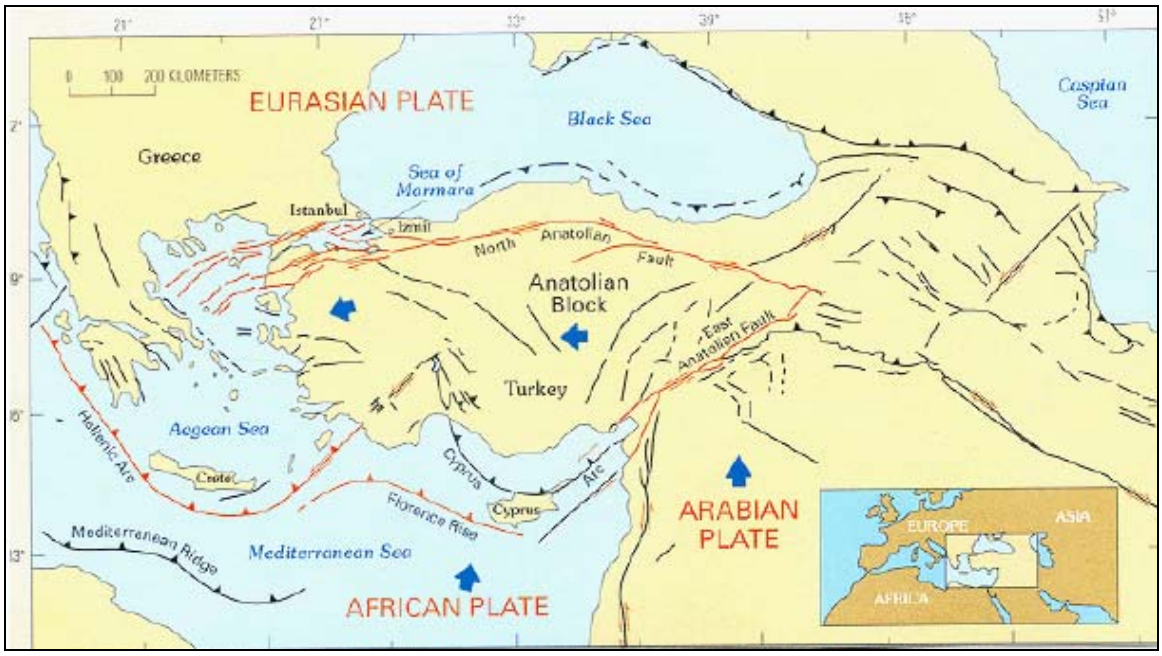

Figure 4.6 The Relative Motion between Eurasian, Arabian Plates
(Source: EM-DAT, The OFDA/CRED International Disaster Database)

Turkey lies on three active fault lines (North Anatolia, East Anatolia and Aegean Graben lines). The main fault line to cause the most devastating earthquakes in Turkey is the `North Anatolian fault line (NAF) which is stretching from east to west on the north region, the second is stretching from east to west on the south region and these two merging at the East part of Anatolia, the third one is the extension of NAF, lying through North-east to South west on the west side of the country. (Jica, 2004)

The 1939 Erzincan earthquake is the start of the chain of earthquakes along the NAF. The fault was ruptured 600 kilometers to the west between 1939 and 1944. Afterwards, this movement slowed down and another rupture of 100 kilometers was recorded between 1957 and 1967. The 1999 Marmara and Duzce earthquakes filled the 100-150 kilometers gap of the previous ruptures (Bibbee et al., 2000).

Official Earthquake Hazard Zoning Map of Turkey based on probabilistic considerations has been commissioned in 1996. The map segments the country into five macro-level regions, as determined by the statistical occurrence of seismic events.

66% of the surface area of Turkey is located in the 1 and 2 zones, which are most prone to the effects of seismic hazards and includes active fault lines. This area includes 57 cities and 11 of them are large cities with populations of more than one million. The population which lives in this area constitutes 71% of the total population. 76% of the industrial sites and 69% of the dams are also located in these seismically active areas.

Table 4.6 Distribution of Elements at Risk in Turkey
(Source: GDDA, 1996)

Earthquake Zone	Surface Area %	Population %	Industry %	Dams %
Zone 1 (pga >= 0.40 g)	42	45	51	46
Zone 2 (pga = 0.30- 0.39 g)	24	26	25	23
Zone 3 (pga = 0.20- 0.29 g)	18	14	11	14
Zone 4 (pga = 0.10- 0.19 g)	12	13	11	11
Zone 5 (pga < 0.10 g)	4	2	2	6
Total	100	100	100	100

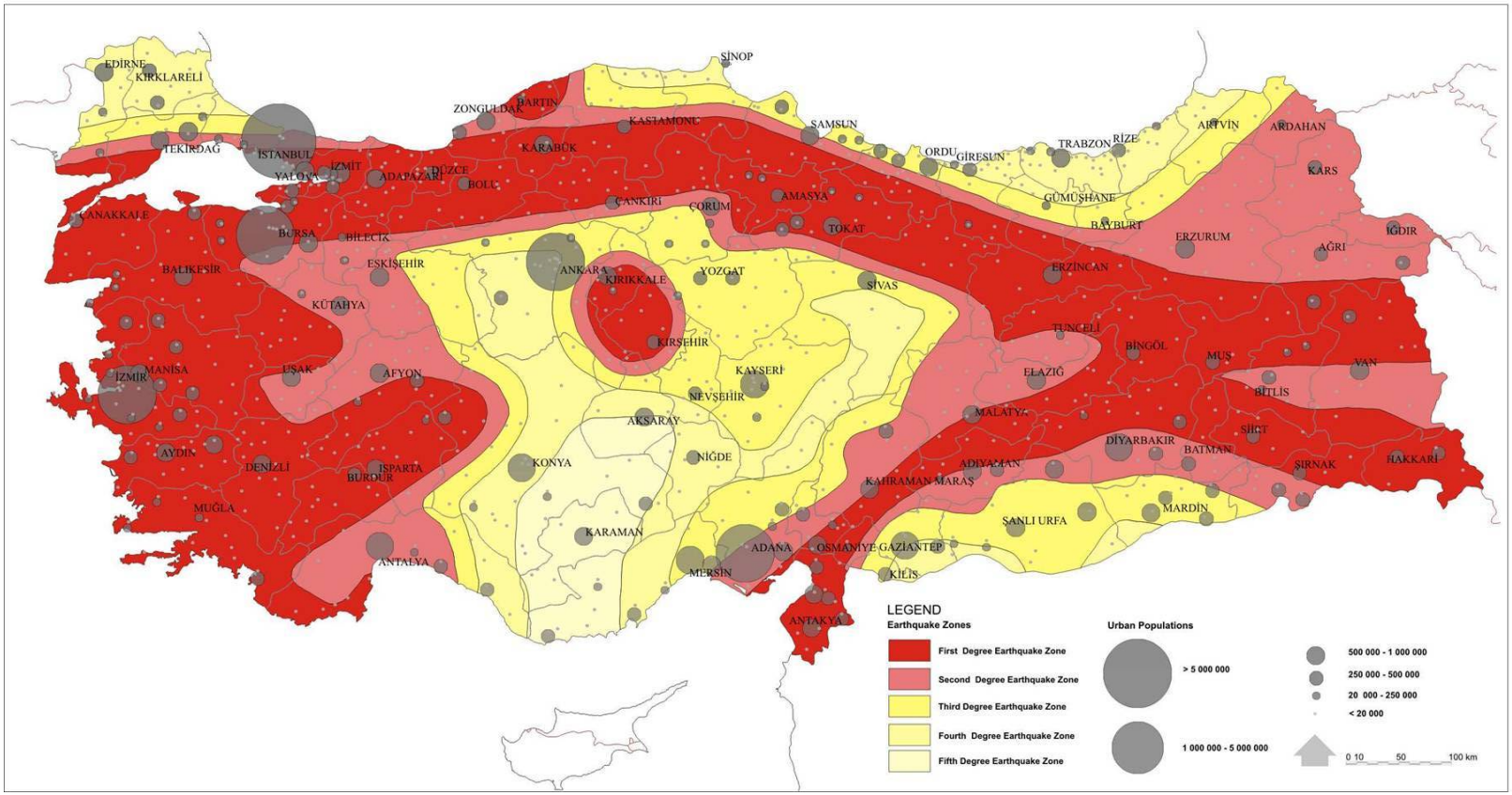

Figure 4.7 Earthquake Hazard Zones and Urban Population

(Source: Balamir, 2007)

4.2. National Disaster Management System of Turkey

4.2.1. Legislative and Institutional Evolution of Disaster Management System

Development of Disaster Management System and National Strategies in Turkey can be divided into four distinct periods according to the "Country Strategy Paper for Natural Disasters in Turkey" prepared by JICA in 2004.

4.2.1.1. The Pre-1944 Period: (Post-event Response)

Since historic times in Turkey, official responses to disasters have been case specific and enacted upon only after the events. Until the early 1940's, post earthquake disaster assistance has been provided by the Turkish Red Crescent Society (TRCS), which was established in 1868. (Jica, 2004)

These responses have taken usually the form of providing relief material in the short term emergency phase. In the long run, the recovery phase, financial assistance using central government sources has been provided for recovery and reconstruction activities. Occasionally, remission of public loans has been put into practice. In a few special cases, building material support, financial grants, deferment of tax payments and tax exemption were implemented for reconstruction of destroyed buildings. (Jica, 2004)

During the period 1939-1944, starting with the 1939 Erzincan earthquake, a sustained sequence of disastrous earthquakes occurred and official disaster response policies started limitedly.

Consequently, we can easily say that there were no effective and systematic policies for mitigation, preparedness, response and recovery activities in this period.

4.2.1.2. The 1944-1958 Period: (Feeble Countermeasures)

As a result of devastating earthquakes, during the period of 1939-1944, Turkey realized the importance and the need for the legal provisions and strategies for mitigation and preparedness activities.

Subsequent to this, the government declared a new law (Law No.4623), which called "Measures to be put into effect prior and after earthquakes", in 1944. This law is the foundation of the disaster management activities in Turkey.

In this period the "Development Law" (Law No.6785) in 1956 and the "Civil Defense Law" (Law No.7126) in 1958 are main improvements of the disaster management system.

In the relation to this law, first earthquake hazard map of Turkey and first mandatory earthquake resistant design regulation were prepared by the Ministry of Public Works and put into force in 1945. An update revision of the earthquake hazard map was made in 1949. Parallel to this new map earthquake resistant design regulation was revised in this period in 1949 and 1953. (Jica, 2004)

In 1958 Ministry of Reconstruction and Resettlement (MRR) was created with Law no: 7116. Duties and responsibilities of the Ministry of Public Works in relation to disaster affairs were transferred to this new Ministry. The Civil Defense Law No: 7126 that went into force in 1958 established the General Directorate of Civil Defense (GDCD) within the Ministry of Interior. GDCD is a response agency and has little mitigation role. (Jica, 2004)

4.2.1.3. The 1959-1999 Period: (Ministry Responsible for Disasters and Reconstruction)

In 1959 a new law, Law No.7269 entitled "Measures and Assistance to be put into Effect Regarding Natural Disasters Affecting the Life of the General Public" so called "Disaster Law" went into force. This law superseded the 1944 Law No.4623, and created the "Ministry of Reconstruction and Resettlement" which was the main central responsible institution to implement this law.

This ministry which was also responsible for implementation of the "Development Law" was later renamed the Ministry of Public Works and Settlements by Degree No.180 in 1983.

A feature of Law No.7269 was the establishment of a ‘Disaster Fund’ to facilitate the undertaking of all activities required under the law with regard to finance, supplementary to the funds made available from the regular national budget. (Jica, 2004)

The General Directorate of Disaster Affairs (GDDA) was created in line with Law No.7269 in 1965 and was charged with the execution of all government level activities in relation to natural disasters.

The Earthquake Research Institute (currently Earthquake Research Department) was established in 1971 under the new law. This institute was responsible for the development earthquake related research activities in Turkey in the close cooperation and collaboration with universities and related organizations and agencies. (Jica, 2004)

A new earthquake hazard map of Turkey was prepared, using updated technology in 1972 by this institute. Latest version of the official earthquake hazard map of Turkey was prepared in 1996 using probabilistic concepts, now in force.

After the Erzincan earthquake in 1992, a specific law for the affected region was passed from the Parliament that named "Measures and assistance to Erzincan, Gümüshane and Tunceli earthquake areas" (Law No.3838). After the Dinar earthquake in 1995, this law replaced with a new law (Law No.4123) "The Services to be Performed in Relation to Damage and Disruption Caused by Natural Disasters" to cover entire country. Finally, a new "Crisis Management Regulation" included natural disasters in it, put into force with a Cabinet Decree in 1997 (Jica, 2004)

4.2.1.4. The Post 1999 Period: (Awakening)

The emergency management system of Turkey was sufficient in responding to local and regional disasters before 1999. However, this disaster response system failed in the 1999 Marmara earthquake since significant coordination problems were experienced. Following this large-scale earthquake, the Turkish emergency management system was reviewed. (Özdemir, 2003)

In the aftermath of Kocaeli earthquake in 1999, the General Directorate of Disaster Affairs started initiatives with the objective to mitigate the earthquake risk in Turkey. (GDDA, 2004)

The enormity of the losses from the Kocaeli Earthquake, forced the Government to send an urgent bill to the Parliament. It enabled the Government to pass whatever legal instrument was judged necessary through an instrument known as the "Decree with the Force of Law", to enable the country to recover from such an enormous event. The bill was passed as Law no. 4452 on 27 August 1999, just ten days after the earthquake. (Jica, 2004)

This law authorized the Government to issue decrees in order to be able to solve problems and meet the needs caused by this catastrophe quickly in the affected area.

The period of validity of this law was 3 months, and then was extended for a further period of 4 months. During the period of seven months, the government promulgated seven new Laws and 32 Decree Laws to improve the national disaster management system and to support the needs of the earthquake stricken areas. (Jica, 2004)

It was agreed that there was a need for a new system to ensure adequate coordination among institutions responsible for emergency response. With this purpose, The General Directorate of Emergency Management was established in order to coordinate the pre-disaster and post-disaster activities. It aims at regulating all relations between government, non-government and civil and military organizations, and the Civil Defense on the national level.

Unfortunately, it has not been able to assume a lead role since it was not equipped with the authority and resources required for coordination. The new authority's efforts were also hampered by lack of clear delineation of roles and responsibilities vis-à-vis other institutions. (Özdemir, 2003)

4.2.2. Organizational Framework

Turkey's Disaster Management System can be described as centralized, hierarchical and unifocal. The responsibility of the organizations goes from bottom to top, from local to central, depending on the size of the affect.

In the current structure of disaster management in Turkey, power and responsibility are concentrated at the center and diminish rapidly as one move to the outer peripheries of administrative organization. The declaration of a disaster concentrates all power and resources under the central government and municipalities are deprived of independent action. (Balamir, 2004)

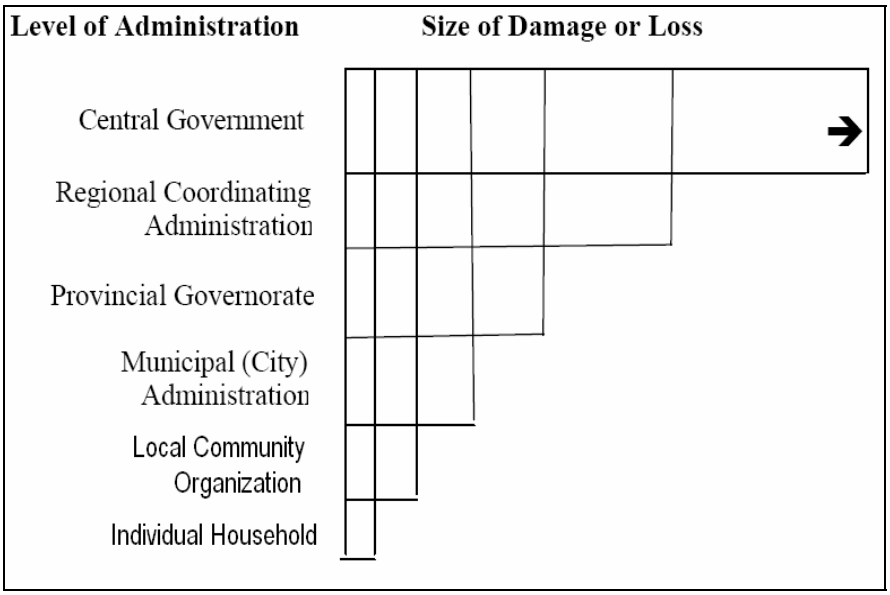

Figure 4.8 The Cascading Responsibilities / Thresholds Model

(Source: Balamir, 2004)

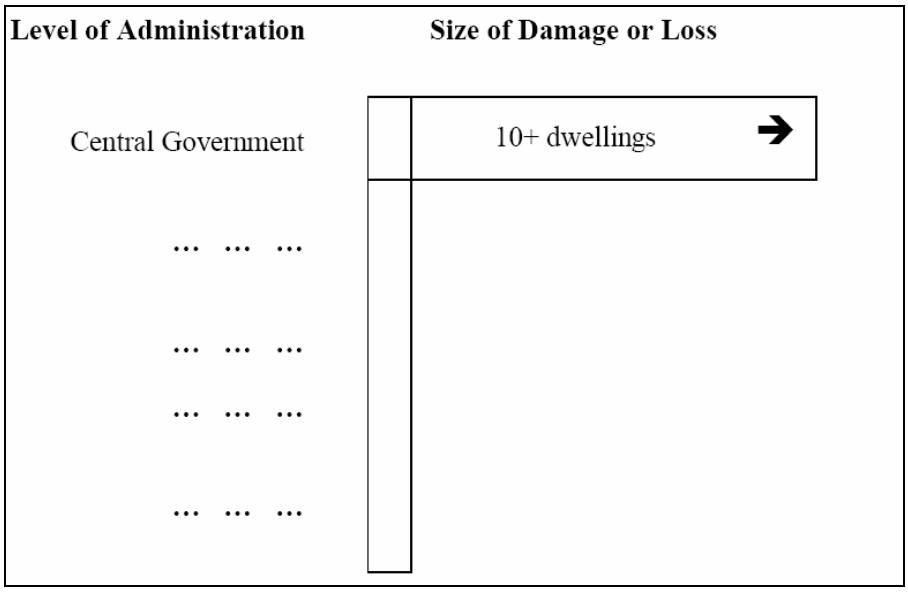

Figure 4.9 The Conventional Model in Turkey

(Source: Balamir, 2004)

The primary actors of the system of development in Turkey are the central and local public authorities (the Ministry of Public Works and Settlement and municipalities), the semi-official organizations and institutions (professional chambers, cooperatives, consultant firms, supervision firms, etc.), the judicial system, and the market agents (consumer households, property owners, contractors, professional individuals, etc). (GDDA, 2004)

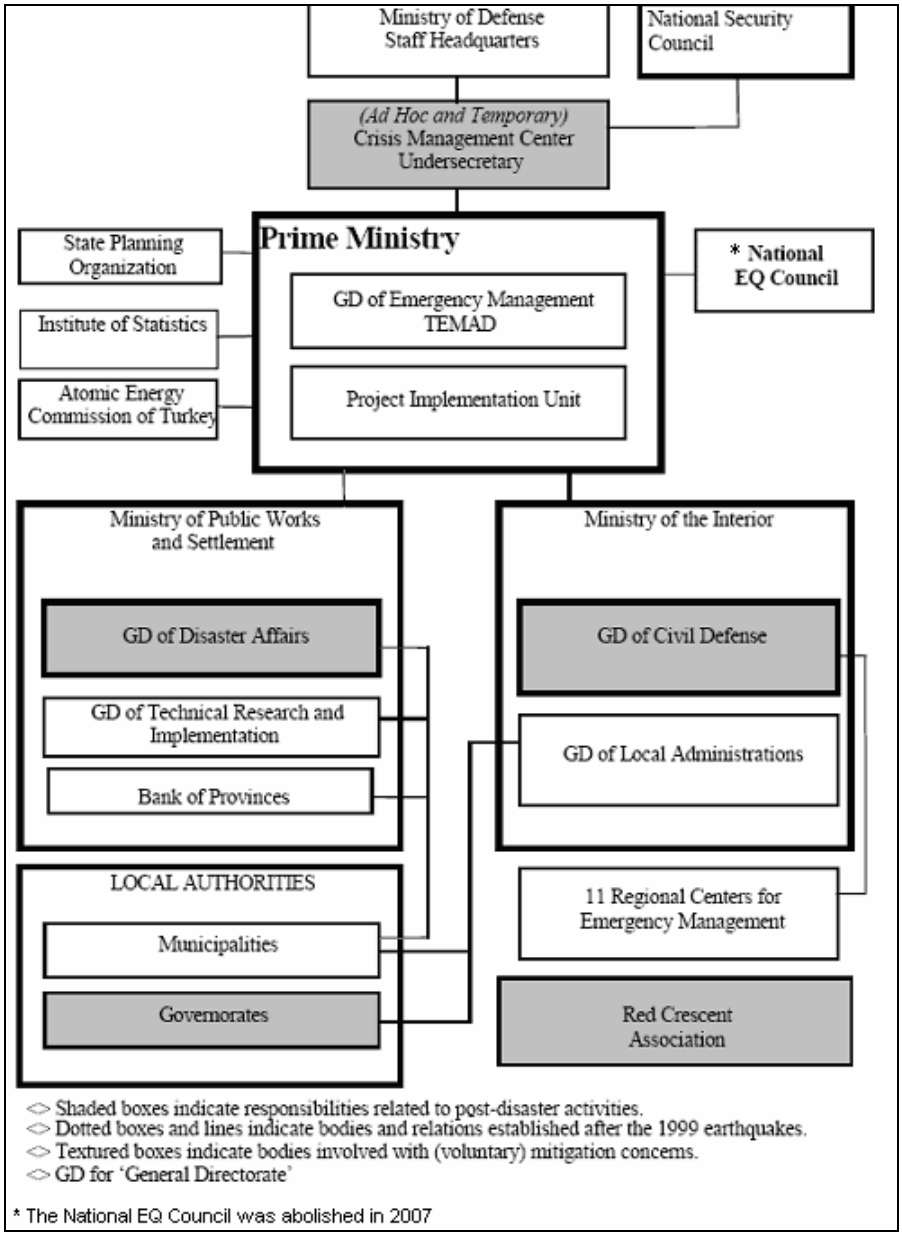

Figure 4.10 Bodies Involved In Hazard Policy

(Source: Balamir, 2004)

4.2.2.1. Central Level

According to the Disaster Law No.7269 (1959), 'The Central Disaster Coordinating Committee' is the main body consisting of the undersecretaries of the related ministries including a representative from Turkish General Staff and the president of the TRCS. (Jica, 2004)

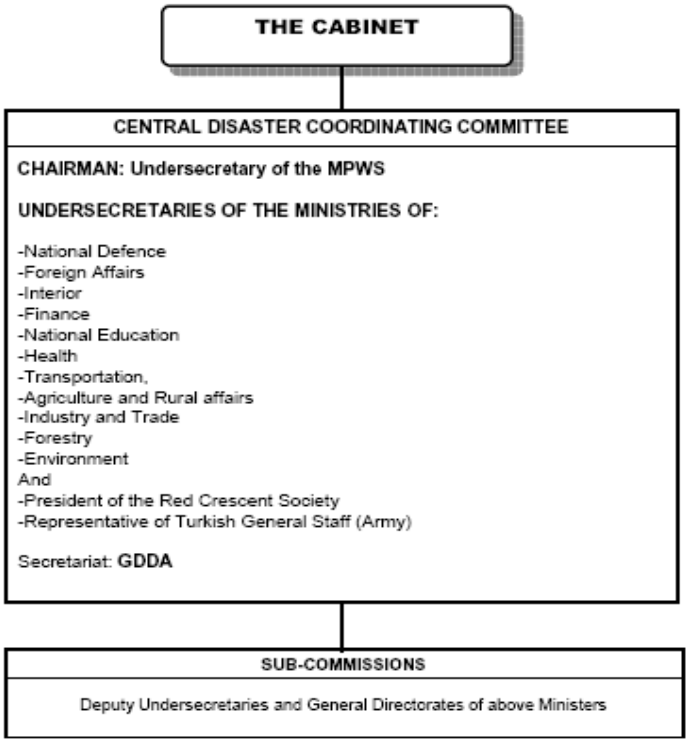

Figure 4.11 The Central Disaster Coordinating Committee
(Source: Jica, 2004)

In addition to the committee mentioned above, if the Prime Minister decides that the size of disaster needs a more comprehensive approach, a "Crisis Management" situation is declared.

In this case a "Crisis Center" is established in the office of Prime Ministry, and each organization also sets up its own "Crisis Center's" in its headquarters. The governorships of provinces and districts are the first response mechanism to disaster.

They also have some other direct responsibilities for disaster management, as participation and implementation of disaster response plans and implementation of training and exercising activities. (Jica, 2004)

Currently, the Turkish Emergency Management General Directorate (TAY), the "General Directorate of Disaster Affairs" (GDDA) and the General Directorates of Civil Defense (GDCD) are in overall responsibilities with respect to Disaster Management duties in Turkey.

- **Turkey Emergency Management General Directorate (TAY)**

Until the 1999 Earthquake, there was no single effective national coordinating agency for overall disaster management in Turkey. However, the experiences gained both from past disasters and 1999 Earthquake showed that an organization, which will be responsible for overall coordination, was needed. (Jica, 2004)

Although the Law No.7269 gives the overall coordination duty to the MPWS, in practice there were some difficulties to coordinate the ministries or state organizations in same level, therefore higher authority was necessary to make coordination by using the power of Prime Ministry. For this reason, Turkey Emergency Management General Directorate was established by Decree No.600 and given some authority and responsibilities especially in terms of coordination of post-disaster activities as well as mitigation efforts. (Jica, 2004)

- **General Directorate of Disaster Affairs (GDDA)**

The General Directorate of Disaster Affairs (GDDA) was created in 1965 and performs its responsibilities due to Disaster Law Number 7269 with later revisions and additional decrees. The law determines the protective and preventive measures as well as regulating the activities to be undertaken before during and after natural disasters and defines guidelines for terms and conditions of assistance to be provided to affected people.

The main responsibility of the GDDA is to define precautions and restriction for earthquake, landslide, rock fall, snow-avalanche and flood. Before and after disaster occurs, and also maintain their implementation and make cooperative studies with relevant governmental and non-governmental bodies. (Özmen, 2005)

- **General Directorate of Civil Defense (GDCD)**

The goal and purpose of the Civil Defense Organization is to minimize the life losses and other types of losses during warfare or a natural disaster. Civil Defense in Turkey is the whole of unarmed, protective and rescuer measures and activities. (Jica, 2004)

GDCD organizes, coordinates, disseminates and monitors the civil defense activities all over the country, both at central and local level; takes preventive measurements and plans the emergency search and rescue activities, standardizes the fire fighting activities, organizes and keeps ready the search and rescue teams, provides first aid, search and rescue, feeding and urgent sheltering in time of an emergency, develops early warning systems, promotes the volunteers who has already been trained about emergencies. (Koçak, 2005)

- **General Directorate of Technical Research and Implementation (TAU)**

The General Directorate of Technical Research and Implementation was established in 1984 in order to carry out mainly the physical planning functions of the central government. Duties and responsibilities of the General Directorate are assigned mainly by the Development Law of 1985. According to this Act, the physical planning and implementation powers at urban level have been delegated to the municipalities, while the preparation of the territorial plans rests within the domain of this General Directorate for those sub-regions which encompasses more than one municipality and display special characteristic in terms of urban development, industrial growth, tourism potential etc.

TAU, searches for the reduction of the losses which earthquakes cause, develops earthquake warning networks and measures for more safe development plans. (Koçak, 2005)

- **The Turkish Red Crescent Society (TRCS)**

The Turkish Red Crescent Society is an integral and important part of overall disaster management structure in Turkey. It is represented at national, provincial, and district level committees. The TRCS is active in the areas of disaster preparedness and response, blood-transfusion services, AIDS, and first-aid training. (Jica, 2004)

The TRCS was founded as an association on 11 June 1868 and beginning in 1924 and continuing to the present time, TRCS is mainly involved in disaster related activities such as providing relief materials, tents and sometimes cash beneficiaries. The main function of TRCS is to provide humanitarian assistance to the vulnerable people. (Jica, 2004)

- **Turkish Armed Forces**

The military has an important role in emergency management with its countrywide organization and human resources. The military is a part of both central and local emergency management system.

During the Marmara Earthquake, the well equipped and educated Military Search and Rescue Teams provided search and rescue services. It acted as an auxiliary to provide stock and distribute the relief items. Just after the earthquake Military established a Civil Military Cooperation Brigade in order to be an active part of the man made or natural disasters consequence management system. (Koçak, 2005)

4.2.2.2. Provincial Level

The governorship of provinces and districts are the first response mechanisms to disasters in Turkey and they have some other direct responsibilities for disaster management. The organizational structure for disaster management at provincial level is under the authorization of the governor (Jica, 2004).

Each of governorship establishes a 'Provincial Rescue and Aid Committee'. There are also nine service droops within this body during disasters to implement effective response and recovery efforts. Districts also established the same structure for their own disaster management activities (Jica, 2004).

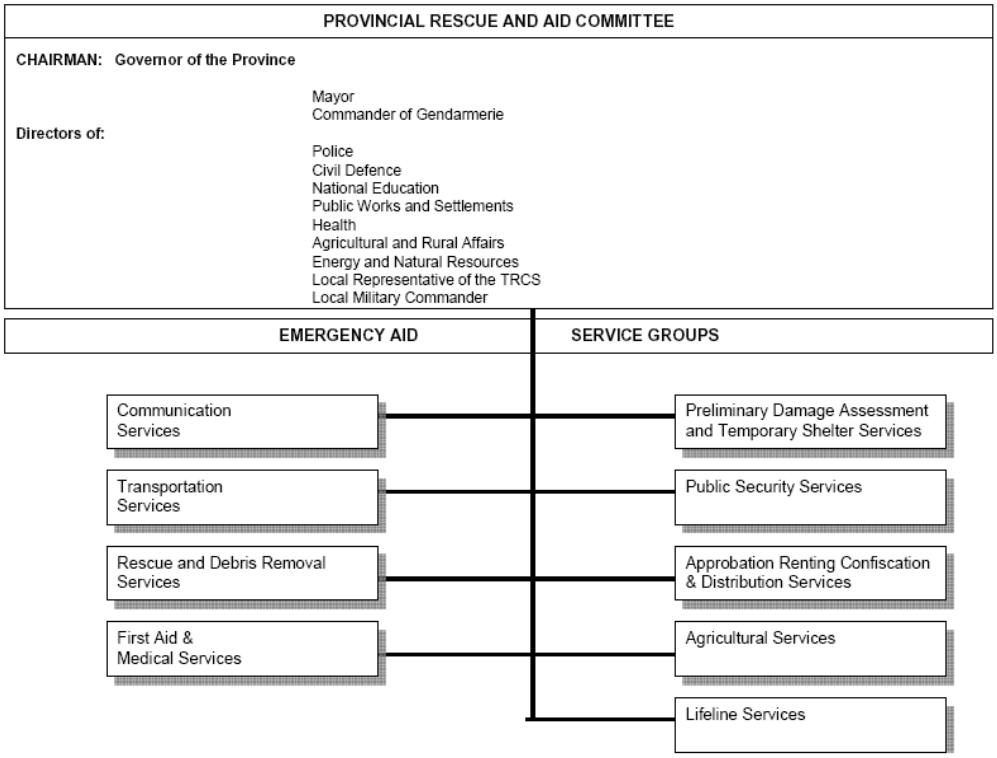

Figure 4.12 Provincial Rescue and Aid Committee

(Source: Jica, 2004)

Municipalities and governorships are also responsible for mitigation activities. Municipalities have the main role and responsibility in order to coordinate, arrange and implement the prevention, mitigation and risk reduction activities among which are preparation and implementing the master plans, land use plans, implementation plans, licensing the constructions, conducting community awareness programs, activate the community based organizations, NGOs for this purpose. And Governorships have the main role and responsibility in order to prepare the Province Emergency Plans, implement and monitor the emergency plans in times of disasters. (Koçak, 2005)

The provincial governorships and the municipalities have had an incongruous relationship. Provincial administrations are fully responsible and liable for all activities and losses after a disaster, but have no powers to intervene in the development processes in normal times.

Municipalities ordinarily have all the powers of monitoring, planning and constructional activities, but can ignore technical requirements and are not held accountable. Responsibilities of local authorities have now been extended to be more explicit about disaster preparation and mitigation duties.

4.2.2.3. Other Ministries and State Agencies

Duties and responsibilities of those ministries before and after disasters are described in the regulation concerning 'The Fundamental of Emergency Aid Organizations and Planning Associated with Disasters '. (Jica, 2004)

Other ministries and state agencies responsible from natural disaster management system in Turkey: Prime Minister's Office, State Meteorological General Directorate (DMI), State Planning Organization (DPT), Turkish Statistical Institute (TUIK), Project Implementation Unit (PUB), Ministry Of Interior, Ministry of Energy and Natural Resources, Ministry of Foreign Affairs, Ministry of National Defense, Ministry of National Education, Ministry of Health, Ministry of Transportation, Ministry of Finance, Ministry of Agriculture and Rural Affairs, Ministry of Environment and Forest, Ministry of Justice, General Directorate of State Hydraulic Works(DSI), General Directorate of Highway, General Directorate of Construction Affair, General Staff of Armed Forces, General Command of Mapping.

4.2.3. Legislative Framework

The conventional disaster policy in Turkey has two major components: the 'Disasters Law' (1959) and the 'Development Law' (1985) and their attendant regulations. These laws provide public intervention capacity and improvement in the efficiency of relief operations after disasters, both administered by the Ministry of Public Works and Settlements.

Although there are many potential links between the two bodies of law, it is observed that there is a lack of coherence between the two systems (Balamir, 2001). The Development Law has almost no reference to natural disasters, whereas the main focus of the Disasters Law deals with the post-disaster operations and relief organizations (Balamir, 2001). These two bodies of law are detailed below.

4.2.3.1. The Disaster Law (7269)

The Disaster Law (7269), which dates from 1959, is the chief legal frame of disaster management and it is mainly directed towards post disaster organization of humanitarian help, assessment of the damage and finance, although there are some articles that are devoted to duties and responsibilities related to preparedness.

The Disaster Law provides for, among other topics:

- Emergency relief and operations, and the preparation of a management brief
- Principles in the determination of effects of disasters on social life
- Determination of the rights of victims of disasters
- Discounts to be made in the payment programs of the disaster victims for buildings constructed by public means
- Principles of distribution of the residual buildings and property
- Design principles for buildings in areas subject to disasters
- Principles for the valuation of the remains of damaged property

The main focus of the Disasters Law and related regulations is to provide formal capacity for post-disaster intervention and relief operation organization. The Disasters Law and its regulations fall short of constituting a contemporary disaster management system. It does not differentiate between authorized and unauthorized construction, and in a sense, it rewards the owners of the unauthorized buildings at the expense of the safety of the majority of inhabitants (Balamir, 2001).

The Law provides extraordinary powers for provincial governors. “When disasters occur, the governor has a sole authority with powers of commanding all public and private and even military resources, property and all vehicles” (Balamir, 2001). Therefore, each governor is responsible for drawing an ‘action plan’ of relief operations to become effective immediately after a disaster (Severn, 1995). These local action plans, as described by the Disasters Law and by the recent mandates of the Ministry of the Interior, are currently prepared with greater attention since 1999 (Balamir, 2001). However, “there is a preparation for ‘tents and blankets operations’ rather than any form of a risk analysis, estimations of losses and a contingency plan for pre-disaster monitoring of forms of mitigation” (Balamir, 2001).

Of the 68 articles in the main body of the Law, only a few contain provisions for pre-disaster activities and in practice disaster mitigation requirements are hardly fulfilled (Balamir, 2001).

The local administrations only have the role of providing the logistic support to the central organs whereas the disaster risk management responsibilities must lie here. Besides its confinement to post-disaster operations and its content disparate from the Development Law, the Disasters Law and its regulations fall short of constituting a cotemporary disaster management system (Balamir, 2001).

4.2.3.2. The Development Law (3194)

The Development Law (3194), which dates from 1985, governs the terms of regulation and procedures for the preparation of urban master plans and private construction through building permits, use of buildings, and provision of shelters, among others.

The Development Law provides for, among other topics:

- Uniform development of urban areas
- Preparation, enforcement and revision of development plans
- Development of areas where planning is not mandatory
- Land rearrangement procedures
- Authors eligible to prepare urban plans and topographical maps
- Responsibilities and liabilities on the technical personnel other than urban planners, architects and engineers
- Provision of shelters

It is important to note that the Development Law does not specifically address the issues of disaster risk management or mitigation. The most effective and cost-efficient opportunities for earthquake risk reduction arise in the planning, development, design and construction phases. The topic of earthquake safety is now inadequately addressed by a combination of provisions of the Disaster and Development Laws. (GDDA, 2004)

The conventional system of the Development Law does not include disaster mitigation methods in land-use planning and building construction. Avoidance of disaster risks is an obvious omission in such a way that these concerns can not be confined to the construction of buildings alone (Balamir, 2001).

The Law neither has provisions to cope with natural disasters, nor has an interrelation with the Disasters Law (Gulkan, 2002).

Furthermore, it is “deficient in the technical means of control during the construction stage itself, neglects property management approaches, and has a blind eye in the vital need of protection of various categories of (historical, natural, riparian, etc.) environment” (Balamir, 2001).

As clarified in the Law, municipal and provincial administrations are obliged to prepare urban plans. In their urban Master Plan making functions, local authorities are practically free of guidance and inspection. In addition Master Plans for urban areas represent only an intermediate step in the hierarchy of physical plans. The higher and lower level plans and their relation to urban plans are the missing parts of the overall system. In the Law regional strategy plans, environmental plans and contingency plans are almost totally neglected (Balamir, 2001).

The Law assigns full responsibility for the plan making and their ratification to local administrations. However, local administrations lack the financial and technical skills to meet this obligation. The traditional singular authority of the MPWS has been distributed in the mid-1980s. Since then, municipalities and provincial governments have been responsible in themselves, from plan making and development control functions. Dispersion of such prerogatives causes arbitrariness in ensuring environmental standards and quality. The planning system today, with its numerous regulatory mechanisms and actors, is far from a unified body or authority in monitoring physical development (Balamir, 2001).

Since the overall planning control is diffused, it is often difficult to follow the principles of reducing risks. There are almost a dozen of public authorities and ministries other than the MPWS proper. Therefore it is difficult to decide which authority has the ultimate powers at a specific location. This obstructs the possibility of uniformity in the contents and procedures of plan making, particularly for disaster mitigation purposes (Balamir, 2001).

Specially standardized geological and microzonation maps, as well as integrated information related to other disasters are not considered as a prior condition in the development system. Geological evaluation reports for individual buildings as required by some municipalities are piecemeal and can not be impartial because they are prepared by the investing party (Balamir, 2001).

4.2.3.3. Changes Introduced in the Legal System Since 1999

Revitalization in the existing agencies responsible for natural disasters did take place after the 1999 earthquakes. With a reframed approach to disasters and determination not to exclude mitigation measures, the government envisaged the establishment of new and complementary units (GDDA, 2004).

The events gave great impetus to the existing organizations, in the re-evaluation of their own capabilities, and in devising more efficient methods of carrying out their tasks. Besides reviewing the effectiveness of the two existing official institutions directly related with earthquakes (GDDA and GDCD), new organizational steps were taken in several directions. In the first place, responsibilities of the local authorities were extended to cover disaster mitigation efforts by the Decrees of the Board of Ministers and by amendments to the existing Law of Municipalities (1580) and the Civil Defense Law (7126). (GDDA, 2004)

Following the 1999 Marmara Earthquake, three important steps were taken by the government. These are the introduction of institutions of 'obligatory earthquake insurance', 'construction inspection' functions, and provisions for the improvements in 'professional competence' (Keles, 2004; Balamir, 2001).

In organizational terms, several efforts were aimed to accomplish a more comprehensive management system. Apart from extensions made in the responsibilities of the local authorities in disaster mitigation, three complementary organizations were introduced. Ministry of the Interior initiated regional centers for relief and emergency operations, a General Directorate of Emergency Management was established and attached to the Prime Ministry, and an independent National Earthquake Council was formed by a Prime Ministry mandate. (GDDA, 2004)

These new provisions are reviewed in detail below in Figure 4.13.

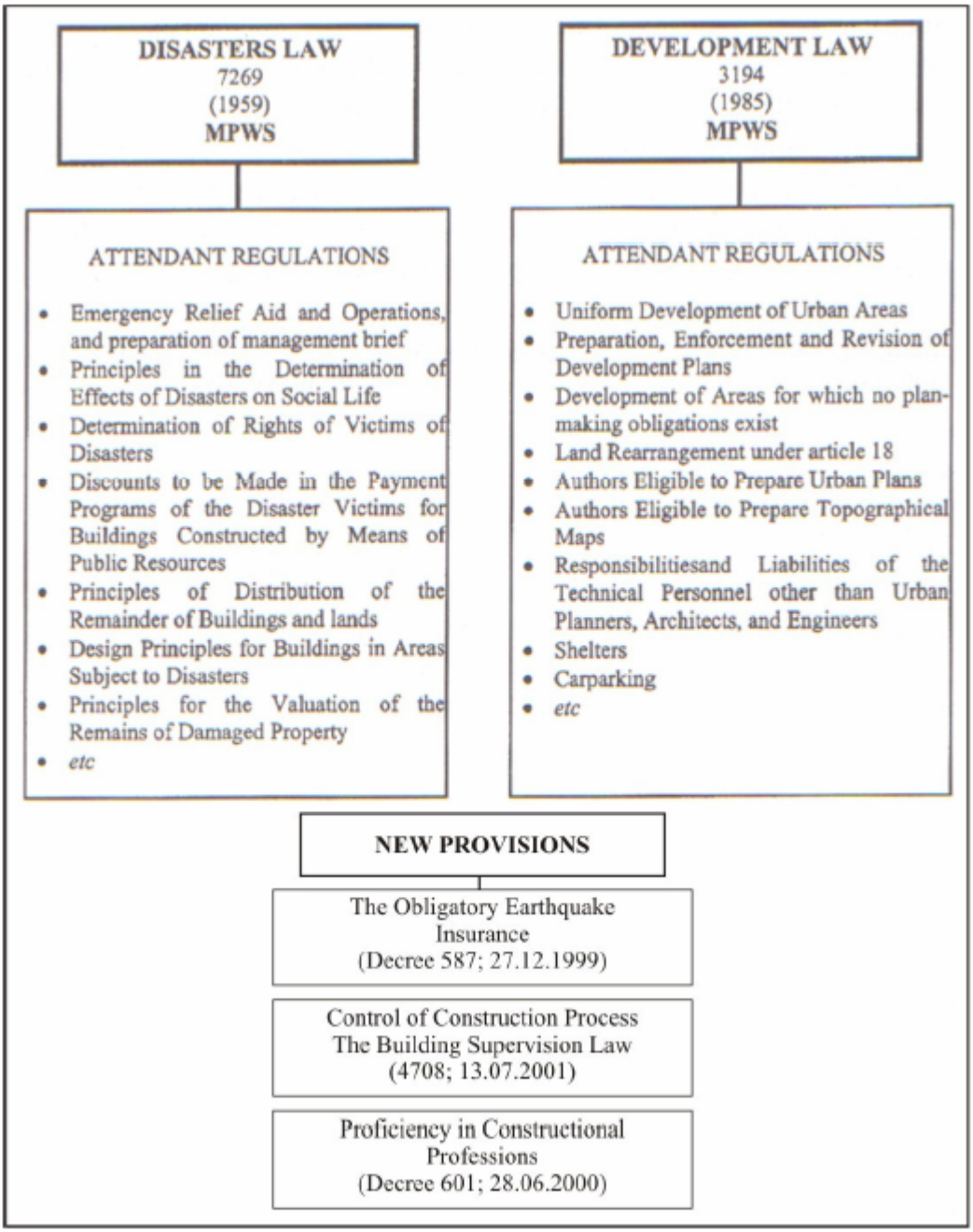

Figure 4.13 The Conventional System and New Provisions in Disaster Policy

(Source: Balamir, 2001)

4.2.3.4. Seismic Design and Construction Changes

Specification for Construction in Disaster Areas have been changed many times following the developments in engineering seismology, tectonic and seismo-tectonic invention and improved earthquake data collection. (Pampal, 2007)

Major earthquakes in Turkey have led to substantial changes in the practice of seismic design and construction. After the largest earthquake in Turkey in the 20th century, 1939 Erzincan earthquake, M7.9, the Turkish Ministry of Public Works and Settlement formed a committee to prepare a seismic zone map. The formation of this committee was the first step toward developing regulations for the seismic design of buildings in Turkey. Key events in the evolution of seismic codes in Turkey are listed below.

Table 4.7 Key events in the evolution of seismic design codes in Turkey
(Source: PEER, 2000)

Year	*Event*	*Code development*
1939	Erzincan earthquake (M7.9)	
1940	Committee formed to develop a seismic zonation map for Turkey	First seismic code published
1942		Earthquake zone map prepared; map promulgated in 1945
1943	Tosya earthquake (M7.2)	
1944	Gerede earthquake (M7.2)	Seismic code revised
1947		Seismic code revised
1949		Seismic code revised
1953		Seismic code revised
1958	Ministry of Reconstruction and Resettlement established	
1961		Seismic code revised
1963		Earthquake zone map revised
1966	Varto earthquake (M7.1)	
1967	Adapazari earthquake (M7.1)	
1968		Seismic code revised
1975		Seismic code revised; ductile detailing introduced
1992	Erzincan earthquake (M6.9)	
1997		Seismic code revised; ductile detailing required
1999	Izmit earthquake (M7.4) Düzce earthquake (M7.2)	

The first seismic design code for buildings was published in 1940, one year after the destructive Erzincan earthquake and revised 8 times in the years of 1944, 1947, 1949, 1953, 1961, 1968, 1975 and 1997.

One of the basic facts reaffirmed in the 1999 East Marmara earthquakes in Turkey, was the deficiency of the building stock in meeting the earthquake design codes even at project stage, let alone those due to production faults and negligence's. This observation is made for the authorized stock only; leaving aside the clandestine unauthorized other half of the total stock (Balamir, 2001).

As very often stated, it is this fabricated environment that kill people, not the earthquake itself. There is always some indeterminacy in the system, owing to variations in local subterranean conditions, physical designs of buildings, manner the construction work was run, choice of structural materials, methods followed in mechanical services, detailing, etc. Although natural forces are the source of hazards, it is the human intervention in the form of inadequate built-environment that fabricates the risks and disasters. (Balamir, 2001)

In order to evaluate the effects of "seismic code" revisions to building stocks; 1961, 1968, 1975 and 1997 revisions are examined, as the cumulative dataset of building construction statistics is composed between 1954 and 2003.

CHAPTER 5

DETERMINATION OF URBAN SEISMIC RISK VARIABLES IN URBAN AREAS OF TURKEY

The aim of this research is to examine the factors that determine urban risks and establishing analysis of seismic risks in cities and living environments could be determined on the basis of a set of attributes of the building stock. The scope is to exhibit and analytically compare such factors in a sample of cities in Turkey.

In order to examine and compare urban risks in the sample of settlements and metropolitan cities of Turkey, statistical surveys and statistical analyses are used. Quantitative information about a set of attributes of settlements selected is investigated statistically to determine which of the factors contribute most to urban risks described locally.

In the determination of risk factors, the Earthquake scenarios identified in Province Disaster Plans, prepared by governorships in each settlement and copies of which are collected in General Directorate of Disaster Affairs provides the dependent variables of the research.

The independent variables of the research are composed of the building stock changes and rates of unauthorized buildings and related attributes of building stock in each settlement obtained from Turkish Statistical Institute (TSI). “Building Construction Statistics” prepared by Turkish Statistical Institute is the main book that is used within this research.

The study is expected to provide information about the critically vulnerable assets in cities, whether this could be considered as a function of hazard-proneness, and whether or not these attributes are consistently correlated with the hazard maps of Turkey.

The basic question of the research is: “How do hazard levels correlate to independent variables?” and regression analyses are used to examine this question.

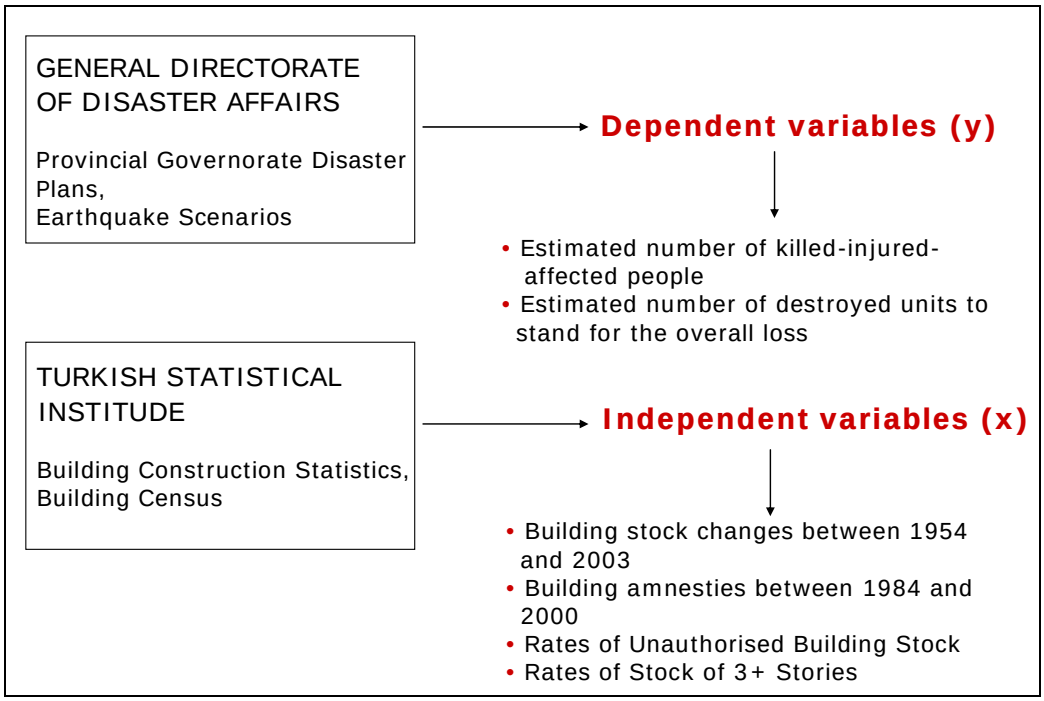

Figure 5.1 Dependent and Independent Variables of the Research

5.1. Descriptions of the Most Likely Disaster Scenario as Dependent Variables of the Research

In the determination of risk factors, the Earthquake scenarios identified in Province Disaster Plans, prepared by governorships and collected in General Directorate of Disaster Affairs generates the dependent variables of the research.

A description of how these must be prepared is given in one of the regulations of the 'Disaster Law' (7269). It requires that a 'most likely' scenario with loss estimates should be made for each settlement. A quantitative measure of the most likely loss can be considered as a direct level of risk of the city involved, irrespective of the subjective nature local assessments.

A detailed archive research in the General Directorate of Disaster Affairs about Province Disaster Plans indicated limitations in terms of available cases. These 'plans' have either did not ever arrive to the General Directory, or have negligently been discarded by the same authority.

As a result of this limitation the general framework of the study is extended from the original intention of metropolitan cities of Turkey, to 17 provincial centers. These have prepared Province Disaster Plans adequately to fulfill the legal regulations.

These cities with satisfactory Disaster Plans and consistent assumptions about Earthquake scenarios are; Aksaray, Antalya, Ardahan, Bursa, Çanakkale, Düzce, Elazığ, Erzincan, Istanbul, Izmir, Karabük, Kastamonu, Kırşehir, Kocaeli, Malatya, Niğde, and Yalova. (See Figure 5.2)

Within the provisions of the Information Law (Law No: 4982) an information request mail sent to the all governorships and municipalities allowed access to 4 Disaster Plans and assumptions about Earthquake scenarios. But the Disaster Plans and Earthquake scenarios of these 4 provincial centers (Ardahan, Elazığ, Erzincan and Malatya) are already obtained from GDDA and there isn't any contribution of Information Law to the research.

Table 5.1 Hazard Zones and Populations of Selected Provincial Centers

Selected Provincial Centers	Earthquake Hazard Zone	Urban Population
Aksaray	4	204.808
Antalya	2	1.127.634
Ardahan	2	35.835
Bursa	1	1.979.999
Çanakkale	1	247.443
Düzce	1	157.894
Elazığ	2	389.774
Erzincan	1	114.437
Istanbul	1	11.174.257
Izmir	1	3.175.133
Karabük	1	164.072
Kastamonu	1	184.685
Kırşehir	1	147.073
Kocaeli	1	894.242
Malatya	2	462.569
Niğde	4	149.696
Yalova	1	122.075

Eleven of the selected cities are in the first hazard zone, four of the selected cities are in the second hazard zone and two of the selected cities are in the fourth hazard zone.

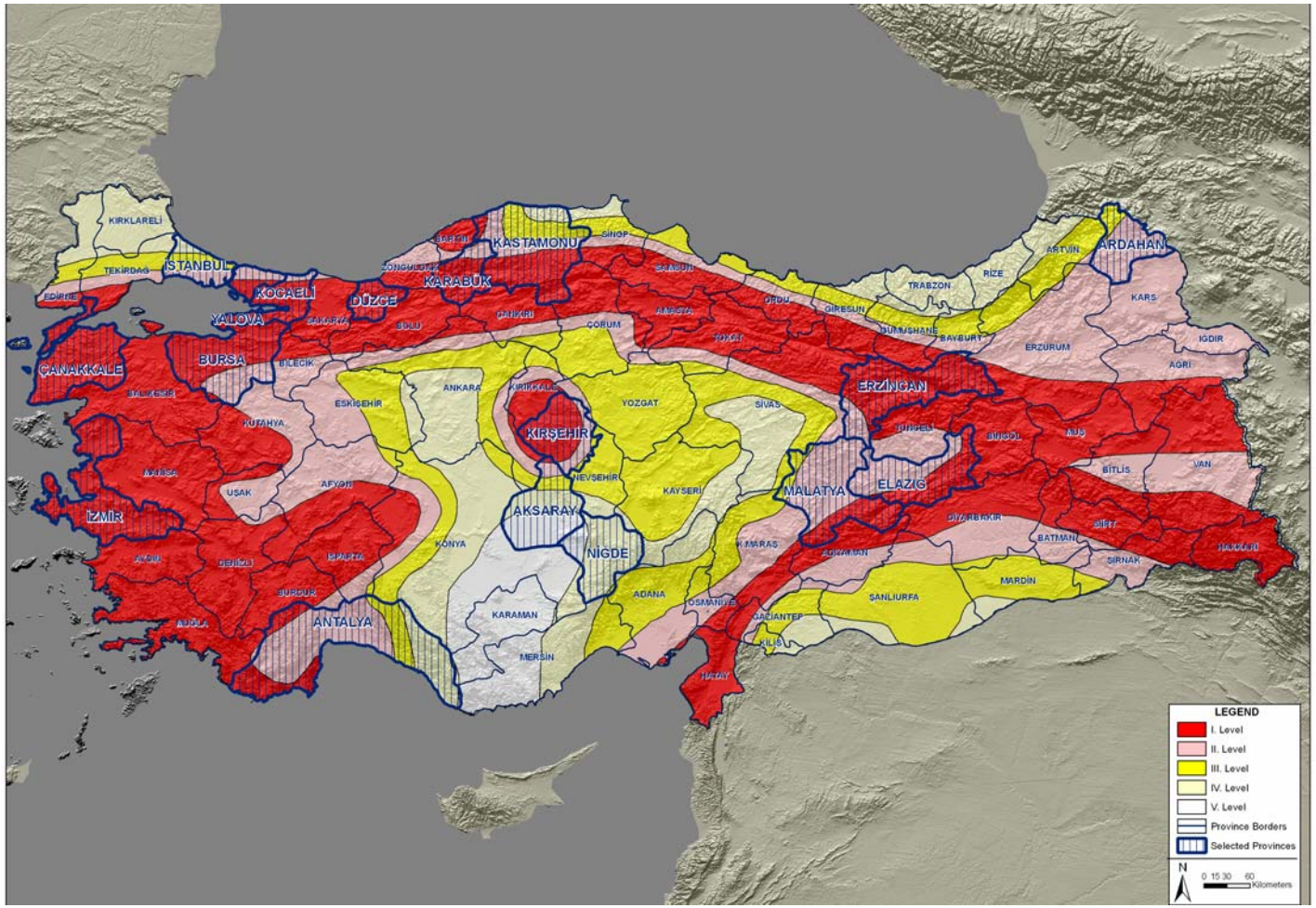

Figure 5.2 Selected Provincial Centers

The dependent variables on the assumptions of earthquake scenarios identified in Province Disaster Plans, prepared by governorships are given below. (See Table 5.2)

- Estimated number of population killed
- Estimated number of population injured
- Estimated number of homeless and affected people
- Estimated number of totally destroyed units
- Estimated number of moderately destroyed units
- Estimated number of lightly destroyed units

The variables are categorized in two groups as human loss and material loss.

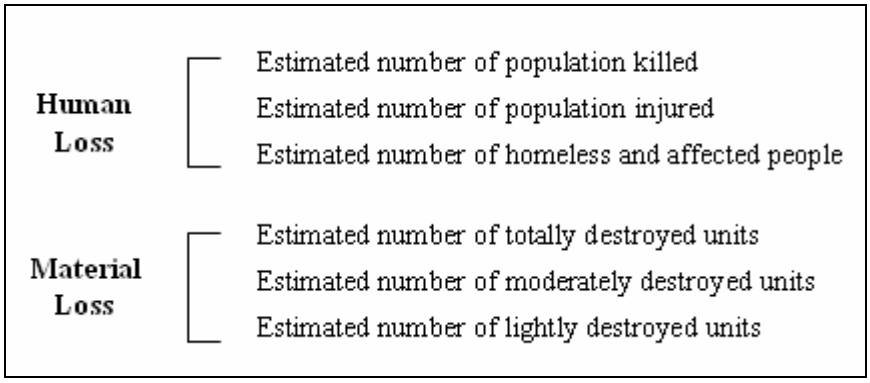

Figure 5.3 Dependent variables of the Research on the assumptions of earthquake scenarios

Table 5.2 Depended Variables on the Assumptions of Earthquake Scenarios

(Source: GDDA, 2007)

Provincial Centers	**Estimated Magnitude**	**Estimated Number of Killed/ Injured/ Affected People**	**Estimated Number of Destroyed Units**
Aksaray	6.7	Killed People: 300 Injured People: 500 Homeless and Affected People: 1270	Totally or Moderately Destroyed Units: 145
Antalya	7	Killed People: %1-%3 of the population Injured People: %3-%9 of the population Homeless and Affected People: %7 of the population	Totally or Moderately Destroyed Units: 2100
Ardahan	6.5	Killed People: %30 of the population Injured People: %40 of the population Homeless and Affected People: %30 of the population	Totally Destroyed Units: %30 of the buildings Moderately Destroyed Units: %70 of the buildings
Bursa	5.7-7	Killed People: %0.12-%0.40 of the pop. Injured People: %0.6-%0.21 of the pop. Homeless and Affected People: %17-%34 of the population	Totally Destroyed Units: 85.550 Moderately Destroyed Units: 98.955 Lightly Destroyed Units: 123.966
Çanakkale	7	Killed People: 54 -181 Injured People: 162 - 543 Homeless and Affected People: 5911-24.598	Totally Destroyed Units: 1802 Moderately Destroyed Units: 5697 Lightly Destroyed Units: 6129
Düzce	7.2	-	Totally Destroyed Units: 9000 Moderately Destroyed Units: 4200 Lightly Destroyed Units: 4000
Elazığ	7.1	Killed People: %1 of the population Injured People: %40 of the population Homeless and Affected People: %50 of the population	Totally Destroyed Units: 1000 Moderately Destroyed Units: 1500 Lightly Destroyed Units: 2000
Erzincan	6.5	Killed People: 500 – 1700 Injured People: 1530 – 2500 Homeless and Affected People: 80.000-12.000	Totally Destroyed Units: 16.989 Moderately Destroyed Units: 7050 Lightly Destroyed Units: 1405
Istanbul	7.5 – 7.7	Killed People: 70.000– 90.000 Injured People: 520.000 Homeless and Affected People: 500.000-600.000	Totally Destroyed Units: 50.000 – 60.000
Izmir	6.5	Killed People: 6946 – 23.159 Injured People: 20.840 – 231.159 Homeless and Affected People: 1.748.082	Totally Destroyed Units: 231.583 Moderately Destroyed Units: 267.867 Lightly Destroyed Units: 335.575
Karabük	7.8	Killed People: 226 Injured People: 569 Homeless and Affected People: 5864	Totally Destroyed Units: 870 Moderately Destroyed Units: 478 Lightly Destroyed Units: 599
Kastamonu	7.5	Killed People: 77 Injured People: 194 Homeless and Affected People: 3573	Totally Destroyed Units: 295 Moderately Destroyed Units: 565 Lightly Destroyed Units: 629
Kırşehir	6.8	Affected People: 144.726	Totally or Moderately Destroyed Units: %0.4 of the buil.
Kocaeli	7 - 7.5	Killed People: %0.7 of the population Injured People: %2 of the population Homeless and Affected People: %33 of the population	Totally Destroyed Units: 77.848 Moderately Destroyed Units: 36.000 Lightly Destroyed Units: 45.000
Malatya	6.8	Killed People: 2000 Injured People: 10.000	Totally or Moderately Destroyed Units: 27.000
Niğde	7.2	Killed People: 2240 Injured people: 5000	Totally Destroyed Units: 540 Moderately Destroyed Units: 1800
Yalova	7 - 7.5	Killed People: 1800 Injured People: 5400 Homeless and Affected People: 27.000	Totally Destroyed Units : 13.400 Moderately Destroyed Units: 6200 Lightly Destroyed Units: 7750

These variables will be used in the comparison of the risk factors dependent on the assumptions of the earthquake scenarios. This investigation of assumptions of the earthquake scenarios within the selected cities aims to compare the official assumptions made by governorships with the results of this study, and therefore to survey the consistency of official assumptions.

Table 5.1 is composed from the raw data of dependent variables on the assumptions of earthquake scenarios identified in Province Disaster Plans, prepared by governorships. This raw data shows clearly the inadequacy of the guide in the preparation of Disaster Plans. As a result of this inadequacy, the assumptions and variables in Disaster Plans do not have a general format.

The units of variables are different from each other, while some governorship used percentages to express the estimated number of killed-injured-affected people and destroyed units, the others used real numbers.

Consequently, a standardization process has to be done in order to organize this raw data. Three main assumptions are made within this standardization process. These are;

1. For the assumptions that are given between a minimum and maximum estimation level, the maximum estimations are accepted in order to obtain the worst-case scenarios. These provincial centers that provided maximum estimations are Antalya, Bursa, Çanakkale, Erzincan, Istanbul and Izmir.

2. The provincial centers that used percentages (% of the population) to express the estimated number of killed, injured and affected people are converted to numbers by using the Population Census (2007) when necessary. These provincial centers that used populations to standardize their assumptions are Antalya, Ardahan, Bursa, Elazığ and Kocaeli.

3. The provincial centers that used percentages (% of the buildings) to express the estimated number of totally, moderately and lightly destroyed units are converted to numbers by using the Building Census (2000). These provincial centers that used building numbers to standardize their assumptions are Ardahan and Kırşehir.

Table 5.3 Standardized Assumptions of Earthquake Scenarios

Provincial Centers	Magnitude	Killed People	Injured People	Affected People	Totally Destroyed	Moderately Destroyed	Lightly Destroyed
Aksaray	6,7	300	1120	150	145	-	-
Antalya	7	53.679	161.037	125.251	2100	-	-
Ardahan	6,5	33.816	45.088	33.816	2463	5748	-
Bursa	5,7-7	9760	19.519	829.558	85.550	98.955	123.966
Çanakkale	7	181	543	24.598	1802	5697	6129
Düzce	7,2	-	-	-	9000	4200	4000
Elazığ	7,1	5413	216.503	270.629	1000	1500	2000
Erzincan	6,5	1700	2500	12.000	16.989	7050	1405
Istanbul	7,5 - 7,7	90.000	520.000	600.000	60.000	-	-
Izmir	6,5	23.159	231.159	1.748.082	231.583	267.867	335.575
Karabük	7,8	226	569	5864	870	478	599
Kastamonu	7,5	77	194	3573	295	565	629
Kırşehir	6,8	-	-	144.726	146	-	-
Kocaeli	7-7,5	10.065	28.759	474.516	77.848	36.000	45.000
Malatya	6,8	2000	10.000	-	27.000	-	-
Niğde	7,2	2240	5000	-	1800	-	-
Yalova	7-7,5	1800	5400	27.000	13.400	6200	7750

According to the standardized assumptions of earthquake scenarios;

The biggest magnitude of earthquake is in Karabük with 7, 8 MSK scale, Istanbul is in the second place with 7, 5- 7, 7 MSK scale, Kastamonu, Kocaeli and Yalova is in the third place with 7-7, 5 MSK scale.

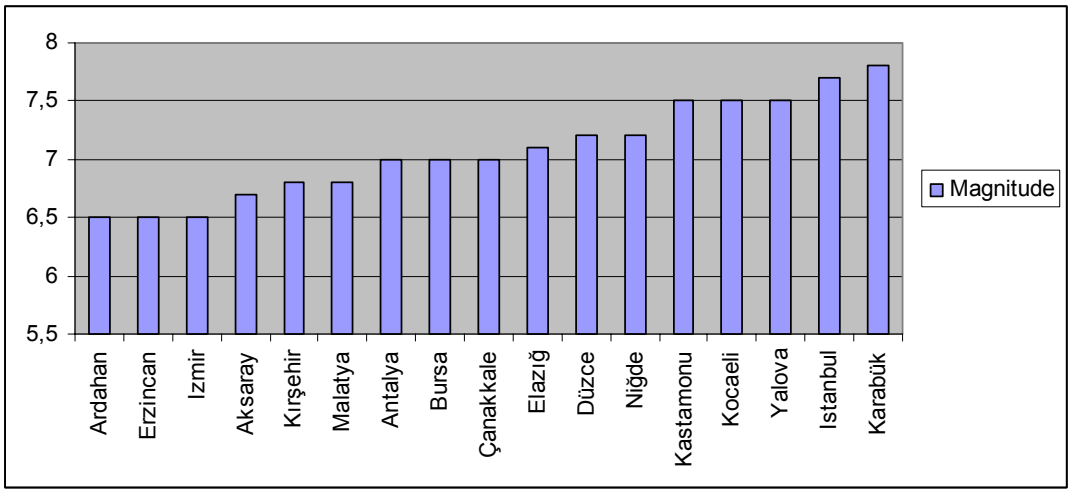

Figure 5.4 Estimated Magnitudes of EQ's

Table 5.4 Earthquake Hazard Zones and Loss Assumptions Comparison

Provincial Centers	Earthquake Hazard Zone	Population	Human Loss	Human Loss / Population (x/1000)	Building Stock	Material Loss	Material Loss / Building Stock (x/100)
Aksaray	4	204.808	1570	7,67	55305	145	0,26
Antalya	2	1.127.634	339967	0,30	233802	2100	0,90
Ardahan	2	35.835	112720	3,15	8148	8211	100,00
Bursa	1	1.979.999	858837	0,43	270023	308471	100,00
Çanakkale	1	247.443	25322	0,10	64657	13628	21,08
Düzce	1	157.894	0	0,00	19617	17200	87,68
Elazığ	2	389.774	492545	1,26	52354	4500	8,60
Erzincan	1	114.437	16200	0,14	37765	25444	67,37
Istanbul	1	11.174.257	1210000	0,11	869444	60000	6,90
Izmir	1	3.175.133	2002400	0,63	522243	835025	100,00
Karabük	1	164.072	6659	0,04	25632	1947	7,60
Kastamonu	1	184.685	3844	0,02	39292	1489	3,79
Kırşehir	1	147.073	144.726	0,98	35704	146	0,41
Kocaeli	1	894.242	513340	0,57	140613	158848	100,00
Malatya	2	462.569	12.000	0,03	84029	27000	32,13
Niğde	4	149.696	7240	0,05	52710	1800	3,41
Yalova	1	122.075	34200	0,28	23269	27350	100,00

When we examine the human loss assumptions according to the earthquake hazard levels, we can see that the highest population loss is in Aksaray which is located in fourth degree earthquake hazard zone. The second and third population loss is in Ardahan and Elazığ, which are located in the second degree earthquake hazard zone.

This ranking shows clearly both the inconsistency of the assumptions and the deficiency of Earthquake Hazard Map of Turkey.

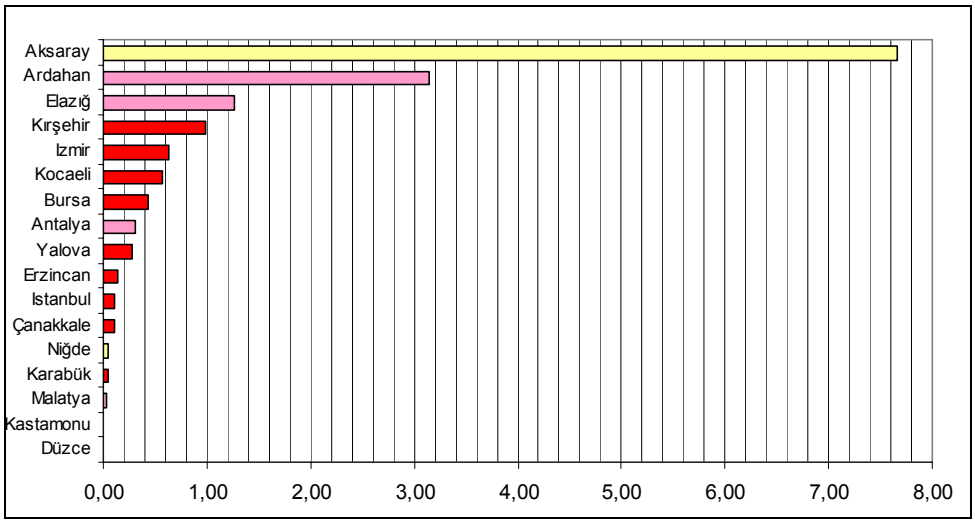

Figure 5.5 Human Loss Assumptions

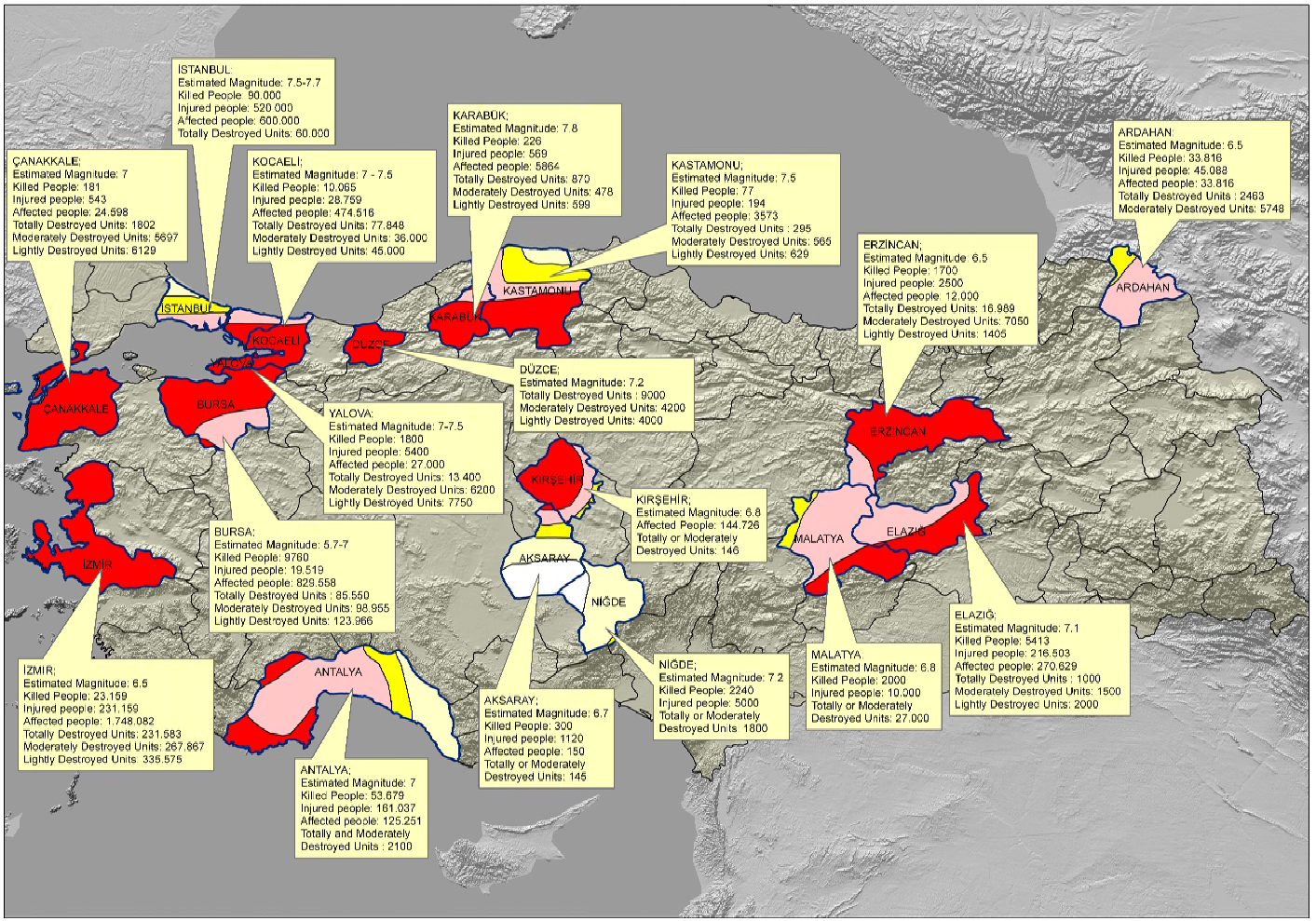

Figure 5.5 Standardized Assumptions of Earthquake Scenarios

Source: GDDA, 2007

After the standardization process, two dependent variables, Y_1 and Y_2 are determined in order to examine the basic question of the research "How do hazard levels correlate to Y_1 and Y_2 and other independent variables?"

Table 5.5 Dependent Variables of the Research

	Urban Population	**Killed People**	**Injured People**	**Affected People**	$\mathbf{Y_{1a}}$	$\mathbf{Y_{1b}}$	$\mathbf{Y_{1c}}$	$\mathbf{Y_2}$
Aksaray	204.808	300	1120	150	14,65	54,69	7,32	26,22
Antakya	1.127.634	53.679	161.037	125.251	476,03	1428,10	1110,74	89,82
Ardahan	35.835	33.816	45.088	33.816	9436,58	12582,11	9436,58	10000
Bursa	1.979.999	9760	19.519	829.558	49,29	98,58	4189,69	10000
Çanakkale	247.443	181	543	24.598	7,31	21,94	994,09	2107,74
Düzce	157.894	0	0	0	0,00	0,00	0,00	8767,91
Elazığ	389.774	5413	216.503	270.629	138,88	5554,58	6943,23	859,53
Erzincan	114.437	1700	2500	12.000	148,55	218,46	1048,61	6737,46
İstanbul	11.174.257	90.000	520.000	600.000	80,54	465,36	536,95	690,10
İzmir	3.175.133	23.159	231.159	1.748.082	72,94	728,03	5505,54	10000
Karabük	164.072	226	569	5864	13,77	34,68	357,40	759,60
Kastamonu	184.685	77	194	3573	4,17	10,50	193,46	378,96
Kırşehir	147.073	0	0	144.726	0,00	0,00	9840,42	40,89
Kocaeli	894.242	10.065	28.759	474.516	112,55	321,60	5306,35	10000
Malatya	462.569	2000	10.000	0	43,24	216,18	0,00	3213,18
Niğde	149.696	2240	5000	0	149,64	334,01	0,00	341,49
Yalova	122.075	1800	5400	27.000	147,45	442,35	2211,76	10000

Y_{1a} Y_{1b} and Y_{1c} are dependent variables of the research and composed from the ratio of killed, injured and affected people numbers to the urban population.

$\mathbf{Y_{1a}}$ = Killed / Urban Population x 10000

$\mathbf{Y_{1b}}$ = Injured / Urban Population x 10000

$\mathbf{Y_{1c}}$ = Affected / Urban Population x 10000

Y2 is the other dependent variable of the research and composed from the ratio of destroyed, units to the building stock.

$\mathbf{Y_2}$ = Destroyed Units / Building Stock x 10000

5.2. Building Stock Attributes as Independent Variables of the Research

The independent variables of the research are composed of the building stock changes and rates of unauthorized buildings obtained from Turkish Statistical Institute (TSI).

After the compulsory selection of the case cities, published statistics of census and housing data prepared by the Turkish Statistical Institute is used to examine the building stock. "Building Construction Statistics" and "Building Census" prepared by Turkish Statistical Institute are the main source of data that is used within this research.

Information in the Building Construction Statistics is based on the construction and occupancy permits for new buildings by province, municipality and number of dwelling units, structural systems, materials used, and types of investors.

This publication is used to obtain two datasets about building stocks. The first dataset is about building stock changes between 1954 and 2003 (see Appendix D). The second dataset is about the "building amnesties" between 1984 and 2000 (see Appendix E).

Building Census was conducted at the center of provinces, districts and villages which have municipality organization for determination the number of buildings, use of building, construction year, number of stories, number of residential buildings, structural system and building material, water installation and waste water drainage system of building and floor area of building.

This publication is used to obtain two datasets about building stocks. The first dataset is about the rates of unauthorized building stock and the second dataset is about the rates of stock of 3+ stories.

5.2.1. Rates of Building Stock Changes between 1954 and 2003

Building Construction Statistics is used to have a cumulative dataset from 1954 to 2003, in order to make a comprehensive assessment about building stock changes in a certain time period. The cumulative dataset is composed according to the 17 selected provincial centers. (See Tables D.1 – D.18)

5.2.2. Rates of "Building Amnesties" between 1984 and 2000

The second dataset composed from Building Construction Statistics includes given permits by "building amnesties" between 1984 and 2000. This dataset consists of the cumulative number of the dwelling units and the use of buildings as a result of building amnesties.

5.2.3. Rates of Unauthorized Building Stock

Building Construction Statistics that are compiled by licenses propriety building stock records were not obtained due to not determined illegal building (TSI, 2000).

Consequently, Building Census (2000) is used to have the number of unauthorized building stock.

5.2.4. Rates of Stock of 3+ Stories

Building Census (2000) is used to have the rates of building stock of 3+ stories.

After four datasets about building stocks are obtained, 6 independent variables are composed from these datasets.

These independent variables are;

X1 = (Floor area emergency facilities / floor area of general total) x 100
X2 = (Floor area of Apartment House / Floor Area of Residential Building) x 100
X3 = (Total Buildings subject to Amnesties / General Total of Building) x 100
X4 = Population Growth Rate (‰)
X5 = Unauthorized Building Stock Rate (%)
X6 = Rates of Stock of 3+ Store's (%)

Table 5.6 Independent variables of the research

Provincial Centers	X_1	X_2	X_3	X_4	X_5	X_6
AKSARAY	1,83	82,29	0,93	35,95	81,34	24,68
ANTALYA	1,39	93,63	13,54	46,67	83,70	18,56
ARDAHAN	20,20	77,05	0,00	3,01	97,56	5,57
BURSA	14,07	77,69	34,63	35,86	71,98	41,82
ÇANAKKALE	12,50	80,60	7,28	33,92	83,25	19,95
DÜZCE	3,15	84,98	0,00	-14,07	65,83	26,50
ELAZIĞ	2,99	84,46	10,22	26,42	51,93	24,33
ERZINCAN	4,73	74,25	6,47	15,51	72,10	10,36
İSTANBUL	1,39	88,56	30,59	28,35	65,92	59,74
İZMIR	2,09	88,49	11,47	23,83	73,48	27,22
KARABÜK	3,92	83,54	0,00	-4,49	58,48	30,23
KASTAMONU	5,21	76,13	10,58	22,55	81,76	27,78
KIRŞEHIR	3,14	78,63	8,37	18,07	77,71	12,19
KOCAELI	2,56	88,81	56,81	2,57	74,59	37,73
MALATYA	1,65	95,01	4,59	34,3	81,69	14,79
NIĞDE	2,41	82,40	21,81	34,98	85,77	11,48
YALOVA	2,21	90,92	0,10	6,32	77,70	36,88

$\mathbf{X_1}$ is the first independent variable of the research and it is composed from the ratio of emergency facilities floor area to general total floor area.

$\mathbf{X_2}$ is the second independent variable of the research and it is composed from the ratio of apartment house floor area to residential buildings floor area.

$\mathbf{X_3}$ is the third independent variable of the research and it is composed from the ratio of building amnesties to general total of buildings.

$\mathbf{X_4}$ is the fourth independent variable of the research and it is composed from the population growth rate of provincial centers.

$\mathbf{X_5}$ is the fifth independent variable of the research and it is composed from the unauthorized building stock rate.

$\mathbf{X_6}$ is the sixth independent variable of the research and it is composed from the rates of stock of 3+ stories.

Table 5.7 First independent variable of the research- X_1

Provincial Centers	Floor Area of Emergency Facilities	Floor Area of General Total	$\mathbf{X_1}$
AKSARAY	122354	6673125	1,83
ANTALYA	557045	39938961	1,39
ARDAHAN	28205	139623	20,20
BURSA	6780411	48175084	14,07
ÇANAKKALE	577914	4624721	12,50
DÜZCE	130628	4150670	3,15
ELAZIĞ	375904	12576303	2,99
ERZINCAN	204381	4320291	4,73
İSTANBUL	3066118	219935918	1,39
İZMIR	1905008	91144358	2,09
KARABÜK	191947	4899558	3,92
KASTAMONU	175384	3365746	5,21
KIRŞEHIR	150239	4778445	3,14
KOCAELI	628243	24578248	2,56
MALATYA	222163	13464631	1,65
NIĞDE	105432	4375888	2,41
YALOVA	91497	4144523	2,21

$\mathbf{X_1}$ = (Floor area of emergency facilities / floor area of general total) x 100

$\mathbf{X_1}$ is the first independent variable of the research and it is composed from the ratio of emergency facilities floor area to general total floor area.

As emergency facilities are both important from pre-disaster and post-disaster activities, this variable is composed to see the correlation between emergency facilities and dependent variables, Y_1 (sum of killed-injured-affected people) – Y_2 (killed-injured-affected people ratio to urban population).

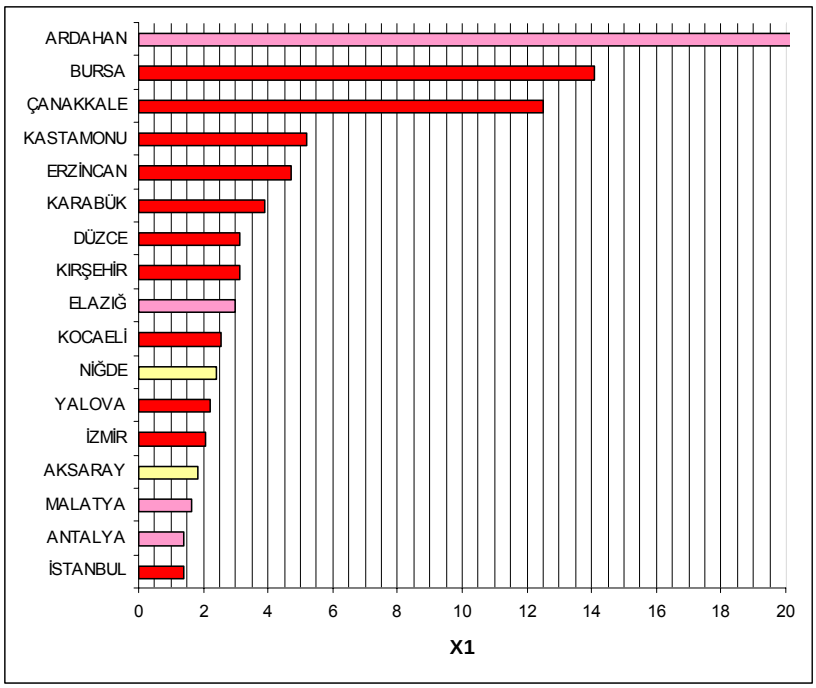

Figure 5.7 First independent variable of the research- X_1

Table 5.8 Second independent variable of the research- X_2

Provincial Centers	Floor Area of Apartment	Floor Area of Residential Building	**X_2**
AKSARAY	4508917	5479017	82,29
ANTALYA	29090527	31069118	93,63
ARDAHAN	58696	76181	77,05
BURSA	26813134	34515195	77,69
ÇANAKKALE	2810708	3487330	80,60
DÜZCE	2675378	3148400	84,98
ELAZIĞ	9137063	10818701	84,46
ERZINCAN	2399597	3231837	74,25
İSTANBUL	154418919	174367511	88,56
İZMIR	61042049	68979492	88,49
KARABÜK	3092224	3701352	83,54
KASTAMONU	2060812	2706949	76,13
KIRŞEHIR	3145944	4000896	78,63
KOCAELI	14845415	16715550	88,81
MALATYA	10379241	10924288	95,01
NIĞDE	2974749	3610334	82,40
YALOVA	3061010	3366805	90,92

X2 = (Floor area of Apartment House / Floor Area of Residential Building) x 100

$\mathbf{X_2}$ is the second independent variable of the research and it is composed from the ratio of apartment house floor area to residential buildings floor area.

As it is accepted that apartments increased the risk within the construction conditions in Turkey, the ratio of apartment houses in residential buildings is important for the research and this variable is composed to see the correlation between apartment houses ratio and dependent variables, Y_1 (sum of killed-injured-affected people) – Y_2 (killed-injured-affected people ratio to urban population).

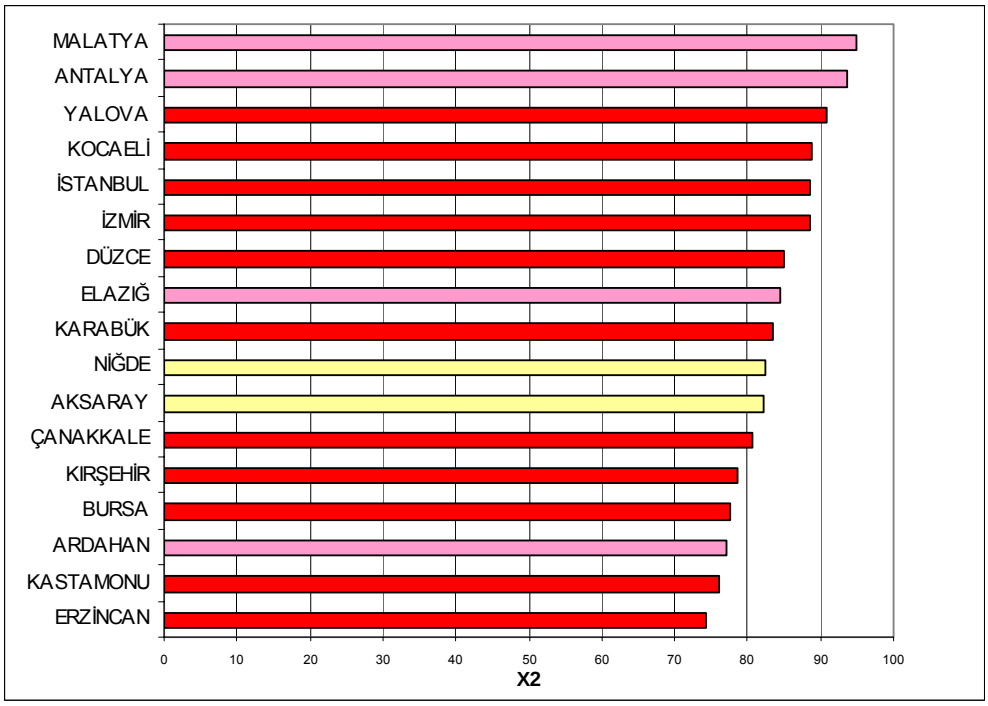

Figure 5.8 Second independent variable of the research- X_2

Table 5.9 Third independent variable of the research- X_3

Provincial Centers	Total Building Amnesties	General Total of Building	X_3
AKSARAY	96	10322	0,93
ANTALYA	5160	38100	13,54
ARDAHAN	0	199	0,00
BURSA	26199	75653	34,63
ÇANAKKALE	788	10829	7,28
DÜZCE	0	6703	0,00
ELAZIĞ	2573	25169	10,22
ERZINCAN	682	10535	6,47
İSTANBUL	90641	296275	30,59
İZMIR	15891	138503	11,47
KARABÜK	0	10643	0,00
KASTAMONU	758	7167	10,58
KIRŞEHIR	666	7960	8,37
KOCAELI	20295	35724	56,81
MALATYA	706	15386	4,59
NIĞDE	1636	7500	21,81
YALOVA	5	5190	0,10

X_3 = (Total Building Amnesties / General Total of Building) x 100

X_3 is the third independent variable of the research and it is composed from the ratio of building amnesties to general total of buildings.

The ratio of unauthorized buildings increased the risk and very important for the research. This variable is composed to see the correlation between unauthorized buildings and dependent variables, Y_1 (sum of killed-injured-affected people) – Y_2 (killed-injured-affected people ratio to urban population).

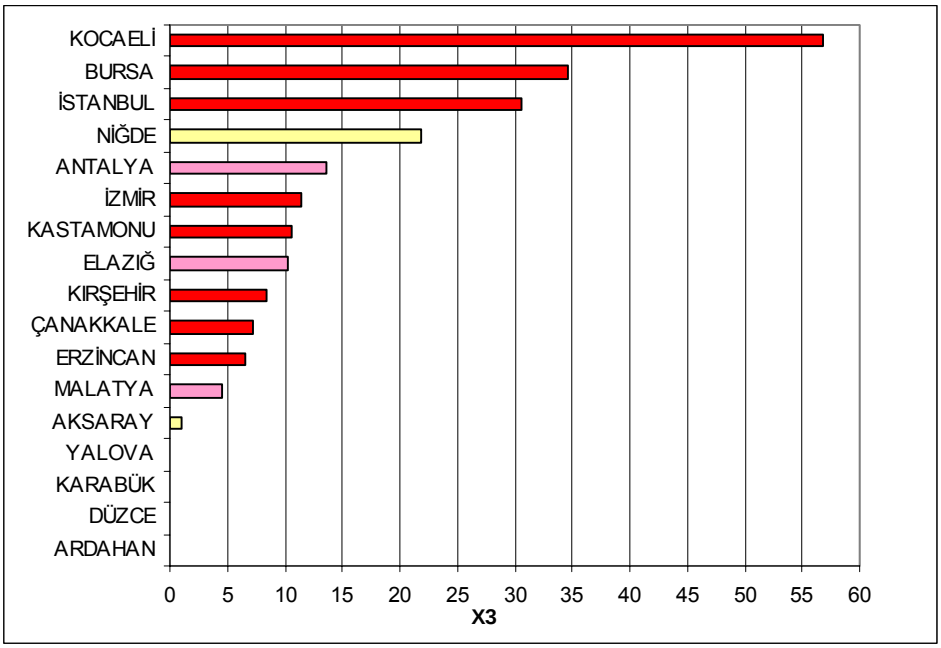

Figure 5.9 Third independent variable of the research- X_3

Table 5.10 Fourth independent variable of the research- X_4

Provincial Centers	**X_4**
AKSARAY	35,95
ANTALYA	46,67
ARDAHAN	3,01
BURSA	35,86
ÇANAKKALE	33,92
DÜZCE	-14,07
ELAZIĞ	26,42
ERZINCAN	15,51
İSTANBUL	28,35
İZMIR	23,83
KARABÜK	-4,49
KASTAMONU	22,55
KIRŞEHIR	18,07
KOCAELI	2,57
MALATYA	34,3
NIĞDE	34,98
YALOVA	6,32

X4 = Population Growth Rate (‰)

X_4 is the fourth independent variable of the research and it is composed from the population growth rate of provincial centers.

As it is accepted that the rise of population raises the building stock, this increased the risk also. This variable is composed to see the correlation between population growth and dependent variables, Y_1 (sum of killed-injured-affected people) – Y_2 (killed-injured-affected people ratio to urban population).

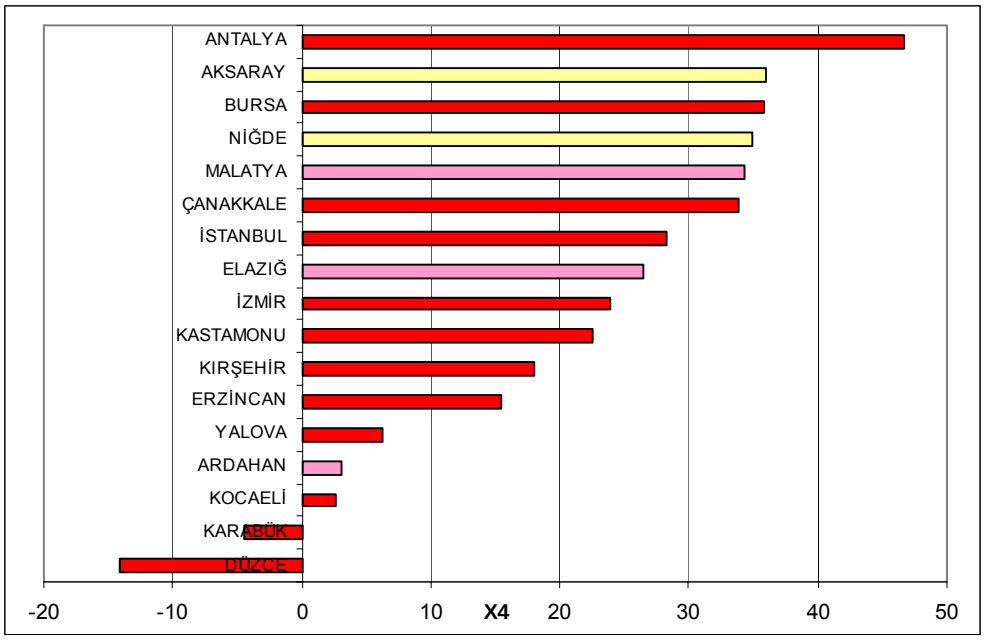

Figure 5.10 Fourth independent variable of the research- X_4

Table 5.11 Fifth independent variable of the research- X_5

Provincial Centers	Building Stock	Unauthorized Building Stock	**X_5**
AKSARAY	55305	44983	81,34
ANTALYA	233802	195702	83,70
ARDAHAN	8148	7949	97,56
BURSA	270023	194370	71,98
ÇANAKKALE	64657	53828	83,25
DÜZCE	19617	12914	65,83
ELAZIĞ	52354	27185	51,93
ERZINCAN	37765	27230	72,10
İSTANBUL	869444	573169	65,92
İZMIR	522243	383740	73,48
KARABÜK	25632	14989	58,48
KASTAMONU	39292	32125	81,76
KIRŞEHIR	35704	27744	77,71
KOCAELI	140613	104889	74,59
MALATYA	84029	68643	81,69
NIĞDE	52710	45210	85,77
YALOVA	23269	18079	77,70

X5 = Unauthorized Building Stock Rate (%)

X_5 is the fifth independent variable of the research and it is composed from the unauthorized building stock rate (%)

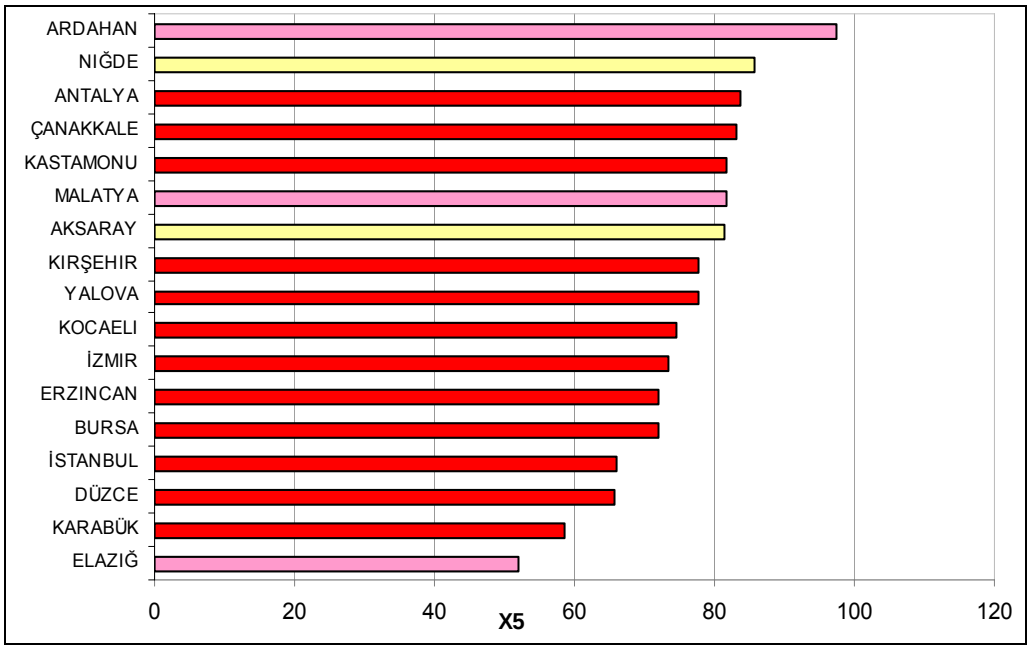

Figure 5.11 Fifth independent variable of the research- X_5

Table 5.12 Sixth independent variable of the research- X_6

Provincial Centers	**Building Stock**	**3-+**	**X_6**
AKSARAY	55305	13647	24,68
ANTALYA	233802	43385	18,56
ARDAHAN	8148	454	5,57
BURSA	270023	112930	41,82
ÇANAKKALE	64657	12896	19,95
DÜZCE	19617	5199	26,50
ELAZIĞ	52354	12740	24,33
ERZINCAN	37765	3911	10,36
İSTANBUL	869444	519434	59,74
İZMIR	522243	142141	27,22
KARABÜK	25632	7749	30,23
KASTAMONU	39292	10917	27,78
KIRŞEHIR	35704	4352	12,19
KOCAELI	140613	53051	37,73
MALATYA	84029	12430	14,79
NIĞDE	52710	6049	11,48
YALOVA	23269	8582	36,88

X6 = Rates of Stock of 3+ Store's (%)

$\mathbf{X_6}$ is the sixth independent variable of the research and it is composed from the rates of stock of 3+ stories.

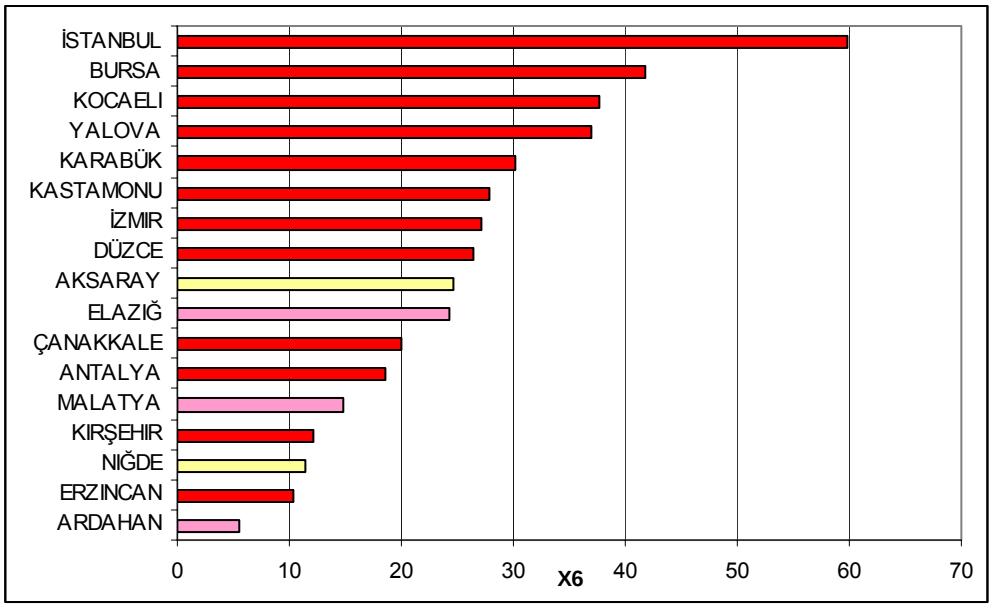

Figure 5.12 Sixth independent variable of the research- X_6

After all dependent and independent variables are composed best subsets regression analyses and regression analyses are employed to see the relationship between these variables.

CHAPTER 6

EVALUATION OF URBAN SEISMIC RISK VARIABLES IN THE METROPOLITAN CITIES OF TURKEY

Dependent and independent variables of the research are shown below. Best subsets regression analyses are employed to determine what combinations of the independent variables might best denote city-level risks.

The results of the best subsets analyses should give us the "most appropriate combination" for the regression analyses.

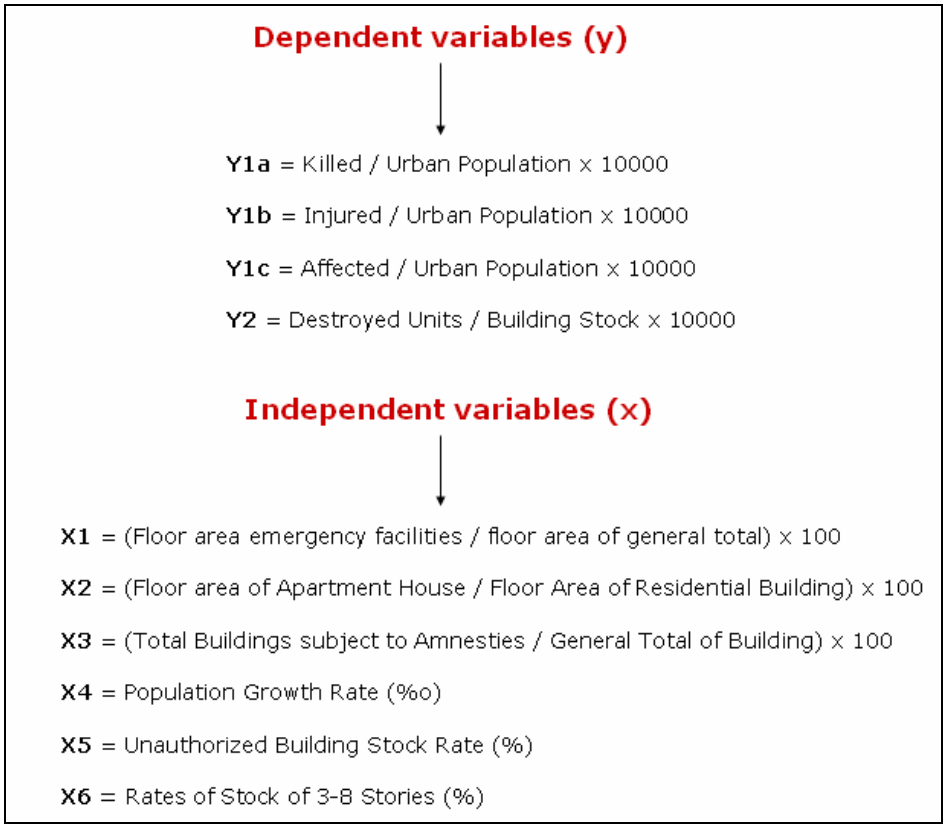

Figure 6.1 Dependent and Independent Variables of the Research

6.1. Best Subsets Regression Analyses

The first best subsets regression analyses is employed between the first dependent variable Y1a and other independent variables (X1, X2, X3, X4, X5, X6) in order to see which independent variable is more related with Y1a.

Table 6.1 Best Subsets Regression: Y1a versus x1; x2; x3; x4; x5; x6

Best Subsets Regression: Y1A versus X1; X2; X3; X4; X5; X6

Response is Y1A

Vars	R-Sq	R-Sq(adj)	Mallows Cp	S	X 1	X 2	X 3	X 4	X 5	X 6
1	51,8	48,6	3,7	1627,1	X					
1	27,7	22,9	12,0	1992,7					X	
2	58,2	52,2	3,5	1569,0	X				X	
2	56,8	50,6	4,0	1594,6	X					X
3	66,4	**58,6**	2,7	1460,5	X				X	
3	61,8	53,0	4,2	1555,2	X	X				X
4	68,6	58,2	3,9	1468,0	X	X		X	X	
4	67,4	56,5	4,3	1496,9	X	X		X		X
5	71,0	57,8	5,0	1474,3	X	X		X	X	X
5	69,8	56,1	5,4	1503,3	X	X	X	X	X	
6	71,1	53,8	7,0	1542,8	X	X	X	X	X	X

In best subsets regression analyses the more related variable is the one that have the biggest number of R-Sq (adj). Table 6.1 shows us that the biggest R-Sq (adj) is 58,6 in the third line and this means that the most related variables with Y1a is X1 and X5.

As a result of this analysis we can say that;
Y1a which is the ratio of killed people to urban population is correlated with X1 and X5.

Accordingly, the first regression analysis is performed with;

Y1a = Killed / Urban Population x 10000 and

X1 = (Floor area emergency facilities / floor area of general total) x 100

X5 = Unauthorized Building Stock Rate (%)

The second best subsets regression analyses is employed between Y1b and other independent variables (X1, X2, X3, X4, X5, X6) in order to see which independent variable is more related with Y1b.

Table 6.2 Best Subsets Regression: Y1b versus x1; x2; x3; x4; x5; x6

Best Subsets Regression: Y1B versus X1; X2; X3; X4; X5; X6

Response is Y1B

Vars	R-Sq	R-Sq(adj)	Mallows Cp	S	X1	X2	X3	X4	X5	X6
1	37,8	33,6	0,1	2597,9	X					
1	12,5	6,7	5,4	3080,1						X
2	42,6	34,4	1,0	2581,6	X					X
2	41,3	32,9	1,3	2611,4	X	X				
3	48,3	**36,4**	1,8	2542,9	X					X
3	44,7	32,0	2,6	2629,3	X	X	X			
4	51,1	34,8	3,3	2573,8	X	X		X		X
4	50,7	34,3	3,3	2584,4	X	X			X	X
5	52,3	30,7	5,0	2655,2	X	X		X	X	X
5	51,2	29,0	5,2	2686,4	X	X	X	X		X
6	52,3	23,7	7,0	2784,5	X	X	X	X	X	X

Table 6.2 shows us that the biggest R-Sq (adj) is 36, 4 in the third line and this means that the most related variables with Y1b is X_1 and X_6.

As a result of this analysis we can say that;
Y1b which is the ratio of injured people to urban population is correlated with X_1 and X_6.

Accordingly, the second regression analysis is performed with;

Y1b = Injured / Urban Population x 10000

X1 = (Floor area emergency facilities / floor area of general total) x 100

X6 = Rates of Stock of 3+ Stories (%)

The third best subsets regression analyses is employed between Y1c and other independent variables (X1, X2, X3, X4, X5, X6) in order to see which independent variable is more related with Y1c.

Table 6.3 Best Subsets Regression: Y1c versus x1; x2; x3; x4; x5; x6

Best Subsets Regression: Y1C versus X1; X2; X3; X4; X5; X6

Response is Y1C

Vars	R-Sq	R-Sq(adj)	Mallows Cp	S	X1	X2	X3	X4	X5	X6
1	15,2	**9,6**	-0,7	3233,5	X					
1	5,1	0,0	0,8	3420,7		X				
2	17,3	5,5	1,0	3305,5	X		X			
2	17,3	5,5	1,0	3305,5	X			X		
3	22,8	5,0	2,2	3314,6	X		X			X
3	20,2	1,8	2,6	3370,8	X		X	X		
4	28,0	4,1	3,5	3330,9	X		X		X	X
4	27,3	3,1	3,6	3348,2	X		X	X		X
5	30,3	0,0	5,1	3423,5	X		X	X	X	X
5	28,9	0,0	5,3	3458,6	X	X	X		X	X
6	31,3	0,0	7,0	3565,8	X	X	X	X	X	X

Table 6.3 shows us that the biggest R-Sq (adj) is 9,6 in the first line and this means that the most related variables with Y1c is X_1.

As a result of this analysis we can say that;
Y1c which is the ratio of affected people to urban population is correlated with X_1.

Accordingly, the second regression analysis is performed with;

Y1c = Affected / Urban Population x 10000

X1 = (Floor area emergency facilities / floor area of general total) x 100

The fourth best subsets regression analyses is employed between Y2 and other independent variables (X1, X2, X3, X4, X5, X6) in order to see which independent variable is more related with Y2.

Table 6.4 Best Subsets Regression: Y2 versus x1; x2; x3; x4; x5; x6

Best Subsets Regression: Y2 versus X1; X2; X3; X4; X5; X6

Response is Y2

			Mallows		X	X	X	X	X	X
Vars	R-Sq	R-Sq(adj)	Cp	S	1	2	3	4	5	6
1	23,3	18,2	2,6	4024,4			X			
1	13,5	7,8	4,5	4274,2	X					
2	34,1	24,7	2,4	3862,8	X		X			
2	30,2	20,2	3,2	3974,6		X	X			
3	43,9	30,9	2,4	3699,3	X	X		X		
3	41,8	28,4	2,8	3766,2	X		X	X		
4	50,1	**33,5**	3,1	3629,5	X			X		
4	45,1	26,8	4,1	3806,7	X	X		X		X
5	50,7	28,3	5,0	3769,4	X	X	X	X	X	
5	50,2	27,5	5,1	3789,3	X	X	X	X		X
6	50,7	21,1	7,0	3952,0	X	X	X	X	X	X

Table 6.4 shows us that the biggest R-Sq (adj) is 33,5 in the fourth line and this means that the most related variables with Y2 is X_1 and X_4.

As a result of this analysis we can say that;
Y2 which is the ratio of destroyed units to building stock is correlated with X_1 and X_4.

Accordingly, the second regression analysis is performed with;

Y2 = Destroyed Units / Building Stock x 10000

X1 = (Floor area emergency facilities / floor area of general total) x 100

X4 = Population Growth Rate (%o)

The results of best subsets regression analyses shows us that X1, the ratio of emergency facilities floor area to general total floor area of buildings, is the most effective and important independent variable and X1 is the only variable that correlates with all dependent variables.

This means that X1, the ratio of emergency facilities, is the most important factor between all independent variables and also the most effective factor on dependent variables.

6.2. Regression Analyses

Four regression analyses are performed according to the results of best subsets regression analyses. These are;

1- Regression Analysis: Y1a versus x1
2- Regression Analysis: Y1a versus x5
3- Regression Analysis: Y1b versus x1
4- Regression Analysis: Y1b versus x6
5- Regression Analysis: Y1c versus x1
6- Regression Analysis: Y2 versus x1
7- Regression Analysis: Y2 versus x4

6.2.1. Regression Analysis 1

Regression Analysis 1 is performed with Y1a and x1.

Y1a = Killed / Urban Population x 10000 and
X1 = (Floor area emergency facilities / floor area of general total) x 100

Table 6.5 Regression Analysis 1: Y1a versus x1

```
Regression Analysis: Y1A versus X1

The regression equation is
Y1A = - 894 + 305 X1


Predictor     Coef  SE Coef      T      P
Constant   -893,6    549,3  -1,63  0,125
X1         305,32    76,03   4,02  0,001


S = 1627,11   R-Sq = 51,8%   R-Sq(adj) = 48,6%


Analysis of Variance

Source           DF        SS        MS      F      P
Regression        1  42694870  42694870  16,13  0,001
Residual Error   15  39712344   2647490
Total            16  82407214


Unusual Observations

Obs    X1   Y1A   Fit  SE Fit  Residual  St Resid
  3  20,2  9437  5274    1219      4163      3,86RX
  4  14,1    49  3402     793     -3353     -2,36R

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large leverage
```

In regression analyses in order to say that there is a relation between variables, the R-Sq (adj) must be minimum 64%. As shown in the Table 6.3, the R-Sq (adj) is 48, 6%.

Although this ratio is insufficient to verify the relationship between Y1a and X_1, 48, 6% is a strong verification of relation for this type of datasets.

Consequently, we can say that there is a relation between killed people and the ratio of emergency facilities floor area to general total floor area of buildings

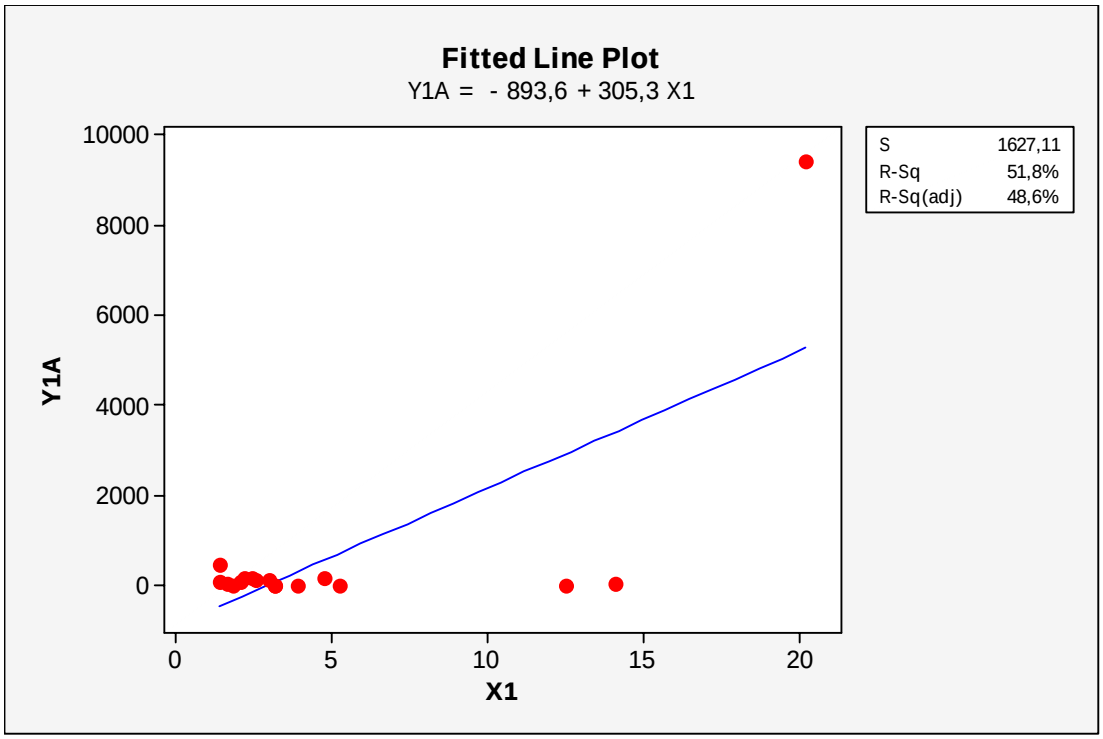

Figure 6.2 Regression Analysis: Y1a versus X_1

Regression equation of Y1a versus X_1 is;

Y1a = - 894 + 305 X1

R-Sq (adj) = 48, 6%

There is a **relation** between the regression equations of Y1a versus X_1

6.2.2. Regression Analysis 2

Regression Analysis 2 is performed with Y1a and X_5.

Y1a = Killed / Urban Population x 10000 and

X5 = Unauthorized Building Stock Rate (%)

Table 6.6 Regression Analysis 2: Y1a versus X_5

```
Regression Analysis: Y1A versus X5

The regression equation is
Y1A = - 7646 + 110 X5


Predictor     Coef  SE Coef      T      P
Constant    -7646     3489  -2,19  0,045
X5         109,65    45,72   2,40  0,030


S = 1992,71   R-Sq = 27,7%   R-Sq(adj) = 22,9%


Analysis of Variance

Source           DF        SS        MS     F      P
Regression        1  22844106  22844106  5,75  0,030
Residual Error   15  59563108   3970874
Total            16  82407214


Unusual Observations

Obs    X5   Y1A    Fit  SE Fit  Residual  St Resid
  3  97,6  9437   3051    1115      6385      3,87R
  7  51,9   139  -1952    1184      2091      1,30 X

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large leverage.
```

As shown in the Table 6.4, the R-Sq (adj) is 22, 9 %. Although this ratio isn't sufficient enough to verify the relationship between Y1a and X5, we can say that there is a weak relation between the killed people and unauthorized stock rate.

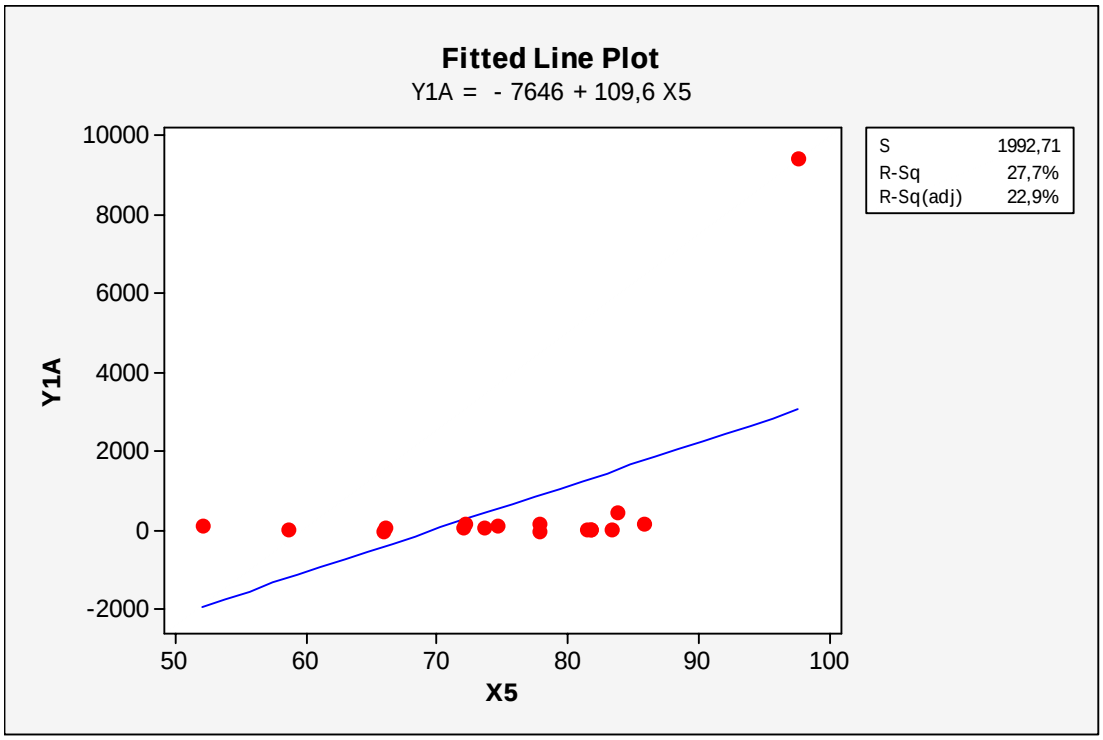

Figure 6.3 Regression Analysis: Y1a versus X_5

Regression equation of Y1a versus X_5 is;

Y1A = - 7646 + 110 X5

R-Sq (adj) = 22, 9%

There is a **weak relation** between the regression equations of Y1a versus X_5.

6.2.3. Regression Analysis 3

Regression Analysis 3 is performed with Y1b and X_1.

Y1b = Injured / Urban Population x 10000

X1 = (Floor area emergency facilities / floor area of general total) x 100

Table 6.7 Regression Analysis 3: Y1b versus X_1

```
Regression Analysis: Y1B versus X1

The regression equation is
Y1B = - 516 + 366 X1


Predictor     Coef  SE Coef      T      P
Constant   -516,4    877,0  -0,59  0,565
X1          366,2    121,4   3,02  0,009


S = 2597,86   R-Sq = 37,8%   R-Sq(adj) = 33,6%


Analysis of Variance

Source           DF         SS        MS     F      P
Regression        1   61426491  61426491  9,10  0,009
Residual Error   15  101233055   6748870
Total            16  162659546


Unusual Observations

Obs    X1    Y1B   Fit  SE Fit  Residual  St Resid
  3  20,2  12582  6881    1947      5701      3,31RX
  4  14,1     99  4636    1266     -4538     -2,00R

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large leverage.
```

As shown in the Table 6.5, the R-Sq (adj) is 33, 6 %. Although this ratio isn't sufficient enough to verify the relationship between Y1b and X1, we can say that there is a weak relation between the injured people and the ratio of emergency facilities floor area to general total floor area of buildings.

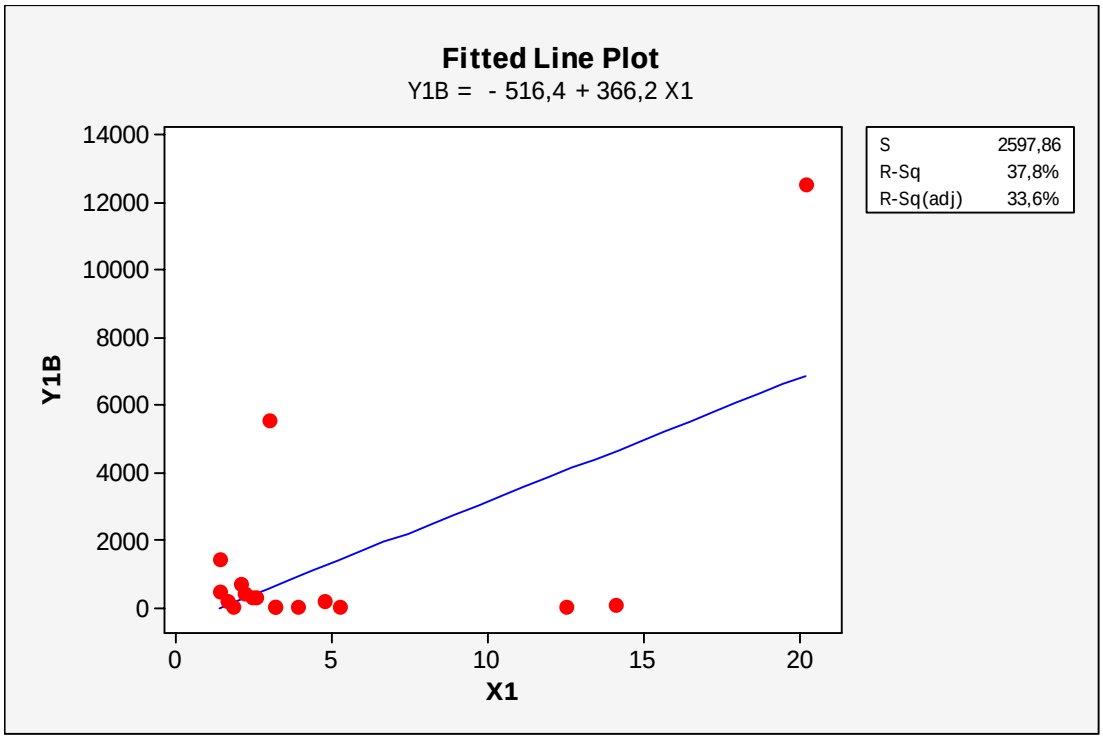

Figure 6.4 Regression Analysis: Y1b versus X_1

Regression equation of Y1b versus X_1 is;

Y1B = - 516 + 366 X1

R-Sq (adj) = 33, 6 %

There is a **weak relation** between the regression equations of Y1b versus X_1.

6.2.4. Regression Analysis 4

Regression Analysis 4 is performed with Y1b and X_6.

Y1b = Injured / Urban Population x 10000

X6 = Rates of Stock of 3+ Stories (%)

Table 6.8 Regression Analysis 4: Y1b versus X_6

```
Regression Analysis: Y1B versus X6

The regression equation is
Y1B = 3426 - 83,1 X6


Predictor    Coef  SE Coef      T      P
Constant     3426     1618   2,12  0,051
X6         -83,14    56,76  -1,46  0,164


S = 3080,10   R-Sq = 12,5%   R-Sq(adj) = 6,7%


Analysis of Variance

Source          DF         SS        MS     F      P
Regression       1   20354238  20354238  2,15  0,164
Residual Error  15  142305309   9487021
Total           16  162659546


Unusual Observations

Obs    X6    Y1B    Fit  SE Fit  Residual  St Resid
  3   5,6  12582   2963    1345      9619      3,47R
  9  59,7    465  -1541    2094      2006      0,89 X

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large leverage.
```

As shown in the Table 6.6, the R-Sq (adj) is 6, 7 %. This ratio isn't sufficient enough to verify the relationship between Y1b and X6 and there is no relation between the injured people and rates of 3+ stories.

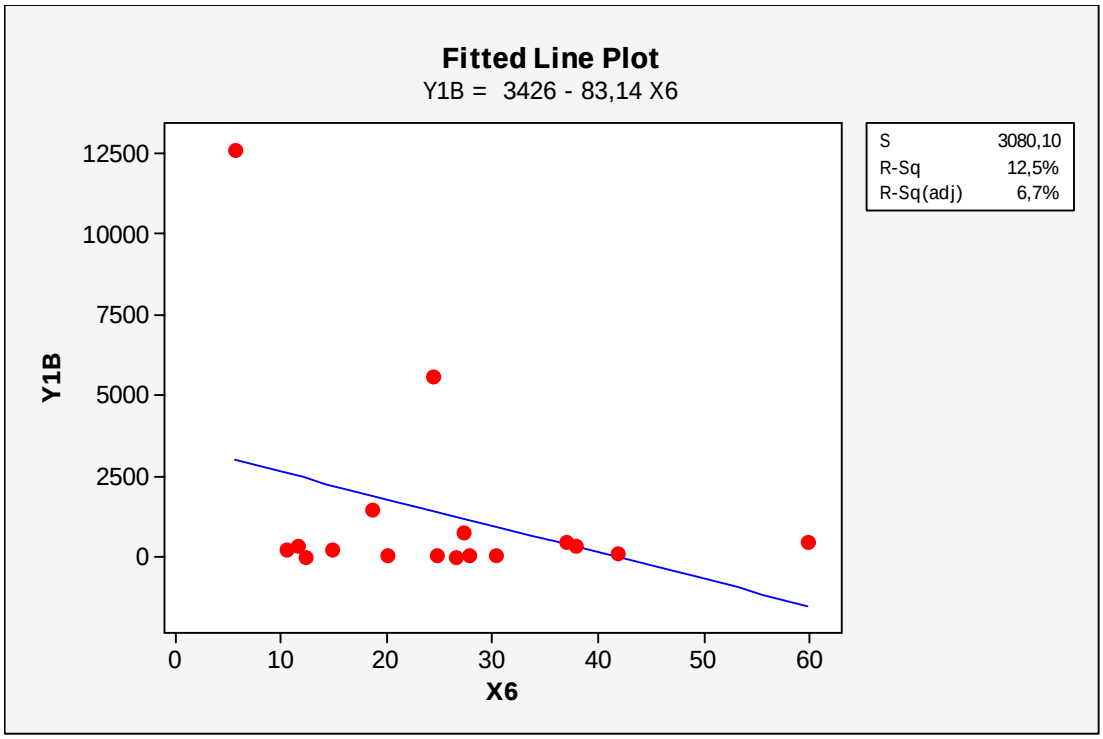

Figure 6.5 Regression Analysis: Y1b versus X_6

Regression equation of Y1b versus X_6 is;

Y1B = 3426 - 83, 1 X6

R-Sq (adj) = 6, 7 %

There is a **no relation** between the regression equations of Y1b versus X_6.

6.2.5. Regression Analysis 5

Regression Analysis 5 is performed with Y1c and X_1.

Y1c = Affected / Urban Population x 10000

X1 = (Floor area emergency facilities / floor area of general total) x 100

Table 6.9 Regression Analysis 5: Y1c versus X_1

```
Regression Analysis: Y1C versus X1

The regression equation is
Y1C = 1558 + 248 X1


Predictor   Coef  SE Coef     T      P
Constant    1558     1092  1,43  0,174
X1         248,2    151,1  1,64  0,121


S = 3233,50   R-Sq = 15,2%   R-Sq(adj) = 9,6%


Analysis of Variance

Source           DF         SS        MS     F      P
Regression        1   28206477  28206477  2,70  0,121
Residual Error   15  156833271  10455551
Total            16  185039747


Unusual Observations

Obs    X1   Y1C   Fit  SE Fit  Residual  St Resid
  3  20,2  9437  6571    2423      2866      1,34 X
 13   3,1  9840  2337     834      7504      2,40R

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large leverage.
```

As shown in the Table 6.7, the R-Sq (adj) is 9, 6 %. This ratio isn't sufficient enough to verify the relationship between Y1c and X1 and there is no relation between the affected people and the ratio of emergency facilities floor area to general total floor area of buildings.

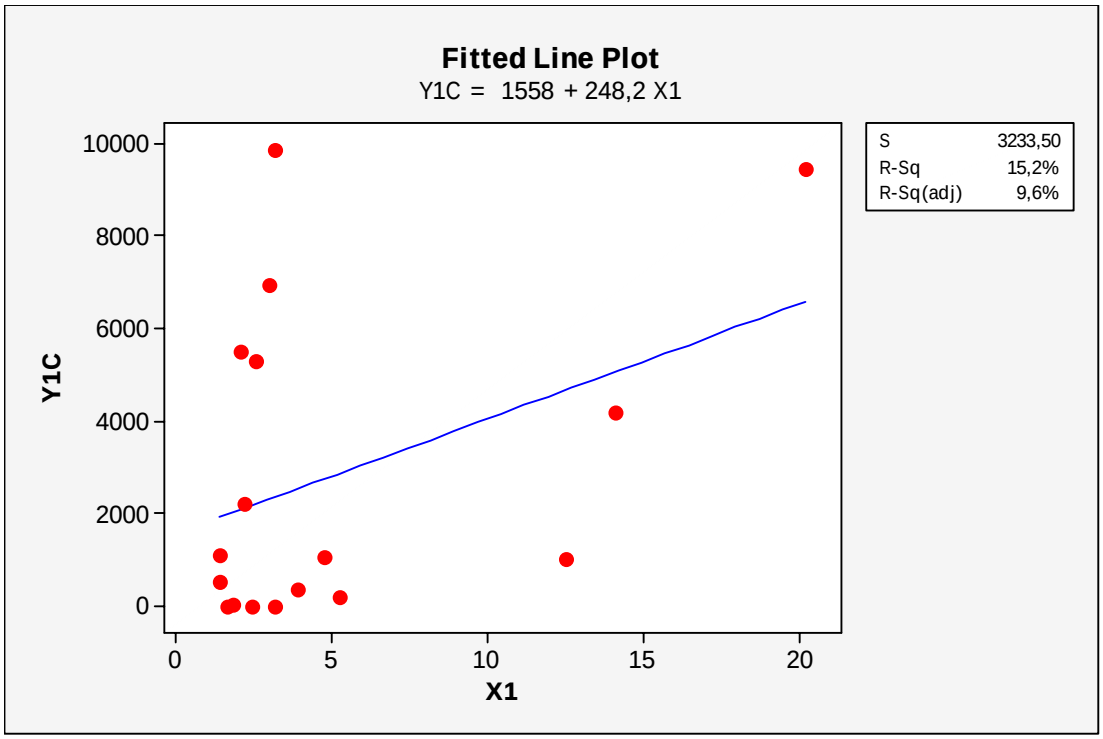

Figure 6.6 Regression Analysis: Y1c versus X_1

Regression equation of Y1c versus X_1 is;

Y1C = 1558 + 248 X1

R-Sq (adj) = 9, 6 %

There is a **no relation** between the regression equations of Y1c versus X_1.

6.2.6. Regression Analysis 6

Regression Analysis 6 is performed with Y2 and X_1.

Y2 = Destroyed Units / Building Stock x 10000

X1 = (Floor area emergency facilities / floor area of general total) x 100

Table 6.10 Regression Analysis 6: Y2 versus X_1

```
Regression Analysis: Y2 versus X1

The regression equation is
Y2 = 2817 + 306 X1


Predictor   Coef  SE Coef     T      P
Constant    2817     1443  1,95  0,070
X1         305,8    199,7  1,53  0,147


S = 4274,24   R-Sq = 13,5%   R-Sq(adj) = 7,8%


Analysis of Variance

Source          DF         SS        MS     F      P
Regression       1   42832152  42832152  2,34  0,147
Residual Error  15  274037268  18269151
Total           16  316869419


Unusual Observations

Obs    X1     Y2   Fit  SE Fit  Residual  St Resid
  3  20,2  10000  8994    3203      1006      0,36 X

X denotes an observation whose X value gives it large leverage.
```

As shown in the Table 6.8, the R-Sq (adj) is 7, 8 %. This ratio isn't sufficient enough to verify the relationship between Y2 and X1 and there is no relation between destroyed units and the ratio of emergency facilities floor area to general total floor area of buildings.

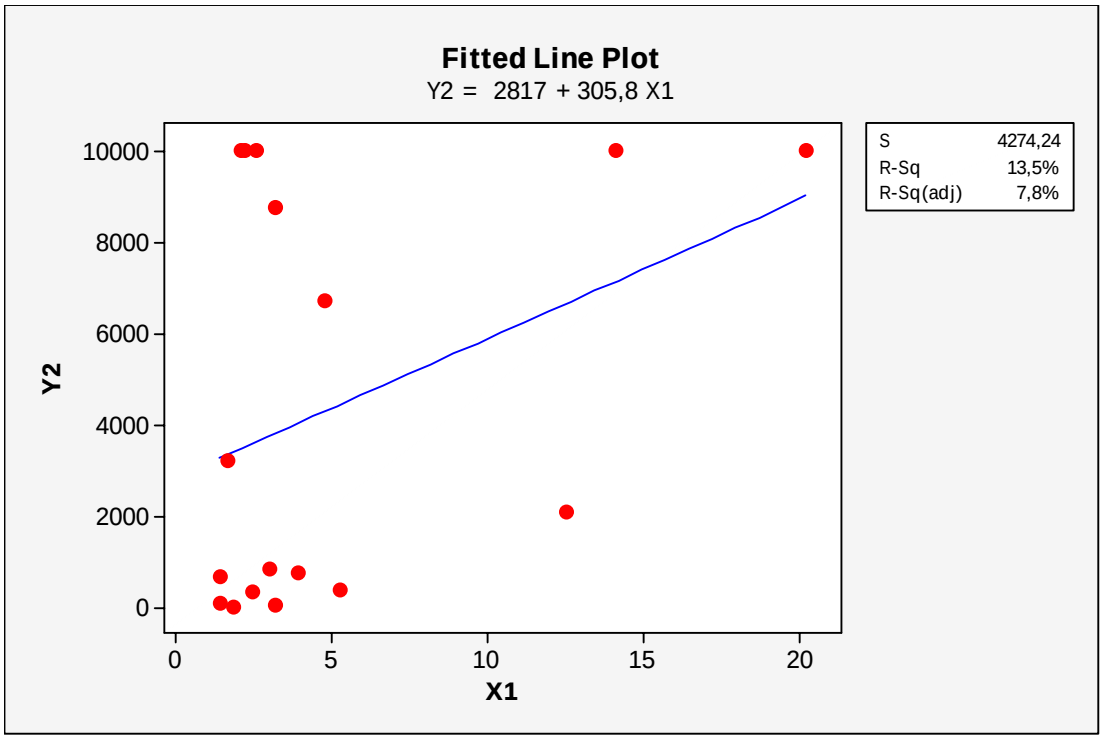

Figure 6.7 Regression Analysis: Y2 versus X_1

Regression equation of Y2 versus X_1 is;

Y2 = 2817 + 306 X1

R-Sq (adj) = 7, 8 %

There is a **no relation** between the regression equations of Y2 versus X_1.

6.2.7. Regression Analysis 7

Regression Analysis 7 is performed with Y2 and X_4.

Y2 = Destroyed Units / Building Stock x 10000

X4 = Population Growth Rate (‰)

Table 6.11 Regression Analysis 6: Y2 versus X_4

```
Regression Analysis: Y2 versus X4

The regression equation is
Y2 = 6982 - 128 X4


Predictor      Coef  SE Coef      T      P
Constant       6982     1570   4,45  0,000
X4          -127,75    59,79  -2,14  0,050


S = 4024,41   R-Sq = 23,3%   R-Sq(adj) = 18,2%


Analysis of Variance

Source           DF         SS         MS     F      P
Regression        1   73931191   73931191  4,56  0,050
Residual Error   15  242938228   16195882
Total            16  316869419


Unusual Observations

Obs    X4     Y2   Fit  SE Fit  Residual  St Resid
  4  35,9  10000  2401    1337      7599      2,00R

R denotes an observation with a large standardized residual.
```

As shown in the Table 6.9, the R-Sq (adj) is 18, 2 %. This ratio isn't sufficient enough to verify the relationship between Y2 and X4 and there is no relation between destroyed units and population growth rate.

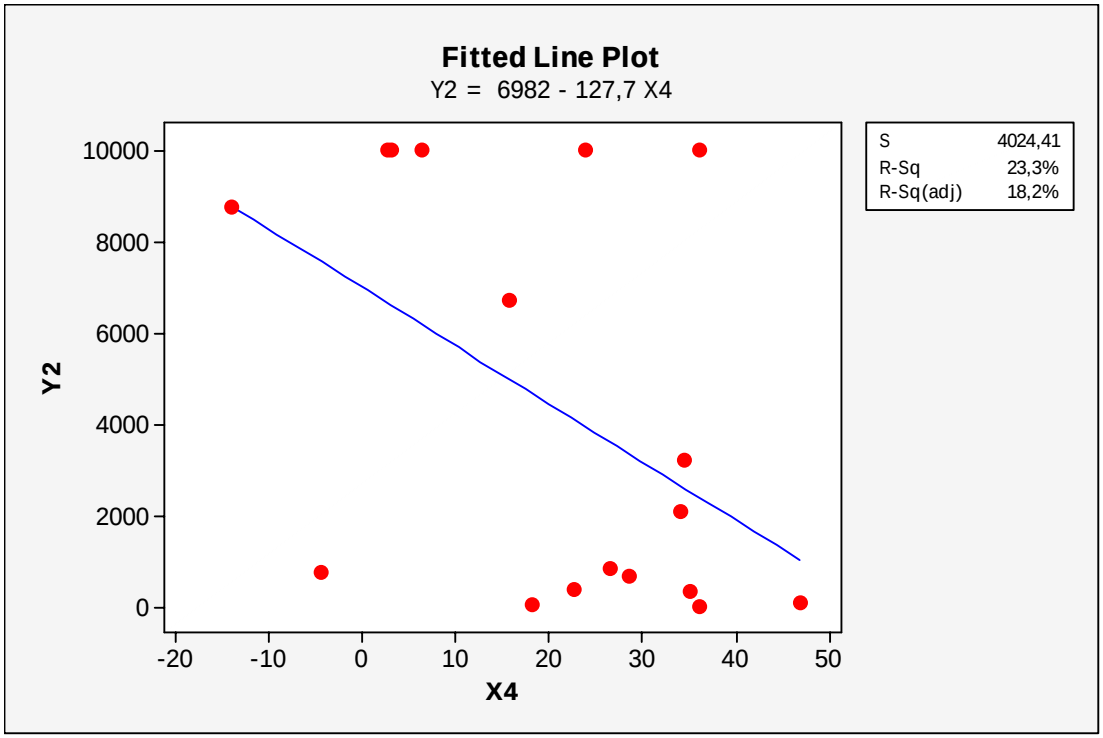

Figure 6.8 Regression Analysis: Y2 versus X_4

Regression equation of Y2 versus X_4 is;

Y2 = 6982 - 128 X4

R-Sq (adj) = 18, 2 %

There is a **no relation** between the regression equations of Y2 versus X_4.

CHAPTER 7

FINDINGS, RECOMMENDATIONS and FURTHER LINES OF INVESTIGATION

7.1. Findings

The study is expected to provide information about the critically vulnerable assets in cities, whether this could be considered as a function of hazard-proneness, and whether or not these attributes are consistently correlated with the hazard maps of Turkey.

As recent international policy emphasis has focused on risks and mitigation, and there is a big deficiency about the issue of risk identification and measurement in Turkey, the examination of the risk and seismic risk concepts with an overview of current understanding and the evolution of the subject from its academic and scientific beginnings to its political implications in the realm of sustainable development of today constitutes one of the most important points of the study.

As mentioned foregoing chapters, the approach in Turkey to risk assessment, risk reduction and risk mapping are deficient and remains limited due to development of regulations that can not be fully implemented.

Furthermore, only a few articles of these regulations contain pre-disaster activities and most of the articles are about post-disaster activities and the new Disaster Act Draft doesn't include risk management and risk assessment approaches.

On the other hand, the Official Seismic Hazard Map does not consider primary factors of risk, social vulnerabilities and attributes of the building stock and only indicates hazard exposure levels of provinces and settlements without providing any information about risk levels.

Consequently, this study is set out with the aim to examine the factors that determine urban risks and establish if analysis of different risks in cities and living environments could be determined on the basis of a set of attributes of the building stock. The scope is to exhibit and analytically compare such factors in a sample of cities in Turkey.

Regression analyses is performed within this concept and the function of this analysis is;
Y1= Fx (ax1, bx2, cx3, ...) and the basic question of the research is: "How do hazard levels correlate to Y1 and Y2 and other independent variables?"

The results of regression analyses shows us that X1, the ratio of emergency facilities floor area to general total floor area of buildings, is the most effective and important independent variable and X1 is the only variable that correlates with all dependent variables.

This means that X1, the ratio of emergency facilities, is the most important factor between all independent variables and also the most effective factor on dependent variables.

As emergency facilities are both important from pre-disaster and post-disaster activities, this variable is composed to see the correlation between emergency facilities and dependent variables.

The strongest relation of X1 is with Y1a, killed people, with the percentage of %48, 6. Although %48, 6 isn't sufficient enough to say that there is a strong relation between these values, %48, 6 is a very high percentage for this type of datasets and this shows the strong relation between the ratio of emergency facilities floor area to general total floor area of buildings (X1) and killed people (Y1a).

The second strong relation of X1 is with Y1b, injured people, with the percentage of %33, 6. This shows the strong relation between the ratio of emergency facilities floor area to general total floor area of buildings (X1) and injured people (Y1a).

Other two relations of X1 is with Y1b, affected people, and Y2, rates of stock of 3-8 stories, with the percentages of %9, 6 and %7,8 respectively. These values aren't sufficient enough to say that there is a relation between X1 - Y1b and X1 - Y2 but we can say that there is a weak relation between these variables.

7.2. Recommendations

A detailed archive research in the General Directorate of Disaster Affairs about Province Disaster Plans indicated limitations in terms of available cases and assumptions made in the scenarios. These 'plans' have either did not ever arrived to the General Directory, or have negligently been discarded by the same authority.

The unconcerned approach of GDDA about collection and preservation of Disaster Plans can be accepted as the most important and conspicuous example of the Turkey's official approach to the pre-disaster and mitigation activities.

The inadequacy of a guide in the preparation Disaster Plans can be shown clearly from the assumptions of cities that have prepared Province Disaster Plans adequately to fulfill the legal regulations.

The recommendations about Disaster Plans are as follows:

- The importance of pre-disaster activities and the part of Disaster Plans in these pre-disaster activities should underline
- The duplication of authorities about preparing Disaster Plans should conclude
- An explanatory guide about preparing, collecting and archiving of Disaster Plans should prepare immediately.

7.3. Further Lines of Investigation

This study is the basic and primary step of a comprehensive research about risk sectors, critically vulnerable assets in cities, whether this could be considered as a function of hazard-proneness, and whether or not these attributes are consistently correlated with the hazard maps of Turkey.

Within this thesis only psychical attributes like city development patterns, building stock attributes, rates of unauthorized buildings, that could be effect and correlate with urban risks are considered.

Apart from these psychical attributes as well as social conditions like rates of different tenancy groups, tenant ratios and squatter house ratios that represent vulnerability indicators could be effective in the determination of local risk levels.

This study will develop with the contribution of social values in further lines of investigations, like doctorate thesis work and other comprehensive researches.

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APPENDIX A

PRE-KOBE CONFERENCE QUESTIONS

Component 1 – Political Commitment and Institutional Aspects

Political commitment, strong institutions, and good governance are expected to elevate disaster risk reduction as a policy priority, allocate the necessary resources for it, enforce its implementation and assign accountability for failures, as well as facilitate participation from civil society to private sector. Due to its multi-disciplinary and multi-sectoral nature, disaster reduction falls into the agenda of many diverse institutions which, for effective implementation, requires clear assignment of roles and assumption of responsibilities as well as coordination of activities.

1.1 **Are there national policy, strategy and legislation addressing disaster risk reduction?** Please describe to what extent current national efforts and main priority, and mechanisms to enforce the implementation of the policy and legislation are applied (*and/or attach any relevant documentation*)

1.2 **Is there a national body for multi-sectoral coordination and collaboration in disaster risk reduction, which includes ministries in charge of water resource management, agriculture/land use and planning, health, environment, education, development planning and finance?** If yes, please give detailed information (name, structure and functions). *Attach any relevant documentation or indicate source of information*.

1.3 **Are there sectoral plans or initiatives that incorporate risk reduction concepts into each respective development area (such as water resource management, poverty alleviation, climate change adaptation, education and development planning)?** If yes, please indicate some examples and challenges/limitations encountered. If no, does your government have any plans for integrating disaster risk reduction into development sectors? If no, please also specify the major difficulties.

1.4 **Is disaster risk reduction incorporated into your national plan for the implementation of the UN Millennium Development Goals (MDGs) Poverty Reduction Strategy Paper (PRSP), National Adaptation Plans of Action, National Environmental Action Plans and WSSD (World Summit on Sustainable Development) Johannesburg Plan of Implementation?**

1.5 **Does your country have building codes of practice and standards in place, which take into account seismic risk?** If yes, since when? Which are the main difficulties in keeping the compliances of the codes?

1.6 **Do you have an annual budget for disaster risk reduction?** If yes, is this commitment represented as part of the national budget or project based? Through which institution/s? If no, what other financing mechanisms for risk reduction initiatives are available?

1.7 **Are the private sector, civil society, NGOs, academia and media participating in disaster risk reduction efforts?** If yes, how? Indicate existing coordination or joint programming between government and civil society efforts in disaster risk reduction, or major difficulties or constraints for this to be effective.

Component 2 – Risk Identification

Identification of risks is a relatively well-defined area with a significant knowledge base on methods for disaster impact and hazard and vulnerability assessment. Systematic assessment of losses, social and economic impact of disasters, and particularly mapping of risks are fundamental to understand where to take action. Consideration of disaster risks in environmental impact assessments is still to become routine practice.

Early warning is increasingly defined as a means to inform public and authorities on impending risks, hence essential for timely actions to reduce their impact.

2.1 **Has your country carried out hazard mapping/assessment?** If yes, please describe for which hazards, when they were updated and for what geographical scale they exist. Do they include characteristics, impacts, historical data, multi-hazards approach? Which institutions are using the results of the hazard assessment? To whom are they available? (attach any relevant documentation)

2.2 **Has your country carried out vulnerability and capacity assessments?** If yes, please describe the methods used and major social, economic, physical environmental political and cultural factors considered in the assessment (s). Who are the main contacts for these assessments (or attach any relevant documentation or contact information).

2.3 **Does your country have any mechanisms for risk monitoring and risk mapping?** If yes, who is responsible?

2.4 **Is there a systematic socio-economic and environmental impact and loss analysis in your country after each major disaster?** If yes, are the results available?

2.5 **Are there early warning systems in place?** If yes, for what hazards and for what geographical scope. Do you have any example when the system was activated lately? Which are the main institutions Involved? Please indicate any relevant lessons-learnt from the use and public reaction to early warnings issued.

Component 3 – Knowledge Management

Information management and communication, education and training, public awareness and research arc all parts of improving and managing knowledge on disaster risk and their reduction. Inclusion of disaster reduction at all levels of education, effective public awareness and information campaigns, media involvement in advocacy and dissemination, availability of training for communities at risk and professional staff, and targeted research are the ingredients to support the knowledge base for effective disaster reduction.

3.1 **Does your country have disaster risk information management systems (governmental and/or non-governmental)?** If yes, what kind of information on disaster reduction is available how is it collected, how is the information disseminated and who are the main users? (indicate relevant sources of information, if applicable)

3.2 **Are the academic and research communities in the country linked to national or local institutions dealing with disaster reduction?** If yes, please describe the mechanisms for information sharing and indicate any example of usefulness and effectiveness. Which are the main research and academic institutions dealing with disaster reduction related issues (please list, if available, and indicate how their research work is related to the country's disaster risk reduction needs.)

3.3 **Are there educational programs related to disaster risk reduction in your public school system?** If yes, for what age-range? Do you have any educational material developed to support the teachers in this area? (please attach any relevant documentation)

3.4 **Are there any training programs available?** If yes, please list (if available indicate scope and target audiences of the courses). Do you have any indication on how these courses have been useful to change any practices at local or national scale?

3.5 **What kind of traditional indigenous knowledge and wisdom is used in disasterrelated practices or training programs on disaster risk reduction in your country?**

3.6 **Do you have any national public awareness programs or campaigns on disaster risk reduction?** If available, who are the main players for raising public awareness? How are the mass media and schools involved? Who are the targeted groups and how do you evaluate the programs?

Component 4 – Risk Management Applications/Instruments

For effective disaster risk reduction, synergies are needed between sustainable development and disaster risk management practices. Moving from analyzing of and knowing about risk to taking concrete actions to reduce their impacts is a demanding step. Ideas and practices coming from different disciplinary areas will complement what is already practiced in disaster risk management. For example, instruments for risk management have proliferated especially with the recognition of environmental management, poverty reduction and financial management.

Environmental and natural resource management is among the best-known applications to reduce flood risks, control landslides (through reforestation) and control droughts (through ecosystem conservation).

Physical and technical measures, such as flood control techniques, soil conservation practices, retrofitting of buildings or land use planning, are effective in hazard control. Financial instruments in the form of insurance, calamity funds, catastrophe bonds are useful to lessen the impact of disasters.

4.1 **Is there any good example of linking environmental management and risk reduction practices in your country** (key areas of environmental management may include coastal zone, wetland and watershed management, reforestation and agricultural practices, amongst others)? If yes, please indicate in what areas. (Attach any relevant documentation ore references).

4.2 **Are financial instruments utilized in your country as a measure to reduce the impact of disasters** (e.g. insurance/reinsurance, calamity funds, catastrophe bonds, micro-credit finance, community funds, etc)? If yes, please describe what these instruments are and when they were established, who manages them and who are eligible to them.

4.3 **Please identify specific examples of technical measures or programs on disaster risk reduction that have been carried out in your country (case studies).**

Component 5 – Preparedness and Contingency Planning

Preparedness and emergency management has been used as a means for reducing life losses from direct and indirect effects of disasters. A well-prepared system is expected to be effectively informed by early warning, endowed with regularly rehearsed national and local contingency and evacuation plans, fitted with communications and coordination systems, as well as adequate logistical infrastructures and emergency funds. Local-level preparedness, particularly at community level, including training, deserves special attention as the most effective way of reducing life and livelihood losses.

5.1 **Do you have disaster contingency plans in place? Are they prepared for both national and community levels?** If yes, please describe their main components, who is responsible for activating the plan(s) that was or were developed? If yes, what was the result?

5.2 **Has your government established emergency funds for disaster response and are there national or community storage facilities for emergency relief items mainly food, medicine, tents/shelters?** If yes, please provide some details.

5.3 **Who is responsible for the coordination of disaster response preparedness and is the coordination body equipped with enough human and financial resources for the job?** Please comment on the effectiveness of the coordination work done so far.

Component 6 – Call for good practices in disaster risk management

Based on the above analysis and information provided, please provide at least two examples of any successful implementation of disaster reduction activities in your country (could be of local, national or regional scale); any project or community based experience, national policy, interaction between sectors, etc., would be welcome. Provide maximum one page on each example, indicating area of work, institutions and actors involved, duration, impact of the activities, lessons-learnt and if the example have been replicated. You may also kindly direct us to relevant web-based information/organization.

Component 7 – Priorities you want addressed at World Conference on Disaster Reduction

What do you think are the priority topics to be agreed upon at the World Conference to enhance and strengthen national policy and practice to reduce risk and vulnerability to natural and technological hazards? Please list any other thematic areas or specific topics of discussion that you consider of importance to increase the effectiveness of disaster risk reduction for your country. Please also indicate any particular experience or project that your country would like to exhibit or present at the Conference.

APPENDIX B

INFORMATION REPORT ON DISASTER REDUCTION BY THE REPUBLIC OF TURKEY

Component 1: Political Commitment and Institutional Aspects

Political commitment, strong institutions, and good governance are expected to elevate disaster risk reduction as a policy priority, allocate the necessary resources for it, enforce its implementation and assign accountability for failures, as well as facilitate participation from civil society to private sector. Due to its multi-disciplinary and multi-sectoral nature, disaster reduction falls into the agenda of many diverse institutions which, for effective implementation, requires clear assignment of roles and assumption of responsibilities as well as coordination of activities.

1. **Are there national policy, strategy and legislation addressing disaster risk reduction?** If yes, please describe to what extent current national efforts and main priority areas of the policy, and mechanisms to enforce the implementation of the policy and legislation are applied (and/or attach any relevant documentation).

Legal Framework for disaster management on national and local levels:

- Law No. 4373 dated 14 January 1943 concerning Protection Against Flash Floods
- Law No. 7126 dated 09 June 1958 concerning Civil Defense
- Law No. 7269 dated 25 May 1959 concerning Measures and Assistance to Be Put Into Effects Regarding Natural Disasters Affecting the Life of the General Public
- Directions No. 18851 dated 23 August 1985 concerning Principles of the Functioning, Tasks, Training and Controlling of the Fire Brigades Organizations
- Regulations No. 83/9727 dated 07 September 1985 concerning Radiation Safety
- Directions No. 88/12777 dated 08 May 1988 concerning Organization and Planning Principles of Emergency Assistance related Disaster
- Directions No. 88/12777 dated 08.05.1988 concerning Prime Ministry Emergency Management Center

- Instructions No. 02243 dated 05.10.1998 concerning Prime Ministry Emergency Management Center
- Emergency Management Agency of Turkey has been established, within the body of Prime Ministry, with a "Decree Amending the Decree on the Organizational Structure of the Prime Ministry No: 583", issued in the Official Gazette No: 23884, dated November 22, 1999
- Directions of National Implementation relating Nuclear and Radiological hazards dated 15 January 2000
- Emergency Management Agency of Turkey was transformed to Turkey Emergency Management General Directorate (TEMAD) with a decree no: 600 and issued in the official Gazette No: 24079, dated June 14, 2000.

Turkey Emergency Management General Directorate (TEMAD)

The framework of emergency management in Turkey is determined with the expression below which has been added to the tasks of Prime Ministry.

"To take necessary measures in order to provide an effective emergency management through nationwide in case of earthquakes, landslides, rock falls, fires, accidents, meteorological disasters, accidents caused by nuclear and chemical substances and population movements which are in such a scale that threatens national security and to provide coordination between agencies that are parts of emergency management such as the ones that are active either in precaution before emergencies or in search and rescue operations during emergencies or in recovery and reconstruction activities after emergencies."

Tasks of TEMAD

- To ensure the establishment of emergency management centers at governmental agencies and departments for the purpose of effective emergency management, to determine their working principles and to provide coordination between them,

- To monitor and evaluate the taking of the necessary measures, the preparation of short and long term plans and the establishment of data banks by agencies and departments with a view to prevent events that would require emergency management or mitigating their damage when they occur,

- To conduct the activities of coordination in the utilization of all types of land, sea and air transport vehicles and rescue and relief equipment and materials owned by public and private sectors in cases where emergency management is introduced

- To make arrangements that encourage voluntary organizations and individuals providing relief in emergency situations and to coordinate the receipt and protection of relief supplies and their dispatch to locations where such supplies are needed; and

- To carry out other duties which may be assigned by the Prime Minister

2. **Is there a national body for multi-sectoral coordination and collaboration in disaster risk reduction, which includes ministries in charge of water resource management, agriculture/land use and planning, health, environment, education, development planning and finance?** If yes, please give detailed information (name, structure and functions). Attach any relevant documentation or indicate source of information.

There are individual efforts on disaster risk reduction studies and there is no national body for multi-sectoral coordination and collaboration in disaster risk reduction.

3. **Are there sectoral plans or initiatives that incorporate risk reduction concepts into each respective development area (such as water resource management, poverty alleviation, climate change adaptation, education and development planning)?** If yes, please indicate some examples and challenges/imitations encountered. If no, does your government have any plans for integrating disaster risk reduction into development sectors? If no, please also specify the major difficulties.

Within the context of the National Programme of Cooperation for 2001-2005, signed between the Government of the Republic of Turkey and UNICEF, there is a project named as "Preparedness for Disasters and Emergencies" which is being coordinated by the General Directorate of Civil Defense of the Ministry of Interior of the Republic of Turkey.

The aim of this project is to conduct effective studies for the reduction of the disaster affects on women and children. With this general aim, the project targets;

- To encourage and support the strengthening of local/national systems aiming the immediate reaction in case of disasters for reducing the affects of disasters on women and children,

- To create consciousness and environment to support the inclusion of service programmes towards women and children in the plans for disasters preparedness and emergency management,

- To strengthen the disaster preparedness of women and children and to make the services towards women and children sustainable after the disasters, especially in the areas of health, education and psychological guidance.

Within this context, a Project Implementation Committee has been established with the participation of Ministries of Interior, Justice, National Education, Public Works and Settlement, Agriculture and Rural Affairs, Health and also Turkish Red Crescent and UNICEF Representation in Turkey.

4. **Is disaster risk reduction incorporated into your national plan for the implementation of the UN Millennium Development Goals (MDGs), Poverty Reduction Strategy Paper (PRSP), National Adaptation Plans of Action, National Environmental Action Plans and WSSD (World Summit on Sustainable Development) Johannesburg Plan of Implementation?** If yes to any of these, who are the main contacts for these initiatives.

Turkey attaches importance to the above mentioned global initiatives. In the preparation and implementation phases of the disaster and disaster risk reduction plans, the relevant bodies take into account the said initiatives.

5. **Does your country have building codes of practice and standards in place, which takes into account seismic risk?** If yes, since when. Which are the main difficulties in keeping with the compliances of the codes.

Since 2 September 1997 with some revisions in 1998, an Earthquake Design Code is in law to maintain earthquake resistant buildings. Deficiency on the control of buildings is a problem especially on rural areas. (A relevant document of the Ministry of Public Works and Settlement is attached herewith)

6. **Do you have an annual budget for disaster risk reduction?** If yes, is this commitment represented as part of the national budget or project based? Through which institution/s? If no, what other financing mechanisms for risk reduction initiatives are available?

The fund allocated from national budget is being used for disaster risk reduction studies, in-service training, organized education and the awareness of the personnel, voluntaries and population. In addition to those, European Union and World Bank funded projects are aiming the disaster risk reduction studies at different levels.

On the other hand, some special parts of the annual budgets of the Turkish Red Crescent Society, which are not within the context of national budgets, are being used for the preparations made before, during and after the disasters. In this framework, Turkish Red Crescent Society is both preparing special projects with its own resources and also some common projects with the other national organizations and official partners.

7. **Are the private sector, civil society, NGOs, academia and media participating in disaster risk reduction efforts?** If yes, how? Indicate existing coordination or joint programming between government and civil society efforts in disaster risk reduction, or major difficulties or constraints for this to be effective.

With their disaster management and earthquake research institutes, some of the universities contribute to disaster risk reduction efforts with academic studies. Their fund is supplied whether from international projects or from their own budget allocated for scientific studies. Some NGOs play an important role on civil protection activities. Press also sometimes assist disaster risk reduction activities with public information and education programmers.

Component 2: Risk Identification

Identification of risks is a relatively well-defined area with a significant knowledge base on methods for disaster impact and hazard and vulnerability assessment. Systematic assessment of losses, social and economic impact of disasters, and particularly mapping of risks are fundamental to understand where to take action. Consideration of disaster risks in environmental impact assessments is still to become routine practice.

Early warning is increasingly defined as a means to inform public and authorities on impending risks, hence essential for timely actions to reduce their impact.

1. **Has your country carried out hazard mapping/assessment?** If yes, please describe for which hazards, when they were updated and for what geographical scale they exist. Do they induce characteristics, impacts, historical data, multi-hazards approach? Which institutions are using the results of the hazard assessment? To whom are they available? (attach any relevant document)

Some maps are prepared at national level those could be used on hazard mapping assessment both directly and indirectly. Some of them are Earthquake Zoning Map of Turkey prepared by Ministry of Public Works and Settlement, Active Fault Map of Turkey prepared by Mineral Research Institute. In addition to that General Directorate of Disaster Affairs (GDDA) of the Ministry of Public Works and Settlement of the Republic of Turkey is involved at some regional multi-hazard mapping projects which include landslide, rock fall, flood and snow-avalanche hazard maps. Some microzonation maps are being prepared by municipalities which became obligatory for municipalities after 1999 Marmara Region Earthquake.

Those are prepared for the use of land use planning and infrastructure planning organizations like municipalities and related bodies of ministries.

Examples to those studies may be reached via internet from the web pages of different organizations like Earthquake Research Department of Ministry of Public Affairs and Settlement. (Please see the attached document)

2. **Has your country carried out vulnerability and capacity assessments?** If yes please describe the methods used and major social, economic physical, environmental political and cultural factors considered in the assessment(s). Who are the main contact for these assessments (or attach any relevant documentation of contact information).

There are emergency aid plans for cities and counties which is controlled by Ministry of Public Affairs and Settlement periodically in which there exists all the information regarding the capacity of governorates.

In addition Ministry of Public Affairs and Settlement carries out some regional projects for vulnerability assessments on NW Black Sea Region on different types of disasters and with DRM Project on microzonation.

Also Turkish-Japanese Joint Project called "Earthquake Disaster Prevention Research Project" work on vulnerability assessment of earthquakes at regional level. (Relevant web site: www.deprem.gov.tr See also the attached document)

3. **Does your country have any mechanisms for risk monitoring and risk mapping?** If yes, who is responsible?

At national level Earthquake Research Department of Ministry of Public Affairs and Settlement has observation network for earthquakes. Also national efforts are being carried out by Ministry of Public Affairs and Settlement on risk mapping studies where other governmental institutions and academic community has some regional small scaled studies on this issue. The Kandilli Observatory of the Boğaziçi University is also working on this aspect.

4. **Is there a systematic socio-economic and environmental impact and loss analysis in your country after each major disaster?** If yes, are the results available?

Different governmental organizations like National Planning Organization, Ministry of Public Affairs and Settlement, Turkey Emergency Management General Directorate and NGOs like Turkish Red Crescent make some impact and loss analysis after each major disasters. The results of those may be reached from related bodies.

5. **Are there early warning systems in place?** If yes, for what hazards and for what geographical scope. Do you have any example when the system was activated lately? Which are the main institutions involved? Please indicate any relevant lessons-learnt from the use and public reaction to early warnings issued.

* State General Directorate of Meteorology: Early Warning System for Meteorological Extremes.

* General Directorate of Hydraulic Works: Flood early warning system at regional level.

* Istanbul Governorate and Municipality: Earthquake early warning system for Istanbul City that aims to prevent secondary affects of any earthquake like fire by cutting off gas and electricity power lines.

Component 3 Knowledge Management

Information management and communication, education and training, public awareness and research arc all parts of improving and managing knowledge on disaster risk and their reduction. Inclusion of disaster reduction at all levels of education, effective public awareness and information campaigns, media involvement in advocacy and dissemination, availability of training for communities at risk and professional staff, and targeted research are the ingredients to support the knowledge base for effective disaster reduction.

1. **Does your country have disaster risk information management systems (governmental and/or non-governmental)?** If yes, what kind of information on disaster reduction is available how is it collected, how is the information disseminated and who are the main users? (indicate relevant sources of information, if applicable)

Disaster Information System which will work at Ministry of Public Affairs and Settlement is about to be established. With this system more efficient response to disasters is aimed to be achieved. During a disaster Crisis Management Centers maintain the information cycle with some governmental organizations like TEMAD, Ministry of Public Affairs and Settlement, etc.

2. **Are the academic and research communities in the country linked to national or local institutions dealing with disaster reduction?** If yes, please describe the mechanisms for information sharing and indicate any example of usefulness and effectiveness. Which are the main research and academic institutions dealing with disaster reduction related issues (please list, if available, and indicate how their research work is related to the country's disaster risk reduction needs.)

The following projects are the ones aiming this linkage:
- Kandilli Observatory in Istanbul (KOERI): Shared use of data
- Middle East Technical University (METU) Disaster Management Implementation and Research Center: Project based
- Istanbul Technical University (ITU) Disaster Management Research Center: Project based.
- Turkish Scientific Research Councils (TUBITAK): Project based
- Atatürk University Earthquake Research Institute Shared use of data

3. **Are there educational programmes related to disaster risk reduction in your public school system?** If yes, for what age-range? Do you have any educational material developed to support the teachers in this area? (please attach any relevant documentation)

a) There is a Protocol on the Participation in the Training and Civil Defense Services of Scouts between Ministries of Interior and Education.

b) Procedures of Establishment of the Civil Defense Branch in Schools are published in the Bulletin Review of Ministry of Education.

c) There is a unit relating the civil defense and disasters in the National Security Lesson in the first class of high schools. First aid and disaster subjects are given in the biological and healthy lessons.

d) On the other hand, the Ministry of National Education is working on a project in this issue.

4. **Are there any training programmes available?** If yes, please list (if available indicate scope and target audiences of the courses). Do you have any indication on how these courses have been useful to change any practices at local or national scale?

a) Programs relating in-service training in the Civil Defense College and civil defense search and rescue units.

b) Programs which are prepared in the provinces, districts and institutions according to Procedures of the Guidance relating the Civil Defense Organizations and Population Training published by Ministry of Interior.
c) Civil Defense Bulletin published by General Directorate of Civil Defense "four" times in a year are distributed without fee. In addition, trained posters and brochures also distributed for population.

d) More detailed information can be provided in the Web Site: www.ssgm.gov.tr

e) Also a note on the activities of Turkish Red Crescent Society in this aspect is attached herewith.

5. **What kind of traditional indigenous knowledge and wisdom is used in disaster-related practices or training programmes on disaster risk reduction in your country?**

- Scenarios such earthquakes, floods, avalanches as suitable for condition of the region are implemented during the exercises held at the end of training of personnel and voluntaries in the provinces and districts by the General Directorate of Civil Defense of the Ministry of Interior. Exercises include search and rescue in NBC accidents, water floods, avalanches.

- On the other hand, especially after the 1999 earthquakes in Turkey, Turkish Armed Forces both formed specialized units and also restructured all the units at the level of brigades with the capacity of performing Disaster Relief Operations. These units are making their own periodical exercises and also participating to the national disaster exercises.

- At the national level, there arc periodic exercises of the Ministry of Interior and National Security Council.

6. **Do you have any national public awareness programmes or campaigns on disaster risk reduction?** If available, who are the main players for raising public awareness? How are the mass media and schools involved? Who are the targeted groups and how do you evaluate the programmes?

- In general, universities and institutes support the primary and high schools on disaster risk implementation especially on earthquakes. Regular conferences aiming information and awareness of the population on the protective and rescued measures which will be taken are organized in the provinces and districts.

Film and video demonstrations are done in the places such examinations, fairs etc., articles are published via local radios, TV and other means, photos, posters and spots are hung up on the walls and books and brochures are distributed to the population.

- The 1999 earthquakes in Turkey had shown once again the importance of the public awareness. In this framework, the project of forming a uniform education and organization has been given to the Istanbul technical University.

- By the Centers of Strategy and Emergency Management of the Ministry of Interior, an educational project has been started with the aim of training professional emergency managers.

This educational model has been designed to include planning and a model of emergency management for the preparedness of all parts of the society.

- General Directorate of Civil Defense of the Ministry of Interior, which is the only official body that has the legal responsibility of increasing the consciousness of the public against disasters, is making activities in the provinces with this aim.

- Kandilli Observatory of the Boğaziçi University is implementing a project specifically prepared for Istanbul, together with a national non-governmental rescue organization named AKUT.

Component 4 Risk Management Applications/Instruments

For effective disaster risk reduction, synergies are needed between sustainable development and disaster risk management practices. Moving from analyzing of and knowing about risk to taking concrete actions to reduce their impacts is a demanding step. Ideas and practices coming from different disciplinary areas will complement what is already practiced in disaster risk management.

For example, instruments for risk management have proliferated especially with the recognition of environmental management, poverty reduction and financial management.

Environmental and natural resource management is among the best-known applications to reduce flood risks, control landslides (through reforestation) and control droughts (through ecosystem conservation).

Physical and technical measures, such as flood control techniques, soil conservation practices, retrofitting of buildings or land use planning, are effective in hazard control. Financial instruments in the form of insurance, calamity funds, catastrophe bonds are useful to lessen the impact of disasters.

1. **Is there any good examples of linking environmental management and risk reduction practices in your country (key areas of environmental management may include coastal zone, wetland and watershed management, reforestation and agricultural practices, amongst others).** If yes, please indicate in what areas. (Attach any relevant documentation or references)

Studies of Ministry of Environment and a non-governmental organization TEMA is important in this field.

2. **Are financial instruments utilized in your county as a measure to reduce the impact of disasters (e.g. insurance/reinsurance, calamity funds, catastrophe bonds, micro-credit finance, community funds, etc.)?** If yes, please describe what those instruments are and when they are established, who manages them and who are eligible to them.

DASK (Natural Disasters Insurance Organization)
Fund allocated to Ministry of Public Affairs and Settlement for disaster related studies.

3. **Please identify specific examples of technical measures or programmes on disaster risk reduction that have been carried out in your country (see below, case studies).**

Earthquake Resistance of Buildings
Earthquake Resistance of Bridges and Viaducts
Earthquake Resistance of Governmental Buildings like schools and hospitals etc.
Flood Preventions Studies on Major Rivers
Rock fall-Landslide-Snow Avalanche Retaining Structures

Component 5 Preparedness and Contingency Planning

Preparedness and emergency management has been used a means for reducing life lasses from direct and indirect effects of disasters. A well-prepared system is expected to be effectively informed by early warning endowed with regularly rehearsed national and local contingency and evacuation plans, fitted with communications and coordination systems, as well as adequate logistical infrastructures and emergency funds. Local-level preparedness, particularly at community level, including training deserves special attention as the most effective way of reducing life and livelihood losses.

1. **Do you have disaster contingency plans in place? Are they prepared for both national and community levels?** If yes, please describe their main components, who is responsible for activating the plan(s)? Are the plan(s) updated on annual basis? Have you ever used the contingency plan(s) that was or were developed? Of yes, what was the result?

- Province and District Disaster Emergency Relief Plans are prepared by the coordination of the General Directorate of Civil Defense of the Ministry of Interior. These are prepared based on different types and magnitudes of the disasters. Province and District Disaster Emergency Relief Plans are approved by the governor and distributed to the Ministry of Public Works and Settlement, Ministry of Interior, Ministry of Health, Ministry of Agricultures and Ministry of Environment and Forest. Plans used for crisis and disaster emergency and exercises are updated continuously.

- Turkish Armed Forces (TAF) has special plans within the context of natural disaster assistance. They have been prepared in coordination with the relevant civilian authorities.

1. 17 Regional Disaster Commandries (RDCs) for the natural disaster assistance interventions have been established by the TAF. On the other hand; RDCs have sub divisions called Secondary Regional Disaster Commandries (SRDCs) which has an authority according to the area of the disaster-struck region. They are formed in provinces/districts and in the level of brigadiers.

2. If the responsible RDC is heavily subject to the disaster, the executive command of the disaster management may be handed-over to the neighbouring RDC. This possibility is coordinated by the neighbouring RDC during the planning of natural disaster assistance intervention.

3. The RDCs consider time/distance/capabilities/assistance elements in their coordinations. The plans are prepared in order to facilitate long-distance troop transfers to and between disaster-hit areas.

4. If all the RDCs are heavily affected by the disaster, the Turkish General Staff determines the responsible commandry which will be in charge of the disaster management.

5. Natural disaster assistance intervention plans are prepared according to the general assumptions listed below. The worst-case scenarios are taken into consideration and the plans are continuously updated. Their validity is examined by joint exercises with the other relevant government bodies. In the planning's, the priority is given to the civilian capabilities; in case of the insufficiency of the civilian capabilities, military assets will also be used.

(a) The possible disaster might be more comprehensive or in a greater scale than the previous disasters. If there's no recorded data on the previous disasters for that specific region, the earthquake and flood risks are also taken into account.
(b) The earthquake might lead to major fires and this might result in explosions in industrial and energy facilities. The risk of chemical gas leakage should also be taken into consideration.
(c) The number of damaged/demolished/flooded buildings may be in great numbers. People might be bound under debris/avalanche/land mass. Housing demands might increase as a result of the disaster.
(d) Transportation network might be damaged, domestic and foreign transportation necessity might be increased, transportation system might partly or totally be collapsed in the early hours of the disaster.

(e) Dams, power centrals, fuel oil tanks and other facilities of strategic importance might be damaged in case of a disaster.

(f) Communication might totally be interrupted.

(g) Electricity and potable water facilities might be damaged.

(h) The disaster might occur at late night hours, under summer or winter conditions.

(i) Food, medicine and heating materials might be insufficient.

(j) Military staff and their families might also be subject to the disaster.

(k) Looting might take place in disaster regions.

(I) Provocations against official authorities might happen.

(m)Civilian authorities might be in effective in the early stages of the disaster.

6. "Natural Disaster Assistance Troops (DAFYAR)" which is formed in the battalion level, is always kept ready for intervention to natural disasters.

2. **Has your government established emergency funds for disaster response and are there national or community storage facilities for emergency relief items-mainly food, medicine, tents/shelters?** If yes, please provide some details.

- Funds allocated to Ministry of Public Affairs and Settlement for disaster related studies.

- The storage facilities of the Turkish Red Crescent Society are important for this aim. There are also official storage facilities in every province, airport and harbor to be used in case of need.

3. **Who is responsible for the coordination of disaster response preparedness and is the coordination body equipped with enough human and financial resources for the job?** Please comment on the effectiveness of the coordination work done so far?

After the 1999 earthquakes, General Directorate of Emergency Management has been formed under the Prime Ministry and has the responsibility to coordinate the studies.

Component 6 Call for good practices in disaster risk management

Based on the above analysis and information provided, please provide at least two examples of any successful implementation of disaster reduction activities in your country (could be of local national or regional scale) any project or community based experience, national policy, interaction between sectors, etc. would be welcome.

Provide maximum one page on each example indicating area of work, institutions and actors involved, duration, impact of the activities, lessons-learnt and if the example have been replicated. You may also kindly direct us to relevant web-based information/organization.

DETERMINATION OF NATURAL HAZARD AND RISK OF KASTAMONU REGION (NW TURKEY)

Project Stages

Hazard and Risk Assessment of Kastamonu Province project is commenced to mitigate effects of natural disaster, after the catastrophic earthquake that stroke Marmara region on August 17th and November 12th 1999 The project had been planned to foundation to TEFER (Turkey Flood and Earthquake Relief) project which was organized by World Bank But TEFER project was interrupted after Marmara Earthquake.

Objectives and Methodology

The project is intended

- to determine hazard and risk level of Kastamonu region on the basis of Geographic Information Systems (GIS)
- to aid planners and decision makers by providing natural hazards information rooted in earth science.
- to build geographic database for data updating, analyzing and transfer

Under the project's framework, earthquake, landslide, rock fall, and snow avalanche potential of region have been studied, Earthquake, landslide and snow avalanche hazard maps have been prepared on regional scale, while rock fall hazard map has been limited to city center. The hazard maps related to various disaster types have also been combined and a multi-hazard hazard map produced.

Informations Essential for the Emergency Aid Plan

According to the disaster scenario, results prepared Kastamonu City center, following outcomes are suggested to be taken into consideration during planning of emergency aid for the future;

* After an earthquake with magnitude close to the scenario value, a preliminary damage assessment study must be done at Karaçomak Dam.
* The number of collapsed and heavily damaged houses is calculated as 295 according to the scenario earthquake in city center When building/house ratio is considered there might happen 170 points for search and rescue facilities.
* Number of heavily wounded people is estimated to be 48 but this might increase due to casualties from neighboring regions. Transportation of those heavily wounded people to high capacity hospitals at cities must also be considered.
* Earthquake induced land sliding must be accepted between Kastamonu-llgaz, Tosya-llgaz and Kastamonu-Tosya highway. This situation may cause difficulties in transportation and communication.
* Southern parts of Kastamonu Region, Çankırı and Çorum Provinces will be affected from that earthquake. So it will be impossible to maintain assistance from those regions
* Although serious damage on main interconnected systems is not accepted, various damages must be accepted on transformers, electricity transformation poles and also on transmission lines. These problems will cause lack of electrical energy
* Water pipes parallel to Karaçomak River may be broken at various locations so difficulty on water supply of city may arise and this will be vital if earthquake happens especially in summer season
* Due to the fact that earthquake may happen in winter season, fire disasters maybe faced m city center and also on villages In that case efforts to put out the fire will be insufficient and this phenomenon will increase the number of casualties.
* In the case of the break off F/O cables between llgaz-Tosya, telecommunication of Kastamonu will stop with Tosya
* There might be need for language translators for foreign rescue teams.
* Temporary housing will be necessary for more than 861 families. City's own opportunities like government buildings, hotels, student hostels are not enough for accommodation of those victims Tent cities will be necessary for Kastamonu City center

* Number of technical personnel's like architects, civil engineers for damage assessment is not enough.

As a result, this study reveals disaster hazard and risk of Kastamonu Region and put into the facts and also deficiencies of the city.
These are offered for local authorities' and decision makers usage. MINISTRY OF PUBLIC AFFAIRS AND SETTLEMENT plans to extend that kind of studies all around the country.

Component 7 Priorities you want addressed at World Conference on Disaster Reduction

What do you think are the priority topics to be agreed upon at the World Conference to enhance and strengthen national policy and practice to reduce risk and vulnerability to natural and technological hazards? Please list any other thematic areas or specific topics of discussion that you consider of importance to increase the effectiveness of disaster risk reduction for your country.

Please also indicate any particular experience or project that your country would like to exhibit or present at the Conference.

- The General Directorate of Emergency Management of the Prime Ministry would like to make a presentation on the Lessons from the 1999 Earthquakes.

- On the other hand the following issues may be the priorities of the Conference:

- Implementation of regional disaster information systems,
- Earthquake resistance of buildings on rural areas and consciousness of people living on rural areas to the effects of disasters.
- Public Training studies,

APPENDIX C

STAKEHOLDERS OF THE STUDY

The stakeholder analysis is used to identify and assess the importance of key people, organizations and institutions that may significantly influence the development and implementation of the project. (WHO, 2005)

Information generated from stakeholder analysis may serve to provide input for other analyses, to inform the development of action plans, to increase support for a reform policy or to guide a participatory, consensus-building process. (Schmeer, 1999)

Stakeholders have different levels of power to impact disaster risk reduction and different levels of interest. They have different levels of influence both in project and in the implementation of the measures that the project recommends. The most important role of stakeholders within this thesis is to contribute the dissemination and sustainability of the study.

The stakeholders of the study can be grouped into the following categories: Ministries, Local Authorities (Governorships, Municipalities), Universities (Middle East Technical University, METU-Disaster Management Research and Implementation Center) and Non-Governmental Organizations (Turkish Earthquake Foundation, Turkish Red Crescent, Union of Chambers of Turkish Engineers and Architects). These stakeholders can be listed and categorized in various ways. One starting point is to divide the list into primary and secondary stakeholders.

Primary stakeholders are those key people and institutions who have a direct interest in the policy and could affect its implementation and ultimately be affected by the project. This includes direct and intended beneficiaries of greater safety. (WHO, 2005)

Secondary stakeholders are intermediaries in the process of delivering support to primary stakeholders. This includes the people and organizations that can contribute to implementing the solutions that the project recommends for disaster risk reduction. (WHO, 2005)

Although, stakeholders can be listed in two ways according to their participation process to the project as “During the project” and “After/Always”.

Table C.1 Primary Stakeholders

PRIMARY STAKEHOLDERS	PARTICIPATION PROCESS	RELATION TO PROJECT	CONTACT
General Directorate of Disaster Affairs (GDDA)	During the project After/Always	Data research Obtainment and use of variables Application and sustainability of the project Dissemination of the study in the relevant field	Contact Person: Murat NURLU, Chief of Laboratories Section at EQ Research Department Mail: nurlu@deprem.gov.tr, Phone: (90)312- 2873645
Turkish Statistical Institute (TURKSTAT)	During the project	Data research Obtainment of variables	Contact Person: Enver TAŞTI, Head of Social Statistics Department Mail: bilgi@tuik.gov.tr, Tel : 90 (312) 4170432
Middle East Technical University	During the project After/Always	Data research Dissemination of the study in the academic literature Implementation of the measures that the project recommends	Contact Person: Haluk PAMIR, Dean Mail: pamir@metu.edu.tr, Tel :90 (312) 2102201
Governorships	During the project After/Always	Obtainment and use of variables Dissemination and sustainability of the project Contribute the implementation of the measures that the project recommends Public participation.	

Primary Stakeholders

- **General Directorate of Disaster Affairs–GDDA, Earthquake Research Department, Laboratories Section**

Earthquake Research Department, Laboratories Section of GDDA is the key institution with a significant role to play in the application and sustainability of the project.

The cooperation of GDDA in order to obtain and use of the earthquake scenarios identified in Province Disaster Plans, prepared by governorships and collected in General Directorate of Disaster Affairs, plays an important role in the development of the research.

- **Turkish Statistical Institute – TURKSTAT , Social Statistics Department**

TURKSTAT is the key institution with a significant role to play in the data research. Published statistics, like census, housing data of TURKSTAT have an important and leading part in the data research and will be used to examine vulnerabilities in the building stock.

- **Middle East Technical University – METU**

Middle East Technical University can contribute to the dissemination of the study in the relevant field and academic literature and the implementation of the measures that the project recommends.

- **Governorships**

The cooperation of governorships in order to obtain and use of the earthquake scenarios identified in Province Disaster Plans plays an important role in the development of the research. Although, governorships plays the most important role in the dissemination and sustainability of the project and can contribute the implementation of the measures that the project recommends and public participation.

Case governorships with satisfactory Disaster Plans and consistent assumptions about Earthquake scenarios are; Governorship of Ardahan, Governorship of Bursa, Governorship of Çanakkale, Governorship of Düzce, Governorship of Erzincan, Governorship of Istanbul Governorship of Izmir, Governorship of Karabük, Governorship of Kastamonu, Governorship of Kocaeli, Governorship of Malatya, Governorship of Niğde, Governorship of Yalova.

Table C.2 Secondary Stakeholders

SECONDARY STAKEHOLDERS	PARTICIPATION PROCESS	RELATION TO PROJECT	CONTACT
General Directorate of Turkey Emergency Administration (TAY)	After/Always	Dissemination and sustainability of the project Implementation of the measures that the project recommends	Contact Person: Hasan IPEK Mail: tay@basbakanlik.gov.tr, Tel: 90 (312) 4251890,
General Directorate of The Bank of Provinces	After/Always	Dissemination and sustainability of the project Implementation of the measures that the project recommends	Mail: ilbank@ilbank.gov.tr, Tel: 90 (312) 5087023
General Directorate of Civil Defense	After/Always	Dissemination and sustainability of the project Implementation of the measures that the project recommends	Mail: sivsav@ssgm.gov.tr, Tel: 90 (312) 4266115
General Directorate for Local Authorities	After/Always	Implementation of the measures that the project recommends	Mail: mahalli.bilgiedinme@icisleri.gov.tr Tel : 90 (312) 425 7214
Middle East Technical University Disaster Management Research and Implementation Center	After/Always	Dissemination of the study in the relevant field and academic literature Implementation of the measures that the project recommends	Mail: dmc@metu.edu.tr, Tel :90 (312) 2105410
Non-Governmental Organizations Ngo's	After/Always	Dissemination and sustainability of the project	Turkish Earthquake Foundation Mail :tdv@depremvakfi.org, Tel:90(216) 3219009 Union of Chambers of Turkish Engineers and Architects

Secondary Stakeholders

- **General Directorate of Turkey Emergency Administration-TAY**

TAY is the key institution with a significant role to play in the dissemination and sustainability of the project. TAY can contribute to the implementation of the measures that the project recommends.

- **The Ministry of Public Works and Settlement, General Directorate of The Bank of Provinces**

Bank plays an important role in the dissemination and sustainability of the project and can contribute the implementation of the measures that the project recommends.

- **The Ministry of Interior, General Directorate of Civil Defense**

Civil Defense plays an important role in the dissemination and sustainability of the project and can contribute the implementation of the measures that the project recommends.

- **The Ministry of Interior, General Directorate for Local Authorities**

Civil Defense plays an important role in the dissemination and sustainability of the project and can contribute the implementation of the measures that the project recommends.

- **Municipalities**

Municipalities play the most important role with the governorships in the dissemination and sustainability of the project and can contribute the implementation of the measures that the project recommends and public participation.

Case municipalities with satisfactory Disaster Plans and consistent assumptions about Earthquake scenarios are; Ardahan Municipality, Bursa Metropolitan Municipality, Çanakkale Municipality, Düzce Municipality, Erzincan Municipality, Istanbul Metropolitan Municipality, Izmir Metropolitan Municipality, Karabük Municipality, Kastamonu Municipality, Kocaeli Metropolitan Municipality, Malatya Municipality, Niğde Municipality, Yalova Municipality

- **Middle East Technical University, Disaster Management Research and Implementation Center**

Middle East Technical University, Disaster Management Research and Implementation Center can contribute to the dissemination of the study in the relevant field and academic literature and the implementation of the measures that the project recommends.

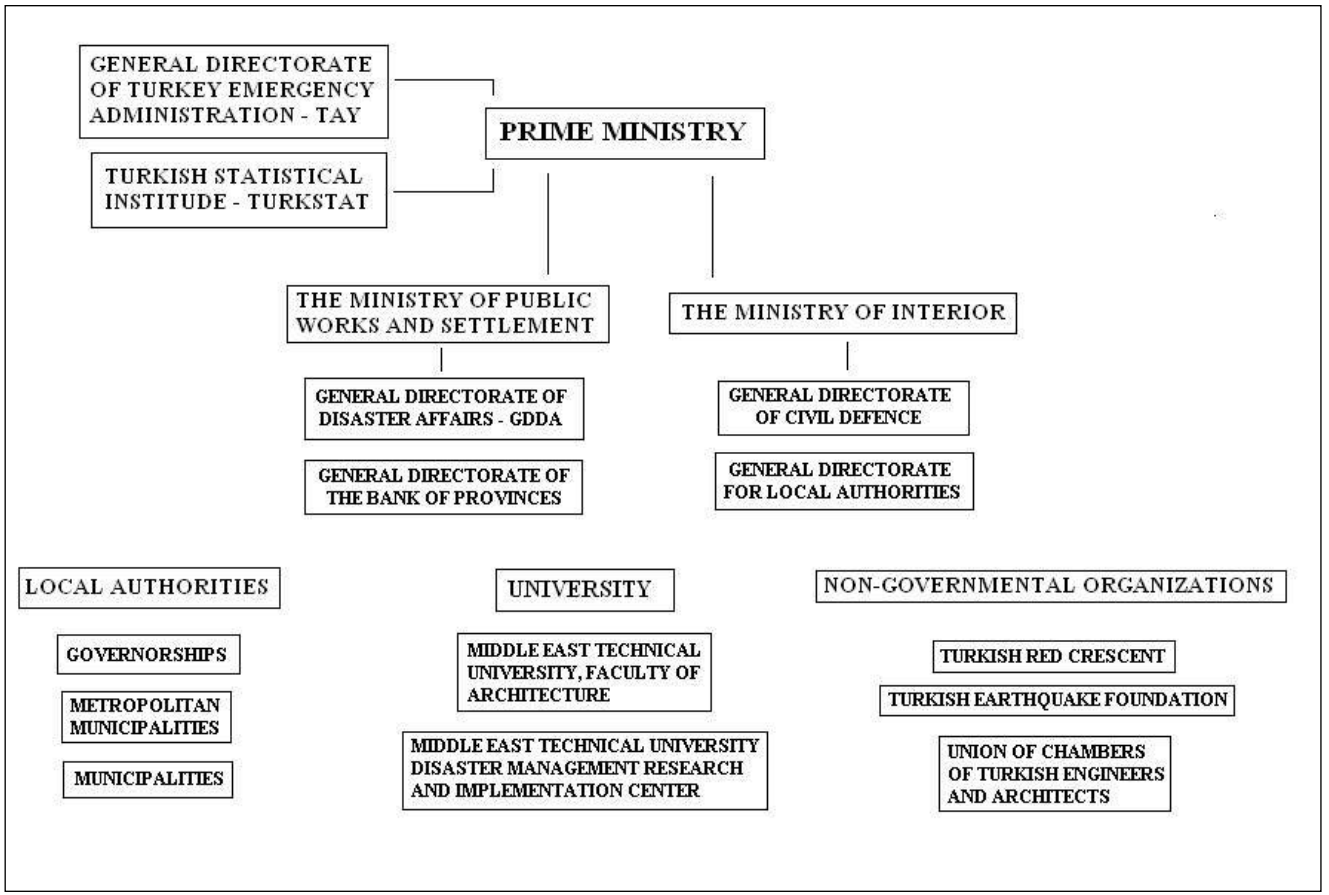

Figure C.1 All Possible Stakeholders

APPENDIX D

BUILDING STOCK CHANGES BETWEEN 1954 AND 2003

Table D.1 Building Stock Changes between 1954 and 2003 in Aksaray

(Source: TURKSTAT, 2007)

AKSARAY	Number of House	Floor Area of House	Number of House Dwelling Units	Number of Apartment House	Floor Area of Apartment House	Number of Apartment Dwelling Units	Commercial Building	Floor Area of Commercial Building	Industrial Building	Floor Area of Industrial Building	Medical and Social Building	Floor Area of Medical and Social Building	Cultural Building	Floor Area of Cultural Building	Administrative Building	Floor Area of Administrative Building	General Total	Floor Area of General Total
1954	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	77	6219	88	5	1214	14	8	612	0	0	0	0	0	0	0	0	91	8129
1969	69	5930	85	21	2841	34	4	290	1	560	0	0	0	0	0	0	95	9621
1970	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	102	15223	154	43	28981	251	19	4074	0	0	0	0	1	2888	0	0	165	51166
1972	110	19004	179	55	32459	319	19	3192	2	254	0	0	0	0	1	469	187	55378
1973	136	22265	202	66	42244	385	39	4629	1	486	0	0	0	0	1	668	247	70716
1974	102	18386	158	47	44618	393	27	9839	3	965	1	450	0	0	1	1160	183	75646
1975	95	17988	155	21	14873	123	18	24028	2	82417	0	0	0	0	0	0	137	140536
1976	108	22745	189	63	36990	320	14	27549	2	2050	0	0	3	5221	2	9308	192	103863
1977	96	17027	144	71	46810	398	12	21984	18	19101	0	0	0	0	0	0	198	104934
1978	275	43416	0	125	110137	0	86	41600	1	270	10	6384	0	0	1	792	501	203279
1979	412	61146	535	141	94315	787	34	28631	1	675	0	0	0	0	0	0	607	205845
1980	98	20719	165	104	66243	531	13	12707	2	555	0	0	0	0	0	0	219	100396
1981	61	11020	93	31	24539	215	5	6636	0	0	0	0	0	0	0	0	99	43018
1982	117	24435	190	45	43661	385	8	8103	0	0	0	0	0	0	0	0	171	76334
1983	76	19167	132	44	40327	330	4	4291	1	1834	1	1404	0	0	0	0	126	67023
1984	219	31197	280	89	62848	466	17	11151	5	1112	1	70	3	1120	0	0	403	114054
1985	192	32230	254	138	127500	1004	14	10985	4	1821	2	2350	4	6646	2	2720	433	192204
1986	160	31530	244	160	142445	1063	22	13588	3	3702	0	0	4	1023	0	0	382	194281
1987	237	48970	363	288	427421	3229	17	30283	1	1875	1	102	1	966	2	1817	603	521360
1988	258	54202	392	182	281762	2092	32	55544	0	0	1	478	0	0	3	2094	504	397457
1989	287	60658	429	139	154746	1131	39	34892	4	3438	2	4999	1	1288	2	1161	503	266508
1990	126	39702	231	127	139213	969	25	31174	1	5054	1	5054	1	3705	1	969	287	222739
1991	119	38275	219	114	142307	941	17	39540	0	0	2	4279	0	0	3	6025	264	232632
1992	77	23522	139	139	221469	1573	11	28613	1	303	0	0	0	0	0	0	230	276467
1993	124	36733	215	131	253948	1665	8	25064	0	0	4	13659	0	0	0	0	267	329404
1994	92	29490	171	156	208070	1358	128	41729	0	182	0	0	0	0	1	4350	379	286589
1995	445	61308	462	251	335589	2130	10	29267	2	2390	0	0	0	0	0	0	709	428664
1996	284	41499	304	216	269744	1654	4	19887	0	0	0	0	3	22183	1	6885	513	361751
1997	299	43820	357	168	194303	1194	9	30777	0	155	0	0	0	0	2	1115	481	273552
1998	20	4399	26	92	89049	497	6	42896	68	18330	0	0	3	12460	0	0	191	167496
1999	26	7587	37	104	121556	679	3	9435	1	460	0	0	0	0	2	1767	138	141615
2000	81	14719	105	96	140141	777	13	38575	3	6607	3	9672	2	13704	1	8000	199	231418
2001	67	9414	73	104	130133	729	2	25343	13	21669	0	0	0	0	0	0	188	188826
2002	49	10872	60	112	230923	1355	3	20564	15	13804	2	2249	0	0	0	0	183	279038
2003	87	25285	95	130	205498	1061	1	6194	9	16209	0	0	0	0	0	0	247	253186
TOTAL	5183	970102	6925	3838	4508917	30052	681	739766	164	206278	31	51150	26	71104	26	49000	10022	6650125

Table D.2 Building Stock Changes between 1954 and 2003 in Antalya

(Source: TURKSTAT, 2007)

ANTALYA	Number of House	Floor Area of House	Number of House Dwelling Units	Number of Apartment House	Floor Area of Apartment House	Number of Apartment Dwelling Units	Commercial Building	Floor Area of Commercial Building	Industrial Building	Floor Area of Industrial Building	Medical and Social Building	Floor Area of Medical and Social Building	Cultural Building	Floor Area of Cultural Building	Administrative Building	Floor Area of Administrative Building	General Total	Floor Area of General Total
1954	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	186	20637	-	2	904	-	30	9477	0	0	0	0	1	251	0	0	233	32231
1957	49	7997	-	10	4707	-	2	230	2	338	0	0	0	0	0	0	87	14023
1958	103	28378	-	12	6618	-	19	4106	3	671	1	105	0	0	0	0	171	41034
1959	125	17469	-	23	10958	-	4	1818	1	182	0	0	0	0	0	0	182	31862
1960	87	14336	-	23	12440	-	11	5185	1	1240	0	0	0	0	0	0	183	36763
1961	83	10944	-	34	20566	-	15	7236	2	1191	2	1034	0	0	0	0	210	42961
1962	85	13338	-	42	21062	-	11	5108	3	1386	3	4396	0	0	0	0	210	49200
1963	77	11542	-	42	21359	-	10	4701	0	0	1	651	0	0	0	0	197	40001
1964	71	13882	117	68	42762	366	6	3879	1	603	0	0	0	0	0	0	197	62857
1965	88	15385	139	79	47346	409	9	3883	0	0	2	4997	1	2064	0	0	238	75415
1966	3	745	6	2	962	10	0	0	0	0	0	0	0	0	0	0	5	1707
1967	18	2365	21	26	12161	114	2	270	0	0	0	0	0	0	0	0	46	14796
1968	23	2489	28	70	24357	234	21	2917	3	600	0	0	1	1176	1	990	122	32664
1969	44	4031	46	120	40898	401	14	2289	1	300	1	11000	0	0	0	0	182	58555
1970	99	7919	111	129	131896	1215	46	12880	1	308	1	2030	1	600	0	0	321	157952
1971	61	5835	77	129	130784	1660	58	13993	1	1862	0	0	0	0	0	0	274	192871
1972	66	8681	100	213	208817	2888	107	31725	11	9308	6	3891	0	0	2	1932	440	368609
1973	212	27169	243	235	319959	2972	43	19277	1	1976	0	0	0	0	4	3228	547	370724
1974	28	4692	42	153	184417	1673	30	32006	2	9870	0	0	1	630	1	1272	255	234720
1975	27	4876	43	171	223145	1988	65	29453	0	0	1	85	0	0	5	9495	308	268781
1976	35	5762	56	267	337382	3159	26	68190	3	1099	1	1800	1	1250	1	200	354	416341
1977	11	2464	19	144	174275	1563	20	20353	29	18751	0	0	2	3405	14	22198	227	241748
1978	5	828	-	134	178881	-	6	32656	0	0	1	1800	0	0	0	0	157	214402
1979	19	3552	34	153	178500	1722	5	33543	0	0	0	0	1	14980	0	0	181	230709
1980	145	9220	157	100	120717	1149	7	14001	0	0	0	2	0	0	2	6099	258	154275
1981	495	43688	511	81	83143	805	476	27309	1	101	1	15800	1	4000	0	0	1055	174041
1982	26	5688	44	257	287329	2355	20	48690	0	0	15	9638	0	0	0	0	318	351345
1983	54	12173	79	561	585695	5792	24	69070	1	2609	43	23443	5	3728	0	0	695	902893
1984	81	19157	135	363	390645	3139	17	46146	1	2000	6	18335	2	858	2	10895	483	495417
1985	85	21536	143	492	486243	4063	26	77075	3	1511	2	4090	1	965	2	3805	612	596533
1986	40	5564	49	1038	1172330	10121	139	207278	0	0	5	11189	1	2240	3	6536	1236	1406473
1987	87	13420	129	1422	1647692	14448	91	527221	4	26729	181	39667	2	3117	4	21657	1804	2287851
1988	216	41114	269	963	1169888	9291	89	313367	3	14957	6	3315	3	4980	3	6178	1297	1560294
1989	162	26510	199	788	1091736	8918	111	241773	7	14863	8	13277	8	20699	0	0	1063	1414955
1990	430	73456	466	1099	1289277	9847	88	255367	9	22915	9	6422	8	10470	6	31518	1659	1700432
1991	63	17780	92	1121	1318970	10249	76	293351	4	7865	11	7565	2	1988	6	9431	1306	1661688
1992	66	15143	95	1094	1289896	9902	48	220192	9	16909	6	9236	1	3872	1	220	1237	1567113
1993	222	50427	288	1436	2009667	14371	145	322189	4	24890	14	17635	2	6030	3	42980	1836	2477427
1994	1205	163478	1381	1801	2301911	17689	300	721091	10	17797	20	31506	6	31506	5	94175	3365	3358622
1995	630	140057	796	1767	2429462	17808	140	411752	8	27833	14	19270	4	12716	3	11603	2601	3091807
1996	644	95675	843	1542	1885848	14765	122	543679	16	59349	4	7855	5	13427	2	1837	2403	2612892
1997	381	89621	568	1427	1681041	12842	630	763469	24	85154	13	13072	4	23817	2	2612	2934	2670035
1998	194	42143	313	1121	1402414	9680	120	538879	6	39471	9	14268	5	18779	1	3350	1484	1974938
1999	119	27861	195	1033	1321217	10580	82	498603	4	15655	4	3791	6	11167	3	12809	1366	1893660
2000	250	51350	317	692	630375	4789	113	325326	0	0	2	564	2	4118	2	14285	1090	1027683
2001	245	59298	340	932	811220	6131	115	410770	3	1308	4	6472	4	17916	2	7165	1339	1326354
2002	193	52166	330	426	368799	2838	155	195535	12	24462	22	18885	2	7930	6	17330	830	694352
2003	83	20973	118	709	652926	5048	196	535518	12	36211	8	11214	2	3933	5	28572	1032	1306293
TOTAL	7754	1333854	8819	24816	26906527	228564	3940	7887174	208	402778	427	525083	85	201662	91	377032	38100	38903981

Table D.3 Building Stock Changes between 1954 and 2003 in Ardahan

(Source: TURKSTAT, 2007)

ARDAHAN	Number of House	Floor Area of House	Number of House Dwelling Units	Number of Apartment House	Floor Area of Apartment House	Number of Apartment Dwelling Units	Commercial Building	Floor Area of Commercial Building	Industrial Building	Floor Area of Industrial Building	Medical and Social Building	Floor Area of Medical and Social Building	Cultural Building	Floor Area of Cultural Building	Administrative Building	Floor Area of Administrative Building	General Total	Floor Area of General Total
1954	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	9	1723	16	3	1268	10	0	850	0	0	0	0	0	0	0	0	12	3841
1994	10	1694	16	9	12103	63	3	1585	0	0	1	3012	0	0	0	0	23	18394
1995	4	488	6	1	297	3	1	342	0	0	0	0	0	0	0	0	6	1127
1996	3	801	4	3	3050	47	2	446	0	0	0	0	0	0	1	4512	9	8809
1997	5	1103	9	3	878	9	1	745	0	0	0	0	0	0	0	0	9	2726
1998	4	823	8	5	2148	15	2	813	1	268	1	300	2	5720	0	0	16	13541
1999	6	1355	10	6	2947	19	3	4412	0	0	1	2490	0	0	1	1021	17	12225
2000	16	3738	25	21	15587	105	5	5001	0	0	0	0	2	5169	0	0	44	29495
2001	9	1966	15	10	9106	49	0	486	0	0	1	2923	1	3200	3	10077	24	27758
2002	8	2511	12	15	8053	51	3	1698	0	0	0	0	0	0	0	0	26	12262
2003	5	1283	9	6	3259	23	1	1512	0	0	1	3391	0	0	0	0	13	9445
TOTAL	**79**	**17485**	**130**	**82**	**58688**	**394**	**21**	**17880**	**1**	**268**	**5**	**12116**	**5**	**16089**	**5**	**15610**	**199**	**136023**

Table D.4 Building Stock Changes between 1954 and 2003 in Bursa

(Source: TURKSTAT, 2007)

BURSA	Number of House	Floor Area of House	Number of House Dwelling Units	Number of Apartment House	Floor Area of Apartment House	Number of Apartment Dwelling Units	Commercial Building	Floor Area of Commercial Building	Industrial Building	Floor Area of Industrial Building	Medical and Social Building	Floor Area of Medical and Social Building	Cultural Building	Floor Area of Cultural Building	Administrative Building	Floor Area of Administrative Building	General Total	Floor Area of General Total
1954	530	73439	-	23	12819	-	33	22986	28	6702	1	38	0	0	0	0	721	119699
1955	507	71253	-	9	6746	-	30	6568	33	11684	0	0	0	0	0	0	653	98404
1956	455	67198	-	9	4226	-	42	9565	47	16615	2	582	0	0	0	0	628	101057
1957	277	59826	-	26	12199	-	32	12208	44	26906	1	68	0	0	0	0	392	106262
1958	306	71699	-	61	26868	-	47	25295	29	20411	1	475	0	0	0	0	465	145645
1959	252	53941	-	155	100482	-	46	24645	15	11751	4	8037	0	0	0	0	505	200819
1960	109	19104	-	140	89030	-	48	21429	3	4388	0	0	0	0	0	0	314	134369
1961	230	38698	-	69	51099	-	63	19813	9	1958	2	6752	0	0	0	0	395	121824
1962	238	41460	-	41	23848	-	61	14191	18	2726	5	6423	0	0	0	0	385	89803
1963	296	43623	-	51	26031	-	72	11854	8	11560	4	3245	0	0	0	0	444	102098
1964	231	36373	348	67	44621	305	98	18785	7	2730	1	3747	6	17705	0	0	416	124235
1965	335	48596	463	81	65890	497	202	34596	5	2938	0	0	3	4343	0	0	628	156975
1966	61	10917	88	46	33166	273	122	10097	1	1731	1	1790	0	0	0	0	233	57790
1967	151	19106	181	85	60988	483	142	31642	24	5652	1	140	0	0	1	661	406	118330
1968	76	10297	92	96	59108	497	109	19558	33	6675	1	45	1	435	0	0	316	96118
1969	78	12357	115	97	81226	645	71	14600	32	5862	1	761	0	0	0	0	281	114906
1970	99	15055	16	281	224657	2035	138	49015	39	26388	1	160	2	2929	2	361	571	313102
1971	125	17873	191	214	200398	1990	102	13907	82	25979	4	4898	4	6276	0	0	543	269992
1972	170	27748	281	232	200349	1868	157	28229	90	90331	3	232	5	7766	4	7669	679	363036
1973	186	43852	301	371	377903	3561	232	38475	120	69216	1	1621	2	7334	0	0	918	538616
1974	160	27929	263	434	397481	3813	258	48678	85	36813	1	616	1	573	6	14638	966	520218
1975	153	21477	216	301	270281	2656	225	46804	86	26339	2	8469	4	16120	3	3132	783	393012
1976	115	18880	164	530	480870	4767	94	187343	95	21797	2	4186	2	3327	0	0	841	717803
1977	32	6504	51	167	200639	1804	18	51791	30	46820	12	17687	3	3061	0	0	263	327119
1978	31	7057	-	288	303790	-	36	73693	54	16693	1	3061	1	1034	2	5988	414	411477
1979	22	4956	40	364	330889	3163	27	47009	53	52130	3	1765	2	1254	1	250	473	438803
1980	15	3916	29	212	201815	1841	22	39665	14	5152	4	5199	1	250	0	0	270	256398
1981	60	11752	103	157	140213	1378	29	26698	24	13725	1	130	2	3757	1	24	276	197043
1982	119	24712	199	222	269039	2468	25	33908	40	25958	1	474	1	732	0	0	417	357341
1983	103	21875	165	334	36603	3150	29	38530	86	59945	1	231	5	10185	5	15812	574	515146
1984	180	31715	278	449	384604	3353	42	74119	147	117025	5	16753	8	16207	6	9831	855	668453
1985	136	24412	207	488	464411	4057	39	58677	99	64730	8	12220	5	10398	2	3563	787	641902
1986	1441	238289	2247	718	867994	7110	71	99029	145	102248	4	2907	2	483	1	2598	2394	1317804
1987	5136	812749	7682	1137	980946	8348	103	218855	163	131011	8	8252	12	13873	5	4425	6590	2182117
1988	3841	647099	5615	916	1001561	7803	77	480436	275	211914	68	31123	0	0	4	3086	5203	2387180
1989	3416	611346	5097	1022	1110993	9921	84	274483	297	354180	2	3354	8	35293	3	11799	4857	2406378
1990	3510	598694	5144	1383	1150963	9753	164	311916	376	490254	5	11191	11	28479	3	54987	5521	2618055
1991	3293	629088	4753	1749	1427107	12468	226	442817	257	300539	5	10673	3	3217	6	13926	5585	2848018
1992	2209	490825	3554	1884	1674028	13746	112	289956	186	186990	4	8195	5	7002	5	18806	4443	2687599
1993	2278	500145	3400	2230	2326536	17646	133	412995	208	381677	8	9153	6	25111	1	23121	5027	3748209
1994	1406	333996	2156	1605	1763251	13521	53	267983	190	220157	4	3917	0	0	1	9007	3309	2622968
1995	1515	315209	2019	1554	1786630	13390	117	399907	267	431401	6	10964	10	28928	4	12097	3530	3080217
1996	824	181447	1222	1291	1569798	11218	209	333093	301	401118	9	15413	4	11743	1	492	2674	2561682
1997	913	192612	1290	1435	2248501	14424	101	364462	274	465695	11	10868	6	12972	4	25603	2780	3342207
1998	803	180190	1137	1052	1402265	9532	123	314214	131	397592	6	36479	5	33724	0	0	2179	2396473
1999	364	79875	576	498	620943	4222	43	238337	44	126294	4	2519	5	19237	1	2224	1003	1117523
2000	230	53490	329	288	561907	3621	30	63199	91	316327	1	84	2	6151	1	1688	651	1012247
2001	586	145475	821	426	584795	3506	64	103414	130	422663	9	5195	9	19519	9	20305	1272	1323369
2002	424	119484	565	195	265092	1655	21	53452	94	237444	7	12377	9	19954	4	3131	758	715714
2003	540	153586	821	280	333585	2106	53	88136	156	389815	2	5363	3	6780	0	0	1065	989929
TOTAL	**38567**	**7271280**	**52248**	**25760**	**26830134**	**208894**	**4475**	**5910807**	**5065**	**6394049**	**240**	**297832**	**158**	**386162**	**86**	**269224**	**75653**	**48178084**

Table D.5 Building Stock Changes between 1954 and 2003 in Çanakkale

(Source: TURKSTAT, 2007)

ÇANAKKALE	Number of House	Floor Area of House	Number of House Dwelling Units	Number of Apartment House	Floor Area of Apartment House	Number of Apartment Dwelling Units	Commercial Building	Floor Area of Commercial Building	Industrial Building	Floor Area of Industrial Building	Medical and Social Building	Floor Area of Medical and Social Building	Cultural Building	Floor Area of Cultural Building	Religious Building	Floor Area of Religious Building	Administrative Building	Floor Area of Administrative Building	Other Building	Floor Area of Other Building	General Total	Floor Area of General Total
1954	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	121	10621	130	4	998	11	21	1524	0	0	1	2800	0	0	0	0	0	0	149	15936	149	15936
1969	152	13351	171	22	5865	63	36	2039	2	498	0	0	0	0	0	0	0	0	212	21773	212	21773
1970	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	224	22851	303	57	22504	245	13	1224	2	1141	1	784	0	0	0	0	0	0	367	50064	367	50064
1972	198	20900	273	69	23769	286	21	1234	3	2508	0	0	0	0	0	0	2	417	346	49973	346	49973
1973	160	17238	211	81	31288	363	50	3321	0	0	0	0	1	352	0	0	0	0	341	53182	341	53182
1974	137	14139	179	55	21602	262	22	1548	3	6617	0	0	1	1100	0	0	0	0	263	45957	263	45957
1975	191	20710	272	85	36755	433	48	3244	1	4780	0	0	1	1100	0	0	1	1039	339	68070	339	68070
1976	165	17685	230	131	54645	619	26	6826	1	302	2	2732	0	0	0	0	0	0	330	82985	330	82985
1977	121	13071	170	157	60864	706	18	4179	2	359	0	0	2	1491	1	183	2	1786	309	83377	309	83377
1978	59	7077	-	105	40769	-	16	2430	2	8485	1	761	1	49	0	0	0	0	194	59977	194	59977
1979	125	15539	182	172	76227	802	12	10875	0	191	2	1088	0	0	2	670	0	0	326	106274	326	106274
1980	85	12771	132	108	46490	526	3	7860	0	0	5	1440	1	153	1	306	2	1030	208	70438	208	70438
1981	46	5838	70	68	33513	359	14	9832	0	0	3	1323	0	0	0	0	0	0	133	50556	133	50556
1982	68	10216	112	96	43514	458	12	9080	4	7487	1	45	1	5962	0	0	5	6727	189	83226	189	83226
1983	78	12017	128	109	60006	635	17	18715	0	135	3	660	1	966	0	0	2	860	219	94136	219	94136
1984	66	11099	116	156	73720	798	11	12308	1	95	1	102	1	1991	0	0	4	5604	250	105212	250	105212
1985	100	15578	169	195	105383	1049	10	16752	2	310	9	17927	3	1067	0	0	0	0	331	159848	331	159848
1986	152	24123	257	192	109889	1137	14	10023	1	167	1	74	2	3570	0	0	0	0	372	148868	372	148868
1987	117	18915	202	173	91969	931	8	18690	0	0	2	785	0	0	0	0	1	3423	312	134249	312	134249
1988	327	42282	472	170	99177	992	17	34791	1	7423	7	1917	1	3229	0	0	1	3475	564	193949	564	193949
1989	174	27292	278	226	190600	1813	19	19195	1	91	4	7907	2	3169	0	0	2	4894	453	254662	453	254662
1990	175	27454	287	143	85515	829	11	10960	3	1554	1	119	1	111	0	0	1	895	360	128139	360	128139
1991	155	21765	240	149	72951	729	3	7115	0	0	1	706	4	6321	0	0	1	5292	321	114572	321	114572
1992	244	40727	381	170	110091	1043	13	24956	0	0	4	5438	0	0	0	0	0	0	443	182084	443	182084
1993	215	29567	304	181	165921	1432	16	12314	0	0	3	5025	3	9861	0	0	2	8022	433	231864	433	231864
1994	130	19595	186	184	150622	1352	13	12769	1	1000	0	0	3	11273	0	0	1	289	338	197846	338	197846
1995	161	25307	211	248	184675	1659	5	13513	0	0	2	2819	2	5078	0	0	1	1054	425	234348	425	234348
1996	270	37462	309	176	135954	1232	9	24993	3	3540	9	20422	4	69196	1	602	0	0	480	292610	480	292610
1997	292	44500	327	308	235744	2124	14	23251	1	313	4	5621	3	4386	0	0	0	0	627	314306	627	314306
1998	163	23071	187	169	133724	1163	10	21021	1	1218	7	12286	4	13935	0	0	1	273	366	206324	366	206324
1999	31	6249	37	75	72434	663	14	14560	0	0	4	8161	1	12492	0	0	2	2462	136	116729	136	116729
2000	155	25806	171	99	87996	732	18	27844	2	579	5	8482	1	7212	0	0	2	3989	296	164315	296	164315
2001	93	13737	111	72	55801	475	13	11098	0	0	4	12920	4	268809	0	0	2	4738	199	367830	199	367830
2002	33	4160	35	36	26021	242	5	4303	1	3923	3	5469	2	9061	0	0	3	1372	88	54367	88	54367
2003	23	3882	32	60	63752	539	16	9267	0	0	1	1729	1	6438	1	292	2	60	110	86635	110	86635
TOTAL	5006	676604	6875	4501	2810708	26686	570	413674	38	52716	91	139542	51	448372	6	2053	40	57701	521	33401	10839	4624721

Table D.6 Building Stock Changes between 1954 and 2003 in Düzce

(Source: TURKSTAT, 2007)

DÜZCE	Number of House	Floor Area of House	Number of House Dwelling Units	Number of Apartment House	Floor Area of Apartment House	Number of Apartment Dwelling Units	Commercial Building	Floor Area of Commercial Building	Industrial Building	Floor Area of Industrial Building	Medical and Social Building	Floor Area of Medical and Social Building	Cultural Building	Floor Area of Cultural Building	Religious Building	Floor Area of Religious Building	Administrative Building	Floor Area of Administrative Building	Other Building	Floor Area of Other Building	General Total	Floor Area of General Total
1954	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	95	8171	116	12	2491	40	17	2520	0	0	0	0	0	0	0	0	0	0	0	0	124	13182
1969	71	6126	86	14	1827	30	15	2049	0	0	0	0	0	0	0	0	0	0	0	0	100	10002
1970	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			0	0
1971	127	15542	169	19	8903	87	28	2117	5	278	0	0	0	0	0	0	0	0	19	397	198	27237
1972	131	16510	176	36	14084	152	41	2926	3	1360	0	0	0	0	0	0	0	0	19	413	230	34933
1973	133	17905	189	54	27948	261	45	6593	0	0	0	0	0	0	0	0	0	0	12	280	244	52726
1974	113	15578	160	35	19719	177	43	5780	1	1176	0	0	0	0	0	0	0	0	3	52	195	42305
1975	75	11514	114	24	11571	109	38	7287	3	3811	1	210	0	0	0	0	0	0	3	55	144	34448
1976	63	9349	93	34	22138	193	24	6952	2	514	4	6466	2	1636	1	235	0	0	0	0	130	47290
1977	119	17625	180	83	53644	470	31	14117	6	13498	1	6586	2	7919	0	0	0	0	1	137	243	113526
1978	134	21242	-	118	101780	-	33	25005	0	113	1	380	0	0	0	0	1	1435	0	0	287	149955
1979	137	18734	178	125	105174	894	47	42165	2	320	2	3356	0	0	1	280	0	0	9	746	323	170755
1980	87	12424	117	73	57212	465	25	20953	4	4489	2	580	0	0	2	156	1	2736	1	67	195	98617
1981	48	6396	63	53	40386	389	9	3958	1	336	0	0	1	969	0	0	0	0	2	108	114	52153
1982	30	4733	43	43	41975	350	13	11230	3	450	0	0	0	0	0	0	1	1039	2	142	92	59569
1983	31	5607	45	58	49269	387	7	12135	2	1127	0	0	0	0	0	0	0	0	6	555	104	68693
1984	65	10751	95	71	64283	520	9	13765	0	80	0	0	0	0	0	0	1	216	9	410	155	89505
1985	41	6619	62	64	57880	443	8	10220	0	0	0	0	0	0	0	0	0	0	6	1572	119	76273
1986	134	28696	222	108	90772	695	16	17491	5	6541	1	3355	1	1188	0	0	0	0	9	2299	274	150342
1987	140	26905	239	136	120010	906	18	25413	3	3226	0	0	0	0	0	0	1	935	6	2269	304	178768
1988	145	26915	225	196	172286	1307	16	46188	5	15108	6	4724	2	3073	3	1172	2	2012	15	31151	390	302629
1989	99	18168	151	153	150683	1117	17	33945	4	6440	3	3879	1	1189	1	57	0	0	8	5377	286	219738
1990	45	7838	64	136	133131	992	17	33098	1	2776	0	0	0	0	0	0	0	0	1	108	200	176951
1991	44	8641	65	154	138823	998	22	31791	1	743	6	10331	1	2025	0	0	2	2381	2	2250	232	196985
1992	75	13864	106	168	168087	1221	10	24102	1	680	0	0	1	2000	0	0	0	0	1	1059	256	209792
1993	59	11508	92	179	187161	1329	19	31342	1	145	0	0	0	0	0	0	0	0	1	667	259	230823
1994	50	10316	76	152	148990	1041	21	21771	0	0	0	0	0	0	0	0	0	0	1	96	224	181173
1995	47	9816	74	143	146634	1024	14	75218	0	0	1	993	0	0	0	0	0	0	2	431	207	233092
1996	47	10663	78	119	109644	756	11	18786	0	229	2	1684	0	0	0	0	0	0	3	1164	182	142170
1997	28	6411	47	109	119229	809	13	20288	2	1165	4	5571	0	0	1	3704	0	0	1	42	158	156350
1998	39	8929	61	122	117218	841	14	22404	0	0	1	524	0	0	0	0	0	0	1	42	177	149117
1999	22	5085	33	101	107640	774	11	23444	0	0	2	12837	1	5573	0	0	1	1175	4	304	142	156058
2000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	43	9016	63	73	62954	640	1	4394	1	366	2	3457	1	2580	0	0	0	0	0	0	121	82767
2002	130	31386	186	24	11698	86	20	74152	0	0	2	922	3	16852	1	1000	1	2529	1	209	182	138748
2003	77	18273	109	13	8307	52	14	43557	3	12047	1	845	3	18924	0	0	1	2025	0	0	112	103978
TOTAL	**2724**	**457256**	**3777**	**3002**	**2673851**	**19557**	**687**	**737156**	**59**	**76958**	**42**	**66700**	**19**	**63928**	**10**	**6604**	**12**	**16483**	**148**	**52402**	**6703**	**4150570**

Table D.7 Building Stock Changes between 1954 and 2003 in Elazığ

(Source: TURKSTAT, 2007)

ELAZIG	Number of House	Floor Area of House	Number of House Dwelling Units	Number of Apartment House	Floor Area of Apartment House	Number of Apartment Dwelling Units	Commercial Building	Floor Area of Commercial Building	Industrial Building	Floor Area of Industrial Building	Medical and Social Building	Floor Area of Medical and Social Building	Cultural Building	Floor Area of Cultural Building	Religious Building	Floor Area of Religious Building	Administrative Building	Floor Area of Administrative Building	Other Building	Floor Area of Other Building	General Total	Floor Area of General Total
1954	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	161	17399	-	7	2357	-	46	2275	5	350	0	0	0	0	0	0	0	0	0	0	219	22381
1957	398	41671	-	19	8586	-	22	3473	4	245	0	0	0	0	0	0	0	0	1	1395	444	55370
1958	442	51071	-	16	7029	-	29	4565	1	400	0	0	0	0	0	0	0	0	10	2447	498	65512
1959	267	31423	-	4	1423	-	34	4579	2	388	0	0	0	0	0	0	0	0	5	1615	302	39428
1960	313	32113	-	2	1142	-	16	1038	3	1849	0	0	0	0	0	0	0	0	7	132	341	36274
1961	88	8915	-	1	237	-	21	2656	1	119	0	0	0	0	0	0	0	0	82	1693	193	13620
1962	202	20654	-	3	1321	-	36	1550	4	145	0	0	0	0	0	0	0	0	81	1378	326	25048
1963	260	29777	-	12	6369	-	75	6237	4	821	2	2436	0	0	0	0	0	0	66	1343	419	46983
1964	353	37058	394	23	8482	96	33	3299	2	45	0	0	0	0	0	0	3	4243	54	883	468	54010
1965	399	46431	496	42	18499	179	74	8437	6	1151	9	19216	0	0	1	193	2	1067	90	1449	623	96443
1966	208	24399	267	25	11614	108	38	2945	0	0	0	0	1	104	0	0	0	0	1	43	273	39105
1967	167	17780	194	34	9350	94	39	4977	4	300	0	0	0	0	0	0	0	0	3	264	247	32671
1968	211	24433	256	70	29730	278	43	6287	3	235	1	676	0	0	0	0	1	543	1	86	330	61980
1969	199	22887	243	47	19469	183	39	5814	5	504	0	0	0	0	0	0	0	0	1	20	291	48694
1970	494	49945	583	129	62350	661	33	4613	10	4846	1	4485	7	7451	0	0	1	1375	68	1943	743	137008
1971	381	45663	503	130	72671	743	36	3776	4	409	0	0	3	4595	3	730	0	0	87	2611	644	130455
1972	1142	108750	1276	274	181521	1694	65	6566	7	459	2	472	0	0	1	236	2	717	81	2711	1574	301402
1973	419	53529	520	286	176314	1591	152	17110	12	4510	2	524	0	0	1	310	2	6598	88	2261	962	261156
1974	304	41881	413	236	138708	1246	127	29351	5	2432	0	0	0	0	0	0	1	471	35	1020	710	213863
1975	280	43448	403	257	179253	1599	169	22495	26	4682	5	9083	1	786	0	0	4	3358	18	1113	780	264218
1976	287	44078	409	317	237760	2139	69	30855	6	2960	3	6299	3	8161	0	0	1	836	5	171	691	331120
1977	203	33479	303	273	198239	1796	51	31644	4	1495	3	5040	0	0	0	0	2	17698	3	768	539	288363
1978	181	29433	-	259	222070	-	28	44863	3	2692	0	0	0	0	0	0	4	4187	2	125	477	303370
1979	147	26353	225	131	98812	826	10	7560	1	544	1	1060	1	2752	1	324	1	197	0	0	293	137602
1980	122	22393	180	133	109695	939	13	8931	2	1008	0	0	0	0	2	468	0	0	10	912	282	143407
1981	137	17699	186	75	56999	533	12	8325	3	568	3	2248	0	0	0	0	17	6523	2	873	249	93235
1982	95	15624	138	86	68874	646	5	6133	2	504	1	132	0	0	0	0	0	0	9	1188	198	92455
1983	142	28612	226	182	170296	1439	7	12095	0	534	3	4006	1	327	0	0	4	4918	7	724	346	221512
1984	179	32358	266	199	137101	1173	9	10958	6	1128	3	13873	3	1582	0	0	3	2683	13	4336	415	204019
1985	403	60966	476	216	163635	1369	9	11456	4	1010	7	86180	2	1775	1	190	0	0	12	3214	654	328426
1986	664	98082	761	329	268314	2411	12	17753	4	2849	0	0	14	41196	0	0	3	7042	10	2081	1036	437317
1987	264	45662	364	312	306713	2469	25	53310	1	3928	0	0	0	0	1	55	0	0	10	2325	613	431993
1988	158	23182	202	325	298015	2640	7	16034	1	251	2	17410	0	0	2	435	6	12068	5	299	506	367694
1989	194	29702	249	291	255843	2147	20	32988	2	2450	2	4502	2	644	1	843	1	7363	7	1450	520	335785
1990	228	34190	292	360	298024	2435	18	34538	3	4715	3	11957	0	0	1	85	1	6261	4	489	618	390264
1991	211	34972	298	546	489524	3845	14	39129	1	548	3	7307	2	9412	3	1431	1	586	1	90	782	582999
1992	248	46473	354	644	719041	5702	14	33724	2	2606	4	3387	0	0	2	340	0	0	7	3278	921	808949
1993	308	62272	425	655	739245	5499	11	57965	1	250	1	2105	0	0	1	438	0	0	4	359	981	862634
1994	283	48528	358	451	453007	3580	46	59482	2	2726	1	169	0	0	2	520	1	1629	1	30	787	566291
1995	107	17551	149	523	406854	3294	24	43908	0	1913	2	1961	0	0	3	801	0	0	5	187	664	473173
1996	88	17718	141	328	300465	2321	26	40533	0	568	0	0	0	0	1	125	0	0	3	1438	446	360847
1997	123	24484	160	278	270116	1956	16	47328	0	822	1	9854	2	4639	3	2371	1	997	1	385	425	360996
1998	114	20533	144	276	242943	1883	12	45799	2	1399	0	0	3	12312	1	647	1	4350	5	522	414	328805
1999	94	21625	139	318	372076	2463	13	58966	3	6132	5	11294	1	1390	0	0	3	2834	2	463	439	474780
2000	94	25566	134	351	426022	2592	21	64183	1	2800	3	13432	6	21695	0	0	1	5775	2	2271	479	561344
2001	162	40922	195	214	211043	1398	13	36967	4	3066	1	10960	0	0	0	0	1	1095	3	723	396	304846
2002	68	19356	92	230	267300	1608	14	51090	1	210	0	0	1	7015	0	0	1	1044	2	379	317	346354

Table D.8 Building Stock Changes between 1954 and 2003 in Erzincan

(Source: TURKSTAT, 2007)

ERZINCAN	Number of House	Floor Area of House	Number of House Dwelling Units	Number of Apartment House	Floor Area of Apartment House	Number of Apartment Dwelling Units	Commercial Building	Floor Area of Commercial Building	Industrial Building	Floor Area of Industrial Building	Medical and Social Building	Floor Area of Medical and Social Building	Cultural Building	Floor Area of Cultural Building	Religious Building	Floor Area of Religious Building	Administrative Building	Floor Area of Administrative Building	Other Building	Floor Area of Other Building	General Total	Floor Area of General Total
1954	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	44	4517	-	1	300	-	23	3751	7	23630	1	1254	0	0	0	0	0	0	34	952	110	34404
1957	45	5849	-	8	3889	-	88	7484	0	0	0	0	0	0	0	0	0	0	38	1233	179	18455
1958	63	8891	-	2	1185	-	27	3179	3	7167	1	877	0	0	0	0	0	0	30	1062	126	22361
1959	98	14079	127	0	0	0	21	3404	1	339	0	0	0	0	0	0	0	0	52	1831	172	19653
1960	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	83	10247	-	17	8486	-	18	2602	0	0	1	440	0	0	0	0	0	0	75	2980	194	24755
1964	102	15728	134	8	5255	30	22	3793	3	1433	2	16196	0	0	1	288	1	131	58	1918	197	44737
1965	87	13184	129	8	6215	38	26	6286	0	0	0	0	0	0	1	720	0	0	82	987	204	27392
1966	64	7446	91	10	4047	40	22	2609	0	0	0	0	0	0	0	0	0	0	1	20	97	14122
1967	156	17255	201	11	4494	52	14	2027	0	0	0	0	0	0	2	918	0	0	0	0	183	24694
1968	137	16791	182	7	3085	26	12	2334	0	0	1	8095	0	0	0	0	0	0	0	0	157	30305
1969	126	13957	171	20	7558	75	22	3080	0	0	0	0	0	0	0	0	0	0	0	0	168	24595
1970	168	20350	207	227	122606	928	6	160	1	640	1	154	1	2341	1	18	1	27	211	3670	617	151409
1971	99	15223	139	15	7795	66	14	1898	0	0	2	1043	1	7664	1	683	0	0	289	4038	421	38344
1972	112	19298	164	32	16229	141	31	7834	0	0	0	0	2	5606	0	0	2	907	115	1675	294	51549
1973	322	65205	584	65	37710	315	55	11693	23	12917	1	2325	0	0	1	651	0	0	52	1075	539	131576
1974	102	20547	163	34	19752	159	70	2832	8	7654	0	0	0	0	0	0	1	807	92	2218	307	53810
1975	225	46714	403	40	23034	192	42	4175	3	4379	0	0	1	187	0	0	2	1370	37	1295	350	81155
1976	122	19887	170	45	23380	199	49	13457	7	2143	1	6728	1	1445	3	1028	5	2781	9	642	242	71491
1977	97	19700	152	87	53990	443	24	18530	2	2899	1	1931	0	0	4	1220	1	1644	3	590	219	100904
1978	360	45472	-	115	59202	-	72	38638	6	2937	0	0	0	0	3	2644	0	0	39	2844	595	151737
1979	198	46677	332	120	84948	639	44	8268	7	5080	1	2609	2	2155	0	0	2	5197	7	1150	381	156084
1980	123	26125	198	88	39256	444	63	7479	8	3788	0	0	0	0	1	471	1	5418	3	1123	287	83660
1981	68	16217	122	154	156515	1358	48	32165	5	1798	0	0	0	0	3	869	0	0	3	121	281	207685
1982	111	28506	197	108	75934	633	28	32787	12	6340	0	0	0	0	1	331	2	699	2	209	264	144806
1983	162	29674	258	39	19600	185	14	4397	9	3119	1	220	2	2152	2	521	2	1152	83	11436	314	72271
1984	76	12295	112	36	40006	387	19	5333	1	117	0	0	1	2005	0	0	0	0	32	3184	165	62942
1985	41	8139	67	91	75382	759	19	9001	5	1669	1	3752	2	5023	1	331	1	102	25	1795	186	105194
1986	194	27681	245	93	59638	595	5	2572	1	627	1	197	0	0	1	664	2	6233	15	4129	312	101941
1987	134	25654	200	195	137341	1226	12	4247	2	884	0	0	1	606	1	379	1	680	45	48130	391	217921
1988	122	19582	170	110	79429	684	10	3460	3	2993	5	7951	0	0	3	2272	0	0	60	18254	313	133941
1989	78	17686	140	91	69358	632	21	7670	1	667	0	0	0	0	1	202	3	14706	66	14230	261	124519
1990	91	20567	159	75	82017	589	8	15247	1	1500	2	4576	4	7845	1	414	3	9300	10	2447	195	143913
1991	65	13497	94	104	154162	1020	5	4518	3	342	0	0	6	11800	2	1137	2	1624	13	2602	200	189682
1992	39	4204	43	66	151397	1262	2	3754	0	0	0	0	1	4852	0	0	3	6402	0	0	111	170609
1993	75	12885	94	30	28006	190	8	8583	1	1303	3	2333	0	0	3	7550	5	14240	81	4810	206	79710
1994	31	7810	50	318	319556	2568	32	99057	4	3560	10	34948	2	5201	3	2699	2	2465	2	688	404	475984
1995	68	14108	86	16	11968	85	10	15554	3	759	1	4046	1	1485	1	837	1	39	4	2192	105	50988
1996	11	3490	18	21	26339	199	5	6696	0	0	0	0	0	0	1	483	0	0	1	1445	39	38453
1997	15	4588	27	15	20943	133	9	12070	0	0	2	2869	1	2544	0	0	1	1380	0	0	43	44394
1998	36	9454	45	11	12100	69	5	7957	1	246	2	1656	4	7693	0	0	0	0	0	0	59	39106
1999	19	5461	30	18	24813	140	8	18754	2	1599	0	0	2	8270	1	286	0	0	0	0	50	60992
2000	64	16843	80	49	73011	405	4	9499	1	2661	1	1000	0	0	0	0	0	0	0	0	119	103014
2001	58	17410	87	84	82810	529	18	31041	0	0	1	1119	2	3559	0	0	0	0	0	0	163	135939
2002	66	24825	121	53	63428	328	6	9925	0	0	1	273	2	8931	1	1857	2	2077	0	0	131	111316
2003	47	18517	87	101	103428	554	11	16397	24	3412	0	0	1	6425	0	0	0	0	0	0	184	148179
TOTAL	**4804**	**802235**	**6079**	**2838**	**2398897**	**18317**	**1072**	**516397**	**158**	**108602**	**44**	**106992**	**40**	**97789**	**44**	**29473**	**46**	**79381**	**1689**	**140875**	**10535**	**4330291**

Table D.9 Building Stock Changes between 1954 and 2003 in Istanbul

(Source: TURKSTAT, 2007)

ISTANBUL	Number of House	Floor Area of House	Number of House Dwelling Units	Number of Apartment House	Floor Area of Apartment House	Number of Apartment Dwelling Units	Commercial Building	Floor Area of Commercial Building	Industrial Building	Floor Area of Industrial Building	Medical and Social Building	Floor Area of Medical and Social Building	Cultural Building	Floor Area of Cultural Building	Religious Building	Floor Area of Religious Building	Administrative Building	Floor Area of Administrative Building	Other Building	Floor Area of Other Building	General Total	Floor Area of General Total
1954	3172	465857	-	1678	809803	-	365	160678	50	71996	16	21921	0	0	0	0	0	0	397	15632	5678	1545887
1955	2635	396195	-	1981	774860	-	353	169361	54	88466	18	30476	0	0	0	0	0	0	215	14972	5256	1474330
1956	1010	165762	-	1069	429419	-	189	118077	42	101318	8	24699	0	0	0	0	0	0	160	13320	2478	852995
1957	684	89391	-	644	459308	-	208	63314	55	64805	10	21144	0	0	0	0	0	0	90	8016	1691	705978
1958	566	91781	-	1201	768528	-	447	163713	71	95215	6	5114	0	0	0	0	0	0	190	16080	2481	1140431
1959	517	104231	-	964	625784	-	175	43498	46	82885	14	44116	0	0	0	0	0	0	163	17761	1879	968275
1960	870	134483	-	1130	689340	-	240	94753	34	46334	10	37776	0	0	0	0	0	0	144	11007	2428	1084
1961	1222	174908	-	1500	937394	-	275	100502	35	42660	17	24918	0	0	0	0	0	0	213	44821	3262	1325603
1962	1169	182228	-	1920	1373487	-	304	155617	42	52181	21	31504	0	0	0	0	0	0	157	12658	3613	1807675
1963	911	134425	-	1873	1288463	-	302	90218	47	53942	23	28287	0	0	0	0	0	0	179	24204	3335	1619539
1964	1977	217364	2520	1437	1084507	8595	343	178437	67	75557	10	8833	25	40921	7	6977	4	1271	155	7890	4025	1621757
1965	2455	248725	2962	1895	1435526	12391	461	178686	76	105392	14	8095	13	33405	5	1001	3	2874	188	11364	5110	2029068
1966	416	56015	578	1745	1317657	13369	1094	221201	53	61758	13	12027	19	44063	3	2620	6	7059	40	1496	3389	1723896
1967	672	82577	908	1727	1234501	12802	813	164786	70	89162	12	14031	10	11735	6	1708	5	13857	28	3683	3343	1616040
1968	2471	223567	3022	2124	1243926	13755	1394	179484	85	135247	12	7342	21	36718	6	1484	4	2404	26	2057	6143	1832229
1969	1938	173960	2368	1635	951190	10718	1101	152444	86	88480	6	37213	6	15730	0	0	1	203	17	2083	1938	173960
1970	2136	219776	2852	4066	3201168	32006	1563	342472	128	224573	13	17929	9	22356	5	958	7	4634	149	62452	8072	4096318
1971	3084	323057	4120	3521	2547162	27352	1205	230728	265	110187	12	15006	6	21149	2	744	3	4327	202	11614	8300	3268974
1972	2798	302641	3724	3457	2437498	28032	1255	295300	134	130043	22	40981	8	10528	5	697	9	13383	176	7047	7864	3223018
1973	2483	285136	3386	3430	2579417	27812	1340	264986	146	196285	7	7770	4	7082	2	726	2	1043	102	7880	7516	3350325
1974	2568	287652	3434	3517	2748258	29374	1666	346294	165	268998	9	6886	2	2284	4	1243	3	7964	114	7285	8048	3676464
1975	3168	369735	4316	3473	3094563	31431	1905	426477	166	203104	2	2528	2	1127	0	0	3	2521	50	3700	8769	4103755
1976	2968	362535	4030	3682	3057197	32007	427	553899	101	168508	4	7965	4	5522	3	702	4	18898	21	795	7214	4176081
1977	2233	278007	3021	4449	3619621	35898	388	595437	221	411294	7	23346	55	72946	3	2356	1	1431	18	10397	7375	5014835
1978	3147	419546	-	3778	2987951	-	409	643866	147	358438	9	10652	4	2907	2	2943	3	19810	13	1506	7512	4447619
1979	2669	380478	3828	3428	2752735	25838	291	526298	124	163043	3	5030	2	4476	7	2243	1	1796	16	5209	6541	3841308
1980	1983	284422	2810	2738	2066924	18973	288	487913	65	139828	2	2093	0	0	0	0	0	0	21	4421	5097	2985601
1981	395	56530	559	1071	876800	8161	154	252193	19	20258	0	0	5	4512	0	0	0	0	2	100	1646	1210405
1982	74	13667	116	702	734161	6436	119	163901	9	26852	0	0	0	0	0	0	0	0	2	758	74	13667
1983	54	8431	81	836	954132	8055	108	181147	8	16809	0	0	0	0	0	0	0	0	0	0	1006	1160519
1984	409	77426	716	1797	1961552	16114	88	274347	8	16884	0	0	0	0	0	0	0	0	1	280	2303	2330489
1985	1310	255409	2022	3564	3446366	30444	239	512242	80	82349	5	4456	1	960	2	4230	0	0	15	1294	5216	4307396
1986	2563	562091	4068	6493	6234911	55111	348	938308	57	216548	1	1370	5	17413	0	0	5	15278	9	1554	9481	7987473
1987	3403	874346	4918	7405	7549182	66346	372	1229636	116	293084	6	39748	13	58993	0	0	3	3952	8	2885	11326	10048626
1988	2007	435567	3037	6772	6537040	59299	514	1437335	146	412387	10	39004	7	15708	4	2820	17	68442	29	19857	9506	8968160
1989	1297	276352	1902	5326	5248810	47824	413	1372251	108	435390	6	6682	3	7051	1	275	6	42800	10	9153	7170	7398864
1990	1075	259197	1600	4913	4496001	40339	364	1290111	74	196124	6	13033	7	11808	0	0	1	3500	5	5009	6445	6274883
1991	1750	425916	2435	5448	4752988	41980	393	1343034	95	233879	20	46523	19	97952	1	1738	5	8323	40	14543	7776	6923896
1992	2688	572489	3235	4782	4869197	40602	389	1587606	323	1045538	32	108741	23	72199	5	2960	10	31875	69	113087	7688	8179727
1993	2827	680372	3669	6113	6275107	54095	703	1643255	158	701040	30	82734	13	33528	1	402	11	49916	45	59199	9690	9272518
1994	2408	572660	3618	7011	7144493	58585	492	1650573	143	674779	24	62480	11	49474	3	2089	9	32375	51	28136	10152	10217159
1995	2008	525161	3102	7189	6809071	55396	357	1643725	104	394250	18	57341	14	49638	5	18535	4	10427	45	28240	9744	9536372
1996	2248	628350	3324	6814	6435723	51853	460	1788501	209	713441	20	44358	12	25969	5	3015	2	5267	44	38215	9816	9660839
1997	2341	655382	3427	7959	6819332	58699	1013	1906462	117	617312	20	51354	18	103842	3	1831	8	31371	41	83457	10979	10272930
1998	2193	662796	3039	9110	8252733	71895	440	2249594	109	479816	50	80862	17	64361	3	7773	13	66024	57	63126	11992	11926873
1999	853	248571	1348	6269	5014047	44949	331	1983123	118	672808	19	61600	26	216896	3	749	13	46582	61	90999	7692	8334911
2000	1038	298599	1313	3416	4120159	34430	377	1998692	36	156471	21	31653	21	46289	4	3957	4	2428	23	46476	4940	6704724
2001	1535	453368	1829	3761	4067956	33687	237	1331831	117	1013414	33	154904	28	96403	2	2241	15	19379	48	57416	5776	7196619
2002	1072	359021	1247	1763	1822066	13952	178	693800	74	404410	21	48973	31	127365	2	1416	31	82697	18	18875	3190	3559023
2003	632	209498	829	3208	3483005	26940	265	1096345	112	733579	18	55605	25	144065	9	6944	13	54649	30	32455	4310	5821210
TOTAL	**88100**	**15566633**	**99313**	**175784**	**15448819**	**1285765**	**27155**	**3951515**	**4815**	**1318673**	**657**	**1488843**	**489**	**1577275**	**113**	**87377**	**231**	**678780**	**3893**	**1044430**	**296275**	**21990918**

Table D.10 Building Stock Changes between 1954 and 2003 in Izmir

(Source: TURKSTAT, 2007)

IZMIR	Number of House	Floor Area of House	Number of House Dwelling Units	Number of Apartment House	Floor Area of Apartment House	Number of Apartment Dwelling Units	Commercial Building	Floor Area of Commercial Building	Industrial Building	Floor Area of Industrial Building	Medical and Social Building	Floor Area of Medical and Social Building	Cultural Building	Floor Area of Cultural Building	Religious Building	Floor Area of Religious Building	Administrative Building	Floor Area of Administrative Building	Other Building	Floor Area of Other Building	General Total	Floor Area of General Total
1954	1764	200739	-	132	66125	-	281	127736	34	35281	6	2105	0	0	0	0	0	0	299	12732	2516	444718
1955	1692	175667	-	163	75684	-	164	46917	16	13035	4	2891	0	0	0	0	0	0	93	14358	2132	328552
1956	1187	139051	-	206	103352	-	144	50543	14	8666	7	9616	0	0	0	0	0	0	128	9069	1680	320297
1957	851	96747	-	213	102454	-	882	141016	22	14420	4	2592	0	0	0	0	0	0	55	5620	2027	362849
1958	481	59727	-	212	96560	-	63	33043	16	9910	3	3204	0	0	0	0	0	0	42	10393	817	212837
1959	366	40199	-	138	63339	-	75	44754	11	4244	5	1741	0	0	0	0	0	0	60	3292	655	157569
1960	553	68149	-	165	85890	-	55	47705	13	9174	10	14560	0	0	0	0	0	0	51	11036	847	236994
1961	451	51560	-	228	141356	-	130	34773	13	9060	8	11094	0	0	0	0	0	0	64	9858	894	257701
1962	358	47185	-	277	178670	-	123	55700	10	19634	10	15911	0	0	0	0	0	0	71	3051	849	320151
1963	411	58198	-	305	237398	-	197	44836	17	9358	7	11168	0	0	0	0	0	0	87	5214	1024	367172
1964	383	53550	569	313	223291	1835	135	59630	16	32740	3	4679	6	9039	0	0	4	1191	62	2114	922	386234
1965	284	40694	429	420	310148	2752	193	49494	9	2677	1	504	13	23974	0	0	4	19921	45	1305	969	448717
1966	84	10897	119	173	132388	1258	174	30319	13	2992	3	592	9	17908	0	0	0	0	16	965	472	196061
1967	220	23686	259	441	236226	2085	214	78307	27	21140	2	1639	4	6728	0	0	3	5036	24	1516	935	374278
1968	318	29898	370	708	323340	2894	316	120680	34	30949	7	15683	17	39934	1	750	3	22104	26	3691	1430	586929
1969	509	45642	564	816	384373	3624	369	91663	30	17133	7	16040	5	12156	0	0	3	5415	29	19572	1768	591997
1970	735	83874	1008	948	743914	7327	443	85686	71	35914	6	4661	7	7544	4	1431	4	3311	175	17449	2393	983784
1971	765	98713	1135	906	685639	7328	419	140098	67	29262	15	36228	4	9175	4	1646	5	33087	255	46838	765	98713
1972	1214	153358	1646	1056	773015	8092	498	81558	106	45065	3	424	2	3239	7	2067	6	10594	222	15014	3114	1084334
1973	618	79934	899	1206	962370	9423	638	107343	90	61386	9	11105	11	19558	3	908	2	1970	487	31385	3064	1279359
1974	359	48796	536	1193	964078	9606	687	124693	76	54536	11	6163	7	10044	1	120	3	9782	188	12523	2525	1230735
1975	366	50156	535	1071	750514	7491	571	84249	79	23752	2	7219	13	14297	0	0	3	6620	156	6226	2261	943033
1976	425	52835	591	1529	1215386	12078	110	139928	42	19023	2	4433	4	5395	0	0	3	1072	29	3767	2144	1441839
1977	279	33336	382	810	496323	4871	57	49268	33	8942	2	4840	2	5647	0	0	2	1563	64	20155	1249	620034
1978	389	48315	-	912	700090	-	80	130490	20	8109	1	256	8	8771	3	1039	1	70	39	1690	1453	899830
1979	366	46471	473	984	790082	7611	61	81968	22	22803	13	8638	6	6297	0	0	18	45545	32	3784	1502	1005588
1980	282	37110	377	704	573216	5532	52	83367	23	7760	3	2172	4	3946	0	0	6	5186	19	1893	1093	714650
1981	185	27676	279	648	590171	5953	54	100424	22	5706	11	23014	0	0	0	0	0	0	11	832	931	747823
1982	88	15702	146	634	624438	5816	34	91152	18	16554	2	91	0	0	0	0	0	0	16	2130	792	750067
1983	126	27511	207	951	926800	8049	42	139790	15	20030	12	15067	5	12667	1	470	6	16612	26	4981	1184	1163928
1984	289	53602	460	1078	1063326	9099	86	179899	21	40054	7	48325	1	231	1	160	6	27458	26	4048	1515	1417103
1985	414	69945	625	2118	2485435	22505	166	370755	14	45975	10	12534	9	17388	2	558	11	27355	27	8881	2771	3038826
1986	598	95698	928	1751	1543119	13672	236	344269	12	18018	11	29842	9	27033	1	438	8	10923	27	14644	2653	2088984
1987	1914	319955	2958	2218	2189782	19284	352	500708	42	78432	10	11486	7	24977	3	2274	4	9437	57	57111	4607	3194162
1988	1800	297554	2729	2070	2068083	18432	324	499994	67	137800	11	11603	17	38264	0	0	7	5681	39	21165	4335	3079744
1989	2207	359287	3192	1760	1772519	15889	379	772013	115	223791	13	29563	13	33099	5	1820	5	7172	36	31460	4533	3230724
1990	1792	317879	2885	2474	1984995	18728	411	625155	105	110783	15	27263	8	13508	6	1169	10	29857	48	24087	4869	3145166
1991	2397	413766	3649	3158	2867442	25598	502	782389	106	244293	26	42152	9	14756	4	857	7	19001	103	30216	6312	4414872
1992	3535	569386	4918	2781	2655223	22948	283	415424	166	325988	92	29983	12	18447	5	4076	10	40979	98	58741	6850	3926095
1993	5440	858346	7086	3585	4304738	36132	398	771851	243	315689	23	21422	12	33701	1	1072	11	21434	83	39363	9796	6367545
1994	3912	633865	5382	3171	3730980	30283	450	686183	140	260951	25	42690	26	63705	4	1449	7	32937	73	56810	7808	5514752
1995	3505	647940	4788	3165	3502697	30851	411	691653	212	517100	25	41424	11	23597	8	6374	6	11584	138	56885	7481	5519734
1996	2585	483215	3494	2881	3673839	32458	406	698771	176	445148	22	48463	20	58915	4	3850	8	28079	81	39090	6183	5479128
1997	3125	576547	4098	3034	3649994	30186	527	789907	94	305180	23	30324	19	61858	8	3999	4	23598	117	83007	6951	5524412
1998	1962	380190	2664	1981	2313380	18522	298	708405	65	147457	24	49791	25	49615	7	7067	10	55289	65	21355	4437	3732549
1999	1967	390440	2555	1679	1758734	13602	178	584337	45	119351	51	122589	23	75160	1	660	7	17007	52	14183	3967	3057261
2000	1034	239920	1454	1882	1906606	15558	174	526281	41	126418	6	13079	12	41908	1	1944	10	75614	66	34930	3226	5056710
2001	958	222098	1365	1290	1250110	9784	146	282961	43	115575	14	20109	27	65700	2	1351	6	5496	40	26690	2526	1990048
2002	674	149389	898	638	1927154	4788	88	132631	40	141478	10	31889	15	89974	1	736	5	12296	83	55891	1554	1322988
2003	789	167817	995	725	837363	5468	115	222677	44	125219	7	6359	9	27630	4	3198	7	20434	21	70088	1722	1494682
TOTAL	57005	9192215	67647	61885	61040409	507412	13018	13085083	2770	4443975	604	909223	411	995785	92	61953	225	670700	4151	1030998	138503	91144358

Table D.11 Building Stock Changes between 1954 and 2003 in Karabük

(Source: TURKSTAT, 2007)

KARABÜK	Number of House	Floor Area of House	Number of House Dwelling Units	Number of Apartment House	Floor Area of Apartment House	Number of Apartment Dwelling Units	Commercial Building	Floor Area of Commercial Building	Industrial Building	Floor Area of Industrial Building	Medical and Social Building	Floor Area of Medical and Social Building	Cultural Building	Floor Area of Cultural Building	Religious Building	Floor Area of Religious Building	Administrative Building	Floor Area of Administrative Building	Other Building	Floor Area of Other Building	General Total	Floor Area of General Total
1954	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	58	5583	-	22	13160	-	134	13633	8	26272	18	2726	0	0	0	0	0	0	35	21994	275	83368
1964	133	13436	211	30	10651	136	69	12640	12	28957	3	1094	1	835	1	462	1	95	26	1027	276	69197
1965	247	25793	352	51	23747	267	192	12956	9	1781	3	1312	1	80	2	505	1	190	11	436	517	66800
1966	75	7422	108	20	9691	95	49	1925	7	1056	3	1185	3	1171	0	0	1	190	1	15	159	22655
1967	196	16450	226	52	15122	154	44	4245	8	1478	4	994	1	671	0	0	1	655	0	0	306	39615
1968	209	17218	243	72	19530	220	45	3699	7	981	1	312	2	3853	0	0	1	364	0	0	337	45997
1969	213	17480	249	65	13154	153	37	2534	2	290	1	418	1	163	0	0	1	166	1	38	321	34243
1970	112	13820	155	161	83937	742	53	12402	23		2		1		3		0				412	128091
1971	905	103583	1183	123	70283	724	23	1914	6	2389	0	0	2	323	0	0	1	80	64	2656	1124	181238
1972	88	11901	128	63	29215	276	37	4000	2	1589	0	0	0	0	2	717	1	184	31	984	224	48590
1973	716	99836	959	180	112218	1051	59	5226	7	2274	1	223	3	13844	2	996	2	4559	41	5040	1011	244216
1974	65	7232	76	33	19145	178	23	5585	3	614	1	276	0	0	1	128	1	231	12	259	139	33430
1975	100	14677	171	179	151198	1110	20	2204	3	356	0	0	0	0	0	0	1	92	7	482	310	169009
1976	83	13721	120	80	40521	365	8	9772	3	692	0	0	1	3349	0	0	1	1269	0	0	176	69334
1977	79	13511	124	573	297681	2317	11	17709	4	3237	2	2655	1	3448	0	0	1	1828	3	173	676	340242
1978	178	27432	-	136	91111	-	15	12668	2	1284	2	5265	0	0	1	36	0	0	8	1113	342	138909
1979	103	15289	148	152	106919	923	18	24882	5	2568	0	0	1	1180	1	294	1	1053	2	111	283	152296
1980	89	24976	133	117	91401	732	21	60245	2	3993	0	0	0	0	2	616	0	0	0	0	231	181231
1981	263	42209	301	115	73735	682	8	11896	5	680	0	0	0	0	0	0	1	568	2	37	394	129125
1982	134	23224	215	188	163474	1288	21	11961	0	0	2	1405	0	0	0	0	10	1113	2	162	357	201339
1983	26	4416	40	41	30282	243	9	16817	0	125	1	28	1	77	0	0	0	0	2	56	80	51801
1984	37	6160	52	45	30471	244	209	45445	0	30	1	1552	2	6892	2	435	0	0	6	624	302	91609
1985	27	4286	35	103	91944	700	7	10824	0	288	1	1663	0	0	1	651	1	5786	7	612	147	116054
1986	37	6262	54	38	35702	286	8	6274	5	22926	0	0	1	2491	4	2273	1	1143	7	434	101	77505
1987	50	7375	67	42	28279	226	8	5059	10	15809	3	2475	3	2744	2	643	2	903	17	4660	137	67947
1988	112	18188	145	76	69717	559	8	8044	7	28240	1	210	1	2130	1	1281	1	1000	9	1334	216	130150
1989	12	2127	20	42	38136	301	3	2119	2	957	0	0	1	3376	2	4235	0	0	4	2160	71	53110
1990	17	2730	25	220	231782	1958	2	6178	4	710	3	4586	0	0	3	575	1	1625	0	0	250	248186
1991	36	6753	50	100	131984	1113	3	7210	7	7480	1	3890	0	0	1	140	0	0	5	309	153	158036
1992	73	13892	117	181	219352	1639	3	4383	2	1921	1	746	3	5365	0	0	0	0	1	39	264	245898
1993	50	9272	79	208	195480	1426	11	22481	1	498	0	0	1	8070	1	464	0	0	4	239	276	236504
1994	22	4265	33	58	46754	346	8	35292	1	396	2	4735	0	0	1	374	1	197	5	2367	98	94380
1995	11	1887	16	37	43511	330	4	8561	1	3115	0	0	2	21842	0	0	0	0	1	3755	66	82671
1996	20	3876	30	91	106324	796	10	15899	1	500	1	4490	0	0	0	0	0	0	11	4457	134	135546
1997	11	1926	14	39	47610	315	9	45740	6	4052	0	0	0	0	2	675	1	7314	3	700	75	108017
1998	16	3273	20	64	95714	630	8	29835	7	59005	3	9873	3	6379	1	799	0	0	8	1542	110	206410
1999	8	1653	12	83	112712	761	8	5362	3	3223	2	1538	1	1193	2	1139	1	1728	8	598	116	129146
2000	9	1669	12	32	44999	314	10	17550	4	12352	0	0	0	0	0	0	0	0	5	531	60	77061
2001	5	1552	6	15	29243	194	10	35094	3	5484	7	11734	1	4874	1	712	1	7910	3	117	46	96730
2002	4	307	4	7	6648	42	11	31302	2	1126	0	0	2	8782	0	0	3	9340	2	140	31	57645
2003	10	2463	11	18	19487	124	4	8860	0	0	0	0	4	23430	0	0	2	1911	2	56	40	56207
TOTAL	4639	618125	5944	3954	3092224	23960	1240	600445	184	248704	70	65386	44	126582	44	18180	48	51494	370	59257	10640	4889558

Table D.12 Building Stock Changes between 1954 and 2003 in Kastamonu

(Source: TURKSTAT, 2007)

KASTAMONU	Number of House	Floor Area of House	Number of House Dwelling Units	Number of Apartment House	Floor Area of Apartment House	Number of Apartment Dwelling Units	Commercial Building	Floor Area of Commercial Building	Industrial Building	Floor Area of Industrial Building	Medical and Social Building	Floor Area of Medical and Social Building	Cultural Building	Floor Area of Cultural Building	Religious Building	Floor Area of Religious Building	Administrative Building	Floor Area of Administrative Building	Other Building	Floor Area of Other Building	General Total	Floor Area of General Total
1954	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	15	1454	17	10	3823	36	1	124	0	0	0	0	0	0	0	0	0	0	0	0	26	5401
1969	9	779	10	8	3312	26	2	69	0	0	0	0	0	0	0	0	0	0	0	0	19	4160
1970	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0
1971	64	8231	98	16	4858	55	18	650	1	416	0	0	0	0	0	0	1	504	2	33	102	14692
1972	137	17142	171	30	12319	142	5	212	0	0	0	0	0	0	0	0	0	0	2	88	174	29761
1973	46	5837	74	30	20661	212	5	315	0	0	0	0	0	0	1	185	1	123	5	169	46	5837
1974	55	8009	96	15	4991	56	6	488	0	0	0	0	0	0	0	0	0	0	4	125	80	13613
1975	46	5159	71	28	12774	139	4	968	0	0	0	0	0	0	0	0	0	0	1	13	79	18990
1976	70	9753	109	63	33042	332	9	1826	1	1023	0	0	0	0	0	0	2	4025	0	0	147	49669
1977	64	9480	108	95	61374	653	9	3296	1	258	0	0	1	900	0	0	2	7450	1	1200	173	83958
1978	83	11852	0	88	66297	0	17	10630	14	13720	0	0	0	0	0	0	0	0	2	450	204	102989
1979	67	12103	115	69	48632	467	23	4626	0	131	0	0	0	0	2	2754	0	0	0	0	161	68246
1980	34	5437	55	43	19508	210	11	2026	0	0	0	0	0	0	0	0	0	0	0	0	88	26971
1981	87	15473	152	34	14999	157	9	1267	0	0	0	0	0	0	3	6550	0	0	5	608	138	38897
1982	93	16454	157	45	30551	299	9	3017	0	121	0	0	0	0	0	0	0	0	1	56	148	50199
1983	62	13020	110	17	10885	92	10	3034	2	1056	1	1807	0	0	0	0	3	1220	0	0	95	31022
1984	57	10878	101	40	32531	262	3	2272	1	450	1	1246	1	1880	0	0	2	2581	2	77	107	51915
1985	44	7769	68	23	19828	173	11	8137	0	68	2	4374	3	5945	0	0	4	8340	5	1231	92	55692
1986	89	17395	153	44	32942	266	12	8080	1	1590	1	258	0	0	0	0	1	4716	3	951	151	65932
1987	167	28942	211	44	35256	318	6	2591	0	120	0	0	0	0	0	0	1	1976	0	0	218	68885
1988	93	15654	169	43	40382	306	6	2768	0	0	0	0	1	1782	0	0	2	3223	4	1194	149	65003
1989	184	30999	307	431	215538	2101	4	4098	1	396	0	0	2	2018	0	0	0	0	4	3681	626	256690
1990	131	26383	226	78	64645	500	11	13194	3	21845	4	9693	2	1485	1	502	1	1000	4	983	235	139730
1991	232	41922	334	114	117486	849	9	9393	1	437	1	1674	4	11156	1	120	1	3926	2	185	365	186299
1992	966	115356	1086	227	269032	1942	16	34735	0	60	1	155	2	5693	3	398	1	2565	2	342	1218	428336
1993	176	40831	232	142	141548	1092	27	21144	1	770	2	8453	4	11752	1	240	1	455	7	5726	361	230919
1994	146	28300	200	137	134343	968	23	22154	0	0	3	2634	2	5912	0	0	0	0	8	481	319	193824
1995	149	23800	186	82	93507	627	68	57761	1	2052	2	4792	2	2895	2	1384	0	0	0	0	306	186191
1996	32	6763	48	74	83385	562	14	12887	0	0	12	42144	2	5307	1	470	3	4979	3	919	141	156854
1997	84	17730	100	45	52955	376	12	15977	0	1078	5	3506	3	10783	0	0	1	3148	2	1855	154	107032
1998	30	6786	44	49	60318	413	6	27510	1	1573	2	2679	0	0	0	0	2	656	3	1058	93	100580
1999	24	4596	38	42	39929	275	6	13878	0	0	5	6209	2	5484	0	0	1	3820	5	1184	85	75100
2000	518	55994	541	59	96803	658	8	15629	1	9031	2	1283	2	1712	1	505	2	1657	1	145	594	182759
2001	15	4012	25	23	23853	152	4	11864	0	0	1	290	4	6699	1	363	1	9137	0	0	49	56218
2002	16	4950	27	56	49112	349	6	10800	2	7967	0	0	1	1392	0	0	1	672	1	210	83	75103
2003	69	16898	84	65	109393	673	6	8461	0	2175	0	0	1	1392	0	0	0	0	0	0	141	138319
TOTAL	**4154**	**646101**	**5523**	**2409**	**2090812**	**15738**	**396**	**335921**	**32**	**66337**	**47**	**91197**	**39**	**84187**	**17**	**13473**	**34**	**66173**	**79**	**22964**	**7167**	**3365746**

Table D.13 Building Stock Changes between 1954 and 2003 in Kırşehir

(Source: TURKSTAT, 2007)

KIRSEHIR	Number of House	Floor Area of House	Number of House Dwelling Units	Number of Apartment House	Floor Area of Apartment House	Number of Apartment Dwelling Units	Commercial Building	Floor Area of Commercial Building	Industrial Building	Floor Area of Industrial Building	Medical and Social Building	Floor Area of Medical and Social Building	Cultural Building	Floor Area of Cultural Building	Religious Building	Floor Area of Religious Building	Administrative Building	Floor Area of Administrative Building	Other Building	Floor Area of Other Building	General Total	Floor Area of General Total
1954	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	10	1495	13	8	2711	22	3	351	0	0	0	0	0	0	0	0	0	0	0	0	21	4557
1969	31	3693	33	17	12745	115	5	483	0	0	0	0	0	0	0	0	0	0	1	1224	54	18145
1970	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	18	2930	27	38	37366	316	14	2164	1	192	0	0	0	0	0	0	0	0	0	0	71	42652
1972	65	11787	102	50	48308	406	14	6660	0	0	0	0	0	0	0	0	2	778	2	241	133	67734
1973	41	8031	70	39	30152	264	17	5926	2	2951	0	0	0	0	0	0	1	97	0	0	100	47157
1974	45	8754	77	59	55533	507	15	5767	3	3476	0	0	5	3510	0	0	0	0	1	840	128	77880
1975	62	10776	95	53	37501	316	25	5369	3	5745	0	0	0	0	0	0	0	0	0	0	143	59391
1976	91	15175	151	73	64312	542	16	13631	4	5075	2	3077	0	0	0	0	1	187	1	90	188	101547
1977	64	10866	103	69	61332	539	2	2609	12	14220	0	0	1	362	1	94	0	0	1	220	150	89703
1978	56	12937	-	45	54691	-	6	2214	0	0	0	0	0	0	0	0	1	1661	0	0	108	71503
1979	38	8449	70	43	33652	269	0	1123	1	598	0	0	0	0	0	0	0	0	0	0	82	43822
1980	100	24460	185	148	163213	1305	19	18081	3	1316	0	0	0	0	0	0	1	454	1	45	272	307569
1981	60	10291	88	39	47805	418	12	12937	2	1241	7	19958	3	2183	1	68	7	17004	0	0	131	111527
1982	65	13317	100	13	19714	177	6	2561	1	204	0	0	0	0	0	0	0	0	0	0	85	35796
1983	85	15934	133	23	21862	170	4	2190	0	0	0	0	1	1375	0	0	0	0	1	284	114	41645
1984	93	19381	138	40	37228	264	9	4541	5	3683	4	6268	0	0	3	636	1	4590	2	745	157	77072
1985	318	45816	349	60	61498	463	11	3869	7	4426	5	13054	2	6019	0	0	0	0	8	1241	411	135995
1986	157	29185	212	121	133166	950	19	6016	54	5206	5	9853	4	7462	3	753	0	0	3	724	366	192365
1987	530	77038	624	171	194587	1435	21	12758	2	911	0	0	3	5893	1	306	1	1452	10	4551	739	297496
1988	701	105556	765	235	255406	1936	10	9025	1	2388	1	608	0	0	1	162	0	0	12	3385	961	376530
1989	406	79065	577	108	110304	781	6	5982	2	1498	0	0	0	0	1	224	1	544	3	281	527	198098
1990	133	27618	184	58	46497	305	5	4502	3	4333	3	7438	8	10514	0	0	3	7556	3	1204	216	109662
1991	57	13401	86	44	44516	299	3	6538	5	6169	0	0	1	447	0	0	1	1892	6	2495	117	75458
1992	55	11787	82	51	67182	455	7	6877	1	4000	0	0	1	2188	1	117	1	680	10	5091	127	97922
1993	70	17702	116	112	141255	924	5	7665	0	531	1	2510	3	3275	3	1483	0	0	2	870	196	175288
1994	72	20239	120	138	146678	920	6	14434	1	291	0	0	1	1611	1	254	0	0	4	1448	223	184955
1995	142	39612	226	212	270930	1675	5	14750	0	222	1	614	0	0	0	0	0	0	3	1049	363	327177
1996	100	25874	143	142	169167	1088	5	15408	3	14477	1	678	2	2492	1	288	0	0	10	3423	264	231807
1997	99	22901	120	171	261198	1626	4	10230	7	19645	1	1763	0	0	2	661	0	0	2	2376	286	318374
1998	54	17591	66	75	114643	760	4	6794	1	1544	0	0	3	9811	2	618	0	0	2	709	141	151710
1999	32	7333	36	60	66604	395	4	12702	2	6673	1	200	4	9518	0	0	1	210	0	0	104	103240
2000	64	18732	82	52	72832	418	5	20780	1	2493	0	0	1	3678	3	1434	0	0	0	0	126	119949
2001	113	21589	119	46	64355	372	5	8506	25	39641	2	6215	1	1288	0	0	0	0	0	0	192	141994
2002	391	84099	436	43	57617	332	38	17430	3	2104	1	524	2	3617	2	1164	1	138	0	0	481	166653
2003	49	11678	55	110	139184	797	18	20165	2	1709	1	600	2	1636	1	1060	0	0	0	0	183	176032
TOTAL	4487	865082	5778	2766	3148944	21598	348	361078	157	156862	36	73360	48	76879	27	9322	33	37240	88	32536	7990	4778445

Table D.14 Building Stock Changes between 1954 and 2003 in Kocaeli

(Source: TURKSTAT, 2007)

KOCAELI	Number of House	Floor Area of House	Number of House Dwelling Units	Number of Apartment House	Floor Area of Apartment House	Number of Apartment Dwelling Units	Commercial Building	Floor Area of Commercial Building	Industrial Building	Floor Area of Industrial Building	Medical and Social Building	Floor Area of Medical and Social Building	Cultural Building	Floor Area of Cultural Building	Religious Building	Floor Area of Religious Building	Administrative Building	Floor Area of Administrative Building	Other Building	Floor Area of Other Building	General Total	Floor Area of General Total
1954	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	345	46931	-	50	22526	-	60	9329	5	9738	8	6469	0	0	0	0	0	0	71	2491	539	94246
1964	429	60677	708	76	37319	396	40	12062	7	27479	2	192	0	0	0	0	0	0	70	3690	624	141419
1965	462	65589	740	147	56346	570	101	13679	4	681	0	0	3	5461	2	546	1	1164	42	1428	762	144894
1966	142	15965	185	17	9970	96	35	5429	1	198	0	0	0	0	0	0	1	2339	2	2339	198	34025
1967	292	27693	334	67	25011	258	57	7647	6	3687	2	1162	0	0	0	0	0	0	1	276	425	70476
1968	400	39404	466	177	37508	420	69	9453	6	3602	1	168	1	876	0	0	1	682	0	0	655	91693
1969	350	32424	400	270	48552	536	78	7047	6	2219	1	190	2	3719	0	0	2	909	0	0	709	95060
1970	208	25663	285	210	131714	1337	61	14256	5	2642	0	0	1	2355	1	227	0	0	12	2286	498	179143
1971	216	28617	333	198	152219	1455	65	8446	8	2914	2	6383	0	0	1	90	1	697	11	365	502	199731
1972	155	21274	246	146	99836	1008	45	10882	9	5014	1	4782	0	0	0	0	2	555	65	942	423	143285
1973	91	11854	137	173	173245	1591	49	7665	3	1167	2	700	0	0	0	0	2	1626	15	7654	335	203911
1974	99	13694	153	178	188087	1717	61	11430	7	11045	4	2777	1	6195	0	0	0	0	8	291	358	233519
1975	114	17226	171	144	82990	820	72	12891	7	7487	2	3367	0	0	0	0	1	813	5	270	345	125044
1976	65	9881	98	211	161350	1551	13	18012	2	3553	0	0	0	0	0	0	1	50	1	6571	293	199417
1977	75	13578	125	189	145041	1278	7	14124	0	0	0	0	0	0	0	0	3	2030	6	291	280	175064
1978	71	12435	-	254	227955	-	13	28198	4	1650	1	963	0	0	0	0	1	1298	6	606	350	273105
1979	86	15238	132	291	255408	2176	42	39222	4	2224	0	0	0	0	0	0	1	14628	6	429	430	327149
1980	51	9091	79	184	181385	1617	25	38679	1	168	0	0	0	0	0	0	1	1624	6	446	268	231393
1981	31	5102	47	131	131390	1150	13	15474	4	3804	0	0	0	0	0	0	0	0	3	335	182	156105
1982	43	7171	66	151	118356	1039	12	18769	12	6000	1	206	0	0	0	0	1	978	11	3260	231	154740
1983	56	11131	92	104	77592	685	7	26519	7	5614	16	33232	1	458	0	0	0	0	4	618	195	155164
1984	152	28179	262	191	148467	1279	21	28402	15	25645	2	790	5	5239	0	0	5	11616	14	7786	405	256124
1985	196	36541	326	307	268680	2354	17	46493	21	78499	3	8936	2	3519	1	1215	1	2370	11	1958	559	448211
1986	262	48762	433	617	584716	5032	18	28501	17	2278	1	137	3	5481	3	1224	1	997	13	2935	935	706353
1987	805	130792	1257	742	540884	4667	43	83604	46	63828	3	342	6	16868	4	2422	2	5344	81	25552	1732	869336
1988	534	92105	786	1180	923276	7797	48	104643	27	85802	12	11220	5	9201	3	3359	5	4310	56	12219	1870	1246135
1989	282	47282	439	563	398808	3404	35	85468	38	98694	2	2172	1	644	3	1141	2	4719	34	13418	960	652346
1990	96	19498	168	443	761314	6585	27	57908	412	140683	3	2005	7	6558	3	949	1	1664	6	3421	998	994000
1991	109	22828	192	314	239431	1942	12	69392	8	7071	0	0	2	6983	0	0	0	0	4	772	449	346477
1992	153	29086	242	373	275018	2273	24	95441	6	6760	9	4355	4	9300	0	0	1	668	7	4034	575	424692
1993	152	29256	228	347	287431	2323	17	58499	1	2503	1	75	1	1356	0	0	1	926	4	3865	524	383911
1994	698	119228	981	1492	1216669	8555	49	229148	26	123601	3	1640	13	22516	4	1928	3	16870	21	6020	2309	1537620
1995	548	111268	852	1368	941229	7427	65	201362	17	68773	6	54147	0	0	5	3926	5	50153	33	16066	2047	1446923
1996	419	84115	624	1352	920605	7628	70	225026	53	182953	3	4324	6	14529	1	1200	3	5718	36	17716	1963	1456246
1997	409	82836	581	1452	923953	7637	64	237361	27	110036	2	1064	3	8355	0	0	0	0	20	6777	1977	1472384
1998	433	89074	600	1676	1278052	10030	62	299537	37	71431	3	15143	9	22679	4	2692	4	48113	30	9165	2258	1834986
1999	232	52730	348	1032	819154	6269	35	108330	12	43644	4	4088	5	33067	2	1748	0	0	16	2133	1338	1064894
2000	343	52706	377	1120	909923	9325	17	14760	19	75070	4	3406	6	18605	1	272	1	856	7	3296	1518	3168902
2001	1697	338580	2062	1031	640312	5026	77	131317	67	261072	13	27866	9	43495	2	1141	1	14019	41	5245	2938	1463045
2002	432	96931	574	337	289849	2194	63	95586	46	167329	4	47391	10	39373	0	0	1	23594	10	2596	903	762649
2003	497	111956	663	177	114145	791	76	106507	82	178587	7	15803	10	75916	3	1547	3	4612	7	5388	862	614461
TOTAL	12220	2071153	16782	19482	14864815	122208	1765	2636807	1085	1900145	128	265495	116	362748	43	25627	89	225942	796	184850	35734	24578248

Table D.15 Building Stock Changes between 1954 and 2003 in Malatya

(Source: TURKSTAT, 2007)

MALATYA	Number of House	Floor Area of House	Number of House Dwelling Units	Number of Apartment House	Floor Area of Apartment House	Number of Apartment Dwelling Units	Commercial Building	Floor Area of Commercial Building	Industrial Building	Floor Area of Industrial Building	Medical and Social Building	Floor Area of Medical and Social Building	Cultural Building	Floor Area of Cultural Building	Religious Building	Floor Area of Religious Building	Administrative Building	Floor Area of Administrative Building	Other Building	Floor Area of Other Building	General Total	Floor Area of General Total
1954	149	25899	-	19	9184	-	16	10891	3	7224	4	303	0	0	0	0	0	0	33	1924	223	55425
1955	358	40497	-	21	8893	-	5	3898	0	0	0	0	0	0	0	0	0	0	54	2387	438	55675
1956	250	48677	-	14	5540	-	20	19437	3	7069	1	1090	0	0	0	0	0	0	46	2473	334	84286
1957	247	41147	-	10	4040	-	6	1175	53	6927	0	0	0	0	0	0	0	0	28	1959	344	55248
1958	256	43282	-	19	7529	-	12	2051	2	355	2	938	0	0	0	0	0	0	18	1210	309	55365
1959	173	28849	-	17	7498	-	2	323	1	77	0	0	0	0	0	0	0	0	13	1522	206	38269
1960	161	26711	-	16	8570	-	1	43	0	0	1	1816	0	0	0	0	0	0	10	864	189	38064
1961	130	25431	-	16	6556	-	4	538	2	645	0	0	0	0	0	0	0	0	27	1037	179	34207
1962	151	28624	-	33	13966	-	19	9405	33	5202	2	2376	0	0	0	0	0	0	19	1041	257	60614
1963	195	36163	-	60	21849	-	12	2430	4	981	4	3324	0	0	0	0	0	0	16	519	291	65266
1964	245	40414	387	78	35549	349	16	2581	4	446	0	0	3	1980	2	237	0	0	30	1021	378	82228
1965	198	36405	344	91	45431	421	79	12315	0	0	1	450	4	7331	1	342	3	6173	23	1288	400	109735
1966	13	1620	18	15	8810	94	37	875	2	339	2	946	0	0	0	0	0	0	0	0	69	12590
1967	180	20740	196	45	9733	96	119	10531	1	150	0	0	2	7239	1	249	0	0	0	0	348	48639
1968	147	14378	147	102	19936	180	41	5507	2	373	1	1275	1	300	0	0	3	4381	3	584	300	46734
1969	125	13149	130	98	23385	214	36	3949	0	0	0	0	0	0	1	161	1	2045	2	1026	263	43715
1970	14	2407	24	189	105730	934	10	2368	2		2		2		1		0				228	117478
1971	17	3130	29	201	127155	1128	19	3200	2	2276	1	154	0	0	0	0	0	0	5	206	245	136121
1972	27	5570	45	183	135133	1166	37	7190	2	958	1	1398	0	0	0	0	0	0	4	525	254	150974
1973	17	3990	34	170	162049	1474	43	11657	1	76	2	539	0	0	2	868	2	1963	2	99	239	181241
1974	36	7239	66	137	84147	753	26	18905	1	50	2	1342	0	0	0	0	0	0	3	174	205	111857
1975	14	3753	27	177	125361	1130	45	15906	3	346	0	0	0	0	0	0	1	7195	2	549	242	153110
1976	23	4804	42	253	188416	1679	7	21778	8	6892	1	2457	4	6144	1	730	1	2492	2	185	300	233898
1977	27	5764	47	274	204016	1855	3	13916	2	1487	0	0	0	0	1	112	0	0	2	250	309	225545
1978	26	5825	-	282	259941	-	18	49722	0	190	1	967	5	5838	1	238	1	3442	0	0	334	326163
1979	8	1745	13	264	288725	2478	17	51784	0	0	0	0	0	0	2	347	4	3910	2	4243	297	350754
1980	10	2209	18	211	216345	1873	16	28332	2	3586	0	0	1	1854	0	0	0	0	1	27	241	252353
1981	15	2795	27	146	180818	1513	13	25777	3	2128	1	2855	1	2044	0	0	0	0	0	0	179	216417
1982	13	2369	21	213	214829	1874	11	24568	0	325	4	3292	0	0	0	0	3	3555	0	0	244	248938
1983	25	6158	49	249	281322	2333	22	65738	5	840	1	339	0	0	1	250	6	37735	1	323	310	392745
1984	41	8467	54	257	266260	2137	11	40704	2	8467	1	474	4	2054	1	176	2	1821	3	2996	322	331419
1985	43	10399	71	368	480564	3778	45	38649	8	4504	2	7355	4	8041	0	0	0	0	5	4799	475	554271
1986	56	14480	102	392	519529	4086	19	30255	4	3187	6	5559	2	2762	0	0	2	2332	12	19199	493	597303
1987	62	16713	119	439	574015	4496	39	56510	5	3499	3	1594	6	15504	2	1528	6	23449	5	12418	567	705239
1988	64	15466	113	263	334562	2552	161	84935	5	5909	7	12177	0	0	2	854	3	2769	3	2048	508	458720
1989	40	10772	73	189	212157	1578	19	36933	2	3416	0	0	1	997	0	0	0	0	0	0	251	264275
1990	38	9496	67	198	172010	1208	24	49281	4	20476	3	696	0	0	1	603	1	1101	1	2440	270	256103
1991	72	19260	116	255	360364	2561	30	47844	1	1528	2	16962	0	0	1	324	1	7307	2	16416	364	470005
1992	53	15658	102	311	460300	3435	16	45156	4	8494	4	1753	0	0	0	0	0	0	4	1676	392	532037
1993	98	28896	141	345	512323	3487	16	54345	3	1356	0	0	1	10980	0	0	2	1666	6	2966	471	612532
1994	81	24823	120	334	590266	4222	26	77078	0	471	2	4758	2	4000	2	1652	0	0	2	3038	449	706106
1995	60	19815	104	291	363143	2354	11	41283	6	3197	0	0	0	0	1	944	0	0	2	652	371	429034
1996	79	22272	111	380	594762	3917	23	83856	6	4446	2	2650	2	5542	0	0	1	4520	1	1775	494	719823
1997	44	14510	72	207	283404	1690	17	59643	4	16117	1	552	2	4411	0	0	2	21016	0	0	277	399653
1998	43	13105	69	201	306015	1757	20	140958	3	7943	3	2958	3	7616	0	0	0	0	2	1380	275	479975
1999	38	10094	68	167	210129	1172	9	70599	3	12862	2	4186	2	7460	0	0	0	0	2	396	223	315726
2000	52	17356	85	295	541212	2681	18	97192	6	13094	1	310	0	0	0	0	0	0	2	1202	374	670366
2001	24	8223	39	163	305270	1549	10	29987	3	7961	1	240	3	4436	0	0	5	6825	3	5579	212	368521
2002	29	11133	41	164	224831	1124	7	20608	2	7596	1	2000	5	22122	1	321	0	0	0	0	209	288701
2003	26	9303	39	190	257749	1298	15	44306	1	4856	1	3423	0	0	0	0	0	0	1	700	234	320337
TOTAL	**4293**	**830145**	**3372**	**9012**	**10378244**	**72658**	**1248**	**1577002**	**213**	**188321**	**76**	**93508**	**60**	**128655**	**25**	**9936**	**50**	**145737**	**402**	**105116**	**15388**	**13464853**

Table D.16 Building Stock Changes between 1954 and 2003 in Niğde

(Source: TURKSTAT, 2007)

NİĞDE	Number of House	Floor Area of House	Number of House Dwelling Units	Number of Apartment House	Floor Area of Apartment House	Number of Apartment Dwelling Units	Commercial Building	Floor Area of Commercial Building	Industrial Building	Floor Area of Industrial Building	Medical and Social Building	Floor Area of Medical and Social Building	Cultural Building	Floor Area of Cultural Building	Religious Building	Floor Area of Religious Building	Administrative Building	Floor Area of Administrative Building	Other Building	Floor Area of Other Building	General Total	Floor Area of General Total
1954	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	36	3921	41	19	10387	92	11	1093	0	0	0	0	0	0	0	0	2	702	0	0	68	16103
1969	53	7735	66	21	6758	59	19	3110	4	810	0	0	0	0	0	0	0	0	0	0	97	18413
1970	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	42	5248	57	31	18291	153	8	1362	153	13309	0	0	0	0	0	0	0	0	5	174	239	38384
1972	33	4283	45	27	24423	220	9	3977	1	28	1	2200	2	5125	0	0	0	0	3	85	76	40148
1973	24	4139	36	55	34326	317	19	3474	2	4915	2	12630	2	4877	0	0	2	1536	9	295	115	66192
1974	25	3795	36	32	22973	219	18	3180	0	0	1	604	0	0	0	0	3	1268	1	35	80	31855
1975	36	4962	47	40	33755	308	32	8256	3	826	0	0	2	6564	0	0	0	0	0	0	113	54363
1976	26	3872	36	57	68828	617	3	7282	0	0	0	0	1	1944	0	0	1	872	1	95	89	82893
1977	28	5054	42	90	86961	803	5	19052	0	0	0	0	0	0	0	0	1	1248	0	0	124	112315
1978	35	5141	-	58	51801	-	6	10857	1	550	1	1500	0	0	2	236	0	0	0	0	103	70085
1979	58	8691	81	82	81211	727	10	17830	2	3127	0	0	0	0	0	0	0	0	3	113	154	110981
1980	19	3161	29	69	64454	595	5	11557	0	287	2	1574	0	0	0	0	2	5674	1	85	98	86792
1981	12	1756	17	33	25631	259	17	48332	2	1029	0	0	0	0	0	0	1	138	0	0	65	76883
1982	49	8798	89	36	28867	297	4	5615	0	0	0	0	0	0	0	0	0	0	3	162	92	43442
1983	14	2289	20	58	54655	515	2	2220	0	0	4	2449	1	339	0	0	1	3730	9	1137	89	66819
1984	113	15776	126	36	39199	338	12	9328	160	30990	0	0	2	888	1	138	2	3706	37	5163	363	105148
1985	149	20654	174	50	43078	394	4	2120	3	21119	3	2259	1	4316	0	0	0	0	24	1901	234	95447
1986	115	14584	136	99	112928	1049	9	11499	2	755	0	0	4	3989	0	0	0	0	5	1731	234	145486
1987	424	89806	778	46	72495	640	5	8090	2	2494	0	0	0	0	0	0	1	1840	13	2123	491	176848
1988	203	30805	269	64	50854	462	2	5966	1	240	0	0	1	864	0	0	2	5216	35	4320	308	98265
1989	484	57832	545	54	50755	505	8	4869	2	867	0	0	0	0	1	388	0	0	26	1659	575	116376
1990	75	15433	126	83	127870	1312	1	3147	3	12231	1	2885	0	0	2	608	0	0	13	2014	178	164188
1991	93	18653	157	45	30475	291	1	2630	5	2377	4	12547	4	5675	1	289	9	7216	13	1062	175	80924
1992	124	23817	172	89	98522	828	4	6884	3	6788	0	0	0	0	1	114	2	3765	6	642	229	140532
1993	208	32805	261	85	105514	839	2	11031	2	2757	0	0	0	0	0	0	1	128	11	1705	309	153940
1994	130	28406	206	116	113647	948	3	13965	2	743	0	0	0	0	0	0	2	2742	5	401	258	159304
1995	183	43174	259	147	185379	1377	7	18766	3	5076	0	0	1	630	0	0	0	0	6	1136	347	254161
1996	181	39389	236	179	177936	1308	4	8531	1	596	1	1657	0	0	0	0	0	0	3	331	369	228440
1997	119	22308	144	229	228013	1609	19	27194	2	2022	0	0	0	0	0	0	0	0	7	1040	376	280577
1998	86	20645	116	131	129470	925	11	21225	3	2349	1	2502	2	1888	0	0	0	0	3	335	237	178414
1999	323	44290	335	151	153004	1080	12	22592	4	8592	0	0	1	6828	0	0	1	284	8	2133	500	238323
2000	57	13429	78	140	170842	1209	11	22443	0	0	0	0	2	2014	0	0	0	0	3	193	213	208921
2001	38	7927	52	94	166185	1102	15	29937	2	2718	0	0	1	4581	0	0	1	4490	2	354	153	216192
2002	49	12302	64	111	156078	1046	12	38974	1	549	1	4680	0	0	0	0	3	3239	0	0	177	215833
2003	47	10694	65	111	149224	965	6	34409	4	947	1	6169	2	1254	0	0	0	0	1	210	172	202907
TOTAL	3691	635574	4941	2768	2974749	23408	316	450806	373	129091	23	53688	29	51778	8	1773	37	47794	355	30634	7500	4375888

Table D.17 Building Stock Changes between 1954 and 2003 in Yalova

(Source: TURKSTAT, 2007)

YALOVA	Number of House	Floor Area of House	Number of House Dwelling Units	Number of Apartment House	Floor Area of Apartment House	Number of Apartment Dwelling Units	Commercial Building	Floor Area of Commercial Building	Industrial Building	Floor Area of Industrial Building	Medical and Social Building	Floor Area of Medical and Social Building	Cultural Building	Floor Area of Cultural Building	Religious Building	Floor Area of Religious Building	Administrative Building	Floor Area of Administrative Building	Other Building	Floor Area of Other Building	General Total	Floor Area of General Total
1954	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	69	6940	73	17	4520	40	12	3116	2	229	0	0	0	0	0	0	1	136	0	0	101	14941
1970	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	72	6964	77	96	94267	1211	4	8925	1	156	0	0	4	9203	0	0	1	97	0	0	178	119612
1977	26	2517	30	79	58397	598	1	4932	2	1704	0	0	1	1974	0	0	0	0	0	0	109	69524
1978	19	2209	-	84	79365	-	5	9333	1	96	0	0	0	0	0	0	0	0	1	3904	110	94907
1979	42	5894	61	124	122299	1378	8	14594	0	0	1	5130	0	0	1	216	0	0	0	0	176	148133
1980	26	13007	39	89	75980	750	0	11767	0	1037	0	0	0	0	0	0	0	0	0	0	115	101791
1981	14	1512	18	61	51821	571	4	11287	0	0	0	0	1	243	0	0	0	0	1	400	81	65263
1982	15	2035	21	71	56744	630	1	5864	0	0	1	3406	0	0	0	0	0	0	1	250	89	68299
1983	21	2564	26	89	85195	861	3	9782	0	170	0	0	0	0	0	0	0	0	1	603	114	98314
1984	8	1491	12	89	98622	992	3	15849	1	393	0	0	0	0	0	0	0	0	0	0	101	116355
1985	9	1391	14	73	68735	648	3	9070	2	1016	0	0	0	0	0	0	1	4000	2	1658	90	85870
1986	39	7683	66	154	136334	1363	5	11858	1	1530	0	0	0	0	0	0	0	0	2	833	201	158238
1987	42	7564	57	116	116974	1106	1	7954	0	0	1	856	0	0	0	0	2	4645	2	592	164	138585
1988	127	24614	165	222	251535	2285	24	30643	0	0	4	2674	0	0	0	0	0	0	2	996	379	310462
1989	27	4047	36	351	404650	3636	7	26380	0	0	0	0	0	0	1	2574	1	2128	0	0	387	439979
1990	465	47348	475	109	131176	1206	10	88981	6	12301	0	0	0	0	1	60	0	0	2	1718	593	281584
1991	149	16352	154	115	138960	1292	4	17230	0	193	0	0	0	0	0	0	0	0	2	287	270	173022
1992	77	16513	87	145	200972	1743	4	14777	0	0	0	0	1	1527	0	0	0	0	2	360	229	234149
1993	40	7653	52	117	136124	1216	13	19951	0	0	1	3064	0	0	0	0	0	0	3	959	174	167751
1994	24	6590	36	89	91368	798	4	9875	3	5645	1	4163	0	0	0	0	0	0	4	642	125	118283
1995	44	10710	59	86	106865	946	7	14420	1	4710	0	0	0	0	0	0	0	0	5	1956	143	138661
1996	30	7993	43	86	82412	764	3	16341	3	17367	0	0	0	0	0	0	0	0	4	808	126	124921
1997	27	7363	41	106	141421	1144	1	17278	6	8115	0	0	1	2382	0	0	2	3030	2	205	145	179794
1998	154	23455	167	118	117608	1014	7	26739	2	1280	4	2736	0	0	0	0	8	21996	3	3366	296	197180
1999	42	8889	52	60	79681	669	3	6600	1	210	2	1218	0	0	0	0	0	0	2	1890	110	98488
2000	0	0	0	2	1974	15	0	0	1	10236	3	3148	5	6282	0	0	3	4176	0	0	14	25816
2001	177	40240	230	24	16620	108	118	60556	1	337	2	2311	4	3108	5	5574	3	5982	1	43	335	134771
2002	42	10918	65	25	31268	273	13	24032	2	3333	7	22161	2	10404	0	48	4	11207	0	0	95	113371
2003	44	11666	69	76	79123	652	9	17196	1	1003	2	4371	1	1136	2	1335	4	10348	1	281	140	126459
TOTAL	**1871**	**306122**	**2225**	**2873**	**3061010**	**27909**	**277**	**515330**	**37**	**71061**	**29**	**95238**	**20**	**36259**	**10**	**10007**	**30**	**67745**	**43**	**21751**	**5190**	**4144523**

Table D.18 Total Building Stock in Selected Provincial Centers

(Source: TURKSTAT, 2007)

	Number of House	Floor Area of House	Number of House Dwelling Units	Number of Apartment House	Floor Area of Apartment House	Number of Apartment Dwelling Units	Commercial Building	Floor Area of Commercial Building	Industrial Building	Floor Area of Industrial Building	Medical and Social Building	Floor Area of Medical and Social Building	Cultural Building	Floor Area of Cultural Building	Administrative Building	Floor Area of Administrative Building	General Total	Floor Area of General Total
AKSARAY	5183	970102	6925	3838	4508917	30052	691	739766	164	206278	31	51150	26	71204	26	49300	10322	6673125
ANTALYA	7741	1333464	8939	24516	29090527	226964	3940	7957174	206	492776	427	325383	85	231662	91	372032	38100	39938961
ARDAHAN	79	17485	130	82	58696	394	21	17890	1	268	5	12116	5	16089	5	15610	199	139623
BURSA	38567	7271280	52241	25763	26813134	208994	4475	5910607	5065	6394249	240	297832	158	386162	86	269224	75653	48175084
ÇANAKKALE	5006	676624	6875	4501	2810708	26696	570	413574	38	52716	91	129542	51	448372	40	57701	10829	4624721
DÜZCE	2724	457256	3777	3016	2675378	19587	702	737156	59	76958	42	66700	19	63928	12	16483	6703	4150670
ELAZIĞ	12025	1681638	12461	10182	9137063	69999	1662	1135257	170	74321	74	250068	53	125836	69	106458	25169	12576303
ERZİNCAN	4604	832235	6079	2838	2399597	18317	1072	516397	158	108602	44	106592	40	97789	46	79381	10535	4320291
İSTANBUL	88102	15566633	99313	175784	154418919	1285565	27155	3.6E+07	4915	13186721	657	1488843	489	1572275	231	678760	296275	219935918
İZMİR	57006	9192215	67647	61895	61042049	507412	13191	1.3E+07	2770	4443975	604	909223	411	995785	225	670700	138503	91144358
KARABÜK	4639	619125	5944	3954	3092224	23960	1240	600415	184	248734	70	65385	44	126562	41	51494	10643	4899558
KASTAMONU	4154	646101	5523	2409	2060812	15738	396	335921	32	66337	47	91197	39	84187	34	66173	7167	3365746
KIRŞEHİR	4467	855052	5778	2766	3143944	21561	348	391078	157	156962	36	73360	48	76879	23	37243	7960	4778445
KOCAELİ	12230	2072153	16792	19482	14845415	122238	1765	2636507	1085	19001145	128	265495	116	362748	59	225942	35724	24578248
MALATYA	4293	830145	3372	9012	10379241	72636	1248	1577002	213	188321	76	93508	60	128655	50	145737	15386	13464631
NİĞDE	3691	635574	4941	2768	2974749	23408	316	450806	373	129091	23	53656	29	51776	37	47794	7500	4375888
YALOVA	1871	306122	2225	2873	3061010	27909	277	515330	37	71061	29	55238	20	36239	30	67745	5190	4144523

APPENDIX E

BUILDING AMNESTIES BETWEEN 1984 AND 2000

Table E.1 “Building Amnesties” between 1984 and 2000 in Aksaray
(Source: TURKSTAT, 2007)

AKSARAY	Number of House	Commercial Buildings	Industrial Buildings	Medical and Social Buildings	Cultural Buildings	Religious Buildings	Administrative Buildings	General Total
1984 - 1988	0	0	0	0	0	0	0	0
1990	43	0	0	1	0	0	0	44
1991	24	1	2	0	0	0	0	27
1992	12	0	0	0	0	0	0	12
1993	1	0	0	0	0	0	0	1
1994	7	2	1	0	0	0	0	10
1995	2	0	0	0	0	0	0	2
1996	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0
TOTAL	89	3	3	1	0	0	0	96

Table E.2 “Building Amnesties” between 1984 and 2000 in Antalya

(Source: TURKSTAT, 2007)

ANTALYA	Number of House	Commercial Buildings	Industrial Buildings	Medical and Social Buildings	Cultural Buildings	Religious Buildings	Administrative Buildings	General Total
1984	733	78	2	1	1	0	5	820
1985	574	25	10	5	3	2	3	622
1986	1119	50	5	2	0	0	3	1179
1987	1980	132	3	4	0	3	2	2124
1988	214	16	1	0	0	0	0	231
1990	103	3	0	0	0	0	0	106
1991	41	2	0	0	0	0	0	43
1992	20	0	3	0	0	0	0	23
1993	1	0	0	0	0	0	0	1
1994	10	0	0	0	0	0	0	10
1995	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0
1998	0	1	0	0	0	0	0	1
1999	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0
TOTAL	4795	307	24	12	4	5	13	5160

Table E.3 “Building Amnesties” between 1984 and 2000 in Ardahan

(Source: TURKSTAT, 2007)

ARDAHAN	Number of House	Commercial Buildings	Industrial Buildings	Medical and Social Buildings	Cultural Buildings	Religious Buildings	Administrative Buildings
1984-2000	0	0	0	0	0	0	0

Table E.4 “Building Amnesties” between 1984 and 2000 in Bursa

(Source: TURKSTAT, 2007)

BURSA	Number of House	Commercial Buildings	Industrial Buildings	Medical and Social Buildings	Cultural Buildings	Religious Buildings	Administrative Buildings	General Total
1984	548	20	16	3	1	1	0	589
1985	413	28	22	4	0	0	1	468
1986	2559	158	26	1	0	0	1	2745
1987	15126	354	180	3	4	2	6	15675
1988	5200	187	155	3	0	1	1	5547
1990	567	39	34	0	0	0	0	640
1991	297	27	12	0	0	0	0	336
1992	133	9	6	0	0	0	0	148
1993	3	0	0	0	0	0	0	3
1994	35	1	1	0	0	0	0	37
1995	3	0	0	0	0	0	0	3
1996	6	0	0	0	0	0	0	6
1997	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0
1999	1	0	0	0	0	0	0	1
2000	1	0	0	0	0	0	0	1
TOTAL	24892	823	452	14	5	4	9	26199

Table E.5 “Building Amnesties” between 1984 and 2000 in Çanakkale

(Source: TURKSTAT, 2007)

ÇANAKKALE	Number of House	Commercial Buildings	Industrial Buildings	Medical and Social Buildings	Cultural Buildings	Religious Buildings	Administrative Buildings	General Total
1984	305	0	0	0	0	0	0	305
1985	133	5	2	0	0	0	0	140
1986	31	2	0	0	0	0	0	33
1987	138	5	0	0	0	0	0	143
1988	94	4	1	1	0	0	1	101
1990	29	4	0	0	0	0	0	33
1991	8	0	0	0	0	0	0	8
1992	2	0	0	0	0	0	0	2
1993	2	0	0	0	0	0	0	2
1994	11	0	0	0	0	0	0	11
1995	1	0	0	0	0	0	0	1
1996	1	0	0	0	0	0	0	1
1997	1	0	0	0	0	0	0	1
1998	2	0	0	0	0	0	0	2
1999	0	0	0	0	0	0	0	0
2000	5	0	0	0	0	0	0	5
TOTAL	763	20	3	1	0	0	1	788

Table E.6 “Building Amnesties” between 1984 and 2000 in Düzce

(Source: TURKSTAT, 2007)

DÜZCE	Number of House	Commercial Buildings	Industrial Buildings	Medical and Social Buildings	Cultural Buildings	Religious Buildings	Administrative Buildings
1984-2000	0	0	0	0	0	0	0

Table E.7 “Building Amnesties” between 1984 and 2000 in Elazığ

(Source: TURKSTAT, 2007)

ELAZIĞ	Number of House	Commercial Buildings	Industrial Buildings	Medical and Social Buildings	Cultural Buildings	Religious Buildings	Administrative Buildings	General Total
1984	575	32	4	1	0	0	0	612
1985	488	31	1	3	0	0	0	523
1986	597	28	5	2	0	0	2	634
1987	676	25	1	0	1	0	0	703
1988	74	6	2	0	0	0	0	82
1990	13	0	0	0	0	0	0	13
1991	3	1	0	0	0	0	0	4
1992	2	0	0	0	0	0	0	2
1993	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0
TOTAL	2428	123	13	6	1	0	2	2573

Table E.8 “Building Amnesties” between 1984 and 2000 in Erzincan
(Source: TURKSTAT, 2007)

ERZINCAN	Number of House	Commercial Buildings	Industrial Buildings	Medical and Social Buildings	Cultural Buildings	Religious Buildings	Administrative Buildings	General Total
1984	112	3	0	0	0	0	0	115
1985	129	6	0	0	1	0	0	137
1986	149	4	0	0	0	0	0	153
1987	171	2	0	0	0	2	0	177
1988	56	3	0	0	2	0	0	63
1990	23	2	0	0	0	0	0	25
1991	4	1	0	0	0	0	0	5
1992	7	5	0	0	0	0	0	12
1993	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0
TOTAL	651	26	0	0	3	2	0	687

Table E.9 “Building Amnesties” between 1984 and 2000 in Istanbul
(Source: TURKSTAT, 2007)

ISTANBUL	Number of House	Commercial Buildings	Industrial Buildings	Medical and Social Buildings	Cultural Buildings	Religious Buildings	Administrative Buildings	General Total
1984	7342	401	200	7	1	2	3	7956
1985	15778	597	254	11	5	5	7	16657
1986	25985	1553	386	22	26	4	6	27982
1987	27467	2041	564	23	7	65	9	30176
1988	5025	438	279	20	0	0	4	5766
1990	932	123	116	1	0	0	0	1172
1991	295	64	22	0	0	0	0	381
1992	193	28	5	0	0	0	0	226
1993	12	0	0	0	0	0	0	12
1994	128	5	8	0	0	0	0	141
1995	44	5	1	0	0	0	0	50
1996	8	3	0	0	0	0	0	11
1997	25	1	2	0	0	0	0	28
1998	32	4	14	0	0	0	0	50
1999	24	5	1	0	0	0	0	30
2000	3	0	0	0	0	0	0	3
TOTAL	83293	5268	1852	84	39	76	29	90641

Table E.10 “Building Amnesties” between 1984 and 2000 in Izmir
(Source: TURKSTAT, 2007)

IZMIR	Number of House	Commercial Buildings	Industrial Buildings	Medical and Social Buildings	Cultural Buildings	Religious Buildings	Administrative Buildings	General Total
1984	1340	94	40	1	5	0	0	1480
1985	1648	74	33	0	0	0	2	1757
1986	3242	197	47	3		1	3	3493
1987	2635	172	46	3	3	1	2	2862
1988	999	123	36	1	0	0	3	1162
1990	704	212	26	4	0	1	0	947
1991	2077	269	30	0	0	0	0	2376
1992	496	72	19	0	1	0	1	589
1993	186	29	1	0	0	0	0	216
1994	632	59	8	0	0	0	0	699
1995	51	16	0	0	0	0	0	67
1996	119	14	1	0	0	0	0	134
1997	24	14	1	0	0	0	0	39
1998	27	7	0	0	0	0	0	34
1999	16	4	1	0	0	0	0	21
2000	13	2	0	0	0	0	0	15
TOTAL	14209	1358	289	12	9	3	11	15891

Table E.11 “Building Amnesties” between 1984 and 2000 in Karabük
(Source: TURKSTAT, 2007)

KARABÜK	Number of House	Commercial Buildings	Industrial Buildings	Medical and Social Buildings	Cultural Buildings	Religious Buildings	Administrative Buildings
1984-2000	0	0	0	0	0	0	0

Table E.12 “Building Amnesties” between 1984 and 2000 in Kastamonu
(Source: TURKSTAT, 2007)

KASTAMONU	Number of House	Commercial Buildings	Industrial Buildings	Medical and Social Buildings	Cultural Buildings	Religious Buildings	Administrative Buildings	General Total
1984	68	6	0	0	0	0	0	74
1985	106	10	3	1	0	0	4	124
1986	96	3	1	0	0	0	0	100
1987	287	18	10	4	2	1	6	328
1988	50	7	0	1	0	0	0	58
1990	21	0	0	0	0	0	0	21
1991	5	0	0	0	0	0	0	5
1992	7	2	1	2	0	0	0	12
1993	9	1	0	0	0	0	0	10
1994	22	2	0	0	0	0	0	24
1995	0	0	0	0	0	0	0	0
1996	2	0	0	0	0	0	0	2
1997	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0
TOTAL	673	49	15	8	2	1	10	758

Table E.13 “Building Amnesties” between 1984 and 2000 in Kırşehir
(Source: TURKSTAT, 2007)

KIRSEHIR	Number of House	Commercial Buildings	Industrial Buildings	Medical and Social Buildings	Cultural Buildings	Religious Buildings	Administrative Buildings	General Total
1984	289	1	5	0	0	0	0	295
1985	124	1	0	0	0	0	1	126
1986	121	0	0	0	0	0	1	122
1987	94	2	0	0	1	0	0	97
1988	0	0	0	0	0	0	0	0
1990	19	1	0	0	0	0	0	20
1991	5	0	0	0	0	0	0	5
1992	1	0	0	0	0	0	0	1
1993	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0
TOTAL	653	5	5	0	1	0	2	666

Table E.14 “Building Amnesties” between 1984 and 2000 in Kocaeli
(Source: TURKSTAT, 2007)

KOCAELI	Number of House	Commercial Buildings	Industrial Buildings	Medical and Social Buildings	Cultural Buildings	Religious Buildings	Administrative Buildings	General Total
1984	2281	55	19	0	1	0	1	2357
1985	4752	92	36	9	3	5	9	4906
1986	5388	103	141	9	0	2	1	5644
1987	4108	197	54	1	1	3		4364
1988	1443	61	38	0	0	3	1	1546
1990	689	32	6	0	0	0	0	727
1991	249	10	11	0	0	0	0	270
1992	347	22	1	1	0	0	0	371
1993	22	1	0	0	0	0	0	23
1994	62	5	1	0	1	0	0	69
1995	4	0	0	0	0	0	0	4
1996	4	1	0	0	0	0	0	5
1997	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0
1999	8	1	0	0	0	0	0	9
2000	0	0	0	0	0	0	0	0
TOTAL	19357	580	307	20	6	13	12	20295

Table E.15 “Building Amnesties” between 1984 and 2000 in Malatya
(Source: TURKSTAT, 2007)

MALATYA	Number of House	Commercial Buildings	Industrial Buildings	Medical and Social Buildings	Cultural Buildings	Religious Buildings	Administrative Buildings	General Total
1984	64	1	0	0	0	0	0	65
1985	102	26	2	0	0	0	0	130
1986	75	41	2	0	0	0	0	118
1987	273	28	2	0	0	0	0	303
1988	20	12	2	0	0	0	0	34
1990	35	12	0	0	0	0	0	47
1991	4	3	0	0	0	0	0	7
1992	0	2	0	0	0	0	0	2
1993	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0
TOTAL	573	125	8	0	0	0	0	706

Table E.16 “Building Amnesties” between 1984 and 2000 in Niğde
(Source: TURKSTAT, 2007)

NİĞDE	Number of House	Commercial Buildings	Industrial Buildings	Medical and Social Buildings	Cultural Buildings	Religious Buildings	Administrative Buildings	General Total
1984	147	12	4	1	1	0	0	165
1985	48	3	2	0	0	0	0	53
1986	216	8	0	1	0	0	0	225
1987	713	4	3	0	1	0	0	721
1988	451	4	1	1	0	0	0	457
1990	8	0	0	0	0	0	0	8
1991	3	0	0	0	0	0	0	3
1992	3	0	0	0	0	0	0	3
1993	0	0	0	0	0	0	0	0
1994	1	0	0	0	0	0	0	1
1995	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0
TOTAL	1590	31	10	3	2	0	0	1636

Table E.17 “Building Amnesties” between 1984 and 2000 in Yalova
(Source: TURKSTAT, 2007)

YALOVA	Number of House	Commercial Buildings	Industrial Buildings	Medical and Social Buildings	Cultural Buildings	Religious Buildings	Administrative Buildings	General Total
1984	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0
1996	1	0	0	0	0	0	0	1
1997	1	0	0	0	0	0	0	1
1998	1	0	0	0	0	0	0	1
1999	2	0	0	0	0	0	0	2
2000	0	0	0	0	0	0	0	0
TOTAL	5	0	0	0	0	0	0	5

Table E.18 Total “Building Amnesties” between 1984 and 2000

(Source: TURKSTAT, 2007)

	Number of House	Commercial Buildings	Industrial Buildings	Medical and Social Buildings	Cultural Buildings	Religious Buildings	Administrative Buildings	General Total
AKSARAY	89	3	3	1	0	0	0	96
ANTALYA	4795	307	24	12	4	5	13	5160
ARDAHAN	0	0	0	0	0	0	0	0
BURSA	24892	823	452	14	5	4	9	26199
ÇANAKKALE	763	20	3	1	0	0	1	788
DÜZCE	0	0	0	0	0	0	0	0
ELAZIG	2428	123	13	6	1	0	2	2573
ERZINCAN	651	26	0	0	3	2	0	682
ISTANBUL	83293	5268	1852	84	39	76	29	90641
IZMIR	14209	1358	289	12	9	3	11	15891
KARABÜK	0	0	0	0	0	0	0	0
KASTAMONU	673	49	15	8	2	1	10	758
KIRSEHIR	653	5	5	0	1	0	2	666
KOCAELI	19357	580	307	20	6	13	12	20295
MALATYA	573	125	8	0	0	0	0	706
NİĞDE	1590	31	10	3	2	0	0	1636
YALOVA	5	0	0	0	0	0	0	5